the iafor european conference series 2014

ece2014 ecll2014 ectc2014

Official Conference Proceedings ISSN: 2188-1138

"To Open Minds, To Educate Intelligence, To Inform Decisions"

The International Academic Forum provides new perspectives to the thought-leaders and decision-makers of today and tomorrow by offering constructive environments for dialogue and interchange at the intersections of nation, culture, and discipline. Headquartered in Nagoya, Japan, and registered as a Non-Profit Organization (一般社団法人) , IAFOR is an independent think tank committed to the deeper understanding of contemporary geo-political transformation, particularly in the Asia Pacific Region.

INTERNATIONAL

INTERCULTURAL

INTERDISCIPLINARY

iafor

The Executive Council of the International Advisory Board

IAB Chair: Professor Stuart D.B. Picken IAB Vice-Chair: Professor Jerry Platt

Mr Mitsumasa Aoyama
Director, The Yufuku Gallery, Tokyo, Japan

Professor David N Aspin
Professor Emeritus and Former Dean of the Faculty of Education, Monash University, Australia
Visiting Fellow, St Edmund's College, Cambridge University, UK

Professor Don Brash
Former Governor of the Reserve Bank, New Zealand
Former Leader of the New National Party, New Zealand
Adjunct Professor, AUT, New Zealand & La Trobe University, Australia

Lord Charles Bruce
Patron, Japan Society of Scotland
Patron, Scottish Centre of Tagore Studies at Edinburgh Napier University
Chairman, Kolkata Scottish Heritage Trust

Professor Judith Chapman
Professor of Education, Australian Catholic University, Australia
Visiting Fellow, St Edmund's College, Cambridge University, UK
Member of the Order of Australia

Professor Chung-Ying Cheng
Professor of Philosophy, University of Hawai'i at Manoa, USA
Editor-in-Chief, The Journal of Chinese Philosophy

Professor Steve Cornwell
Professor of English and Interdisciplinary Studies, Osaka Jogakuin University, Osaka, Japan
Osaka Local Conference Chair

Professor Michael A. Cusumano
SMR Distinguished Professor of Management and Engineering Systems, MIT Sloan School of Management, Massachusetts Institute of Technology, USA

Professor Dexter Da Silva
Professor of Educational Psychology, Keisen University, Tokyo, Japan

Professor Georges Depeyrot
Professor and Director of Research & Member of the Board of Trustees
French National Center for Scientific Research (CNRS) & L'Ecole Normale Superieure, Paris, France

Professor Donald E. Hall
Herbert J. and Ann L. Siegel Dean
LeHign University, USA

Professor June Henton
Dean, College of Human Sciences, Auburn University, USA

Professor Michael Hudson
President of The Institute for the Study of Long-Term Economic Trends (ISLET)
Distinguished Research Professor of Economics, The University of Missouri, Kansas City

Professor Koichi Iwabuchi
Professor of Media and Cultural Studies & Director of the Monash Asia Institute, Monash University, Australia

Professor Sue Jackson
Professor of Lifelong Learning and Gender & Pro-Vice Master of Teaching and Learning, Birkbeck, University of London, UK

Professor Sing Kong Lee
Director, The National Institute of Education, Singapore

Professor Sir Geoffrey Lloyd
Senior Scholar in Residence, The Needham Research Institute, Cambridge, UK
Fellow and Former Master, Darwin College, University of Cambridge
Fellow of the British Academy

Professor Keith Miller
Orthwein Endowed Professor for Lifelong Learning in the Science, University of Missouri-St.Louis, USA

Professor Kuniko Miyanaga
Director, Human Potential Institute, Japan
Fellow, Reischauer Institute, Harvard University, USA

Professor Dennis McInerney
Chair Professor of Educational Psychology and Co-Director of the Assessment Research Centre
The Hong Kong Institute of Education, Hong Kong SAR

Professor Ka Ho Joshua Mok
Chair Professor of Comparative Policy, Associate Vice-President (External Relations)
Dean of the Faculty of Arts and Sciences, The Hong Kong Institute of Education, Hong Kong SAR

Professor Michiko Nakano
Professor of English & Director of the Distance Learning Center, Waseda University, Tokyo, Japan

Professor Baden Offord
Professor of Cultural Studies and Human Rights & Co-Director of the Centre for Peace and Social Justice
Southern Cross University, Australia

Professor Frank S. Ravitch
Professor of Law & Walter H. Stowers Chair in Law and Religion, Michigan State University College of Law

Professor Richard Roth
Senior Associate Dean, Medill School of Journalism, Northwestern University, Qatar

Professor Monty P. Satiadarma
Clinical Psychologist and Lecturer in Psychology & Former Dean of the Department of Psychology and Rector of the University, Tarumanugara University, Indonesia

Mr Mohamed Salaheen
Director, The United Nations World Food Programme, Japan & Korea

Mr Lowell Sheppard
Asia Pacific Director, HOPE International Development Agency, Canada/Japan

His Excellency Dr Drago Stambuk
Croatian Ambassador to Brazil, Brazil

Professor Mary Stuart
Vice-Chancellor, The University of Lincoln, UK

Professor Gary Swanson
Distinguished Journalist-in-Residence & Mildred S. Hansen Endowed Chair, The University of Northern Colorado, USA

Professor Jiro Takai
Secretary General of the Asian Association for Social Psychology & Professor of Social Psychology Graduate School of Education and Human Development, Nagoya University, Japan

Professor Svetlana Ter Minasova
President of the Faculty of Foreign Languages and Area Studies, Lomonosov Moscow State University

Professor Yozo Yokota
Director of the Center for Human Rights Affairs, Japan
Former UN Special Rapporteur on Myanmar

Professor Kensaku Yoshida
Professor of English & Director of the Center for the Teaching of Foreign Languages in General Education, Sophia University, Tokyo, Japan

The International Advisory Board is composed of distinguished academics, business executives, former and current government officials, and community leaders. Its role is to consult and provide counsel on the business and affairs of IAFOR, and suggest areas of scholarly investigation. Membership of the International Advisory Board is by invitation only. For a full list please see the IAFOR website.

The European Conference on Technology in the Classroom 2014

Brighton, United Kingdom

Official Conference Proceedings

ISSN: 2188-1138

The International Academic Forum (IAFOR)
Sakae 1-16-26-201
Naka Ward, Nagoya, Aichi
Japan 460-0008
ww.iafor.org

Table of Contents

Tablet Reading Bridging the University and Children in Remote Areas

Lih-Juan ChanLin, Fu-Jen Catholic University, Taiwan
Te-Lien Chou, National Taiwan University of Science and Technology, Taiwan
Wei-Hsiang Hung, Fu-Jen Catholic University, Taiwan

The European Conference on Technology in the Classroom
Official Conference Proceedings 2014

Abstract
Facing with limited resources and human support, children in remote areas encounter many difficulties in learning and reading with the use of modern technological devices. To help these children experience mobile reading activities with innovative technology, support from the society was initiated. Services to learning sites were provided by the university. In this paper, issues related to support of tablet reading were explored. A platform for sharing experiences among different learning sites was developed. Experiences from learning sites were shared within a mobile reading community for promoting digital equity among children in remote areas.

Keywords: tablet reading, mobile reading, mobile learning, digital divide, remote area

Introduction

With advances in mobile technology, tablet reading offers an innovative way of formal and informal learning. During the past, Fu Jen Catholic University has been engaged in bridging digital divide by providing opportunities and possibilities to reach remote individuals of diverse socio-economic status (Chanlin, Lin & Lu, 2012). University students also actively engage themselves to the services for disadvantage community and children in remote areas. Being involved in authentic service activities, students are provided with opportunity for lifelong civic engagement in the community they serve. Positive attitude gained from the service activities contributes potential value to deepen the relevancy of knowledge acquisition and enrich learning experiences (Fontaine & Todd, 2011). To bridge digital divide for children in remote areas, a charity foundation donations tablet PCs to support children's reading and learning in remote areas. The university played a role in promoting follow-up reading activities. In this paper, several issues related to mobile reading in remote areas are discussed.

Preparing children for electronic reading

Electronic reading entails a combination of various skills and strategies needed to search, select, analyze, evaluate, and communicate with diverse forms of media (Chang, et al., 2011; ChanLin, 2013). To foster knowledge acquisition in various subjects, the importance of reading undertaken in childhood cannot be underestimated (Maynard, 2010). Helping children acquire the skills necessary to navigate, evaluate, and communicate with technological devices is crucial for development of literacies required in modern society (Dunn, 2013). The reading process involves intellectual and complex tasks that may encompass the use of several cognitive strategies for achieving specific objectives. Guidance for providing reading scaffold is needed to encourage active participation in the reading process (Alber, 2011).

Successful electronic reading experiences require applications of strategies in use of reading devices and use of reading content (ChanLin, 2013; Larson, 2010). Children should be encouraged to reflect on the reading content and build connections and to think in a more dynamic way. Modern technology makes electronic reading materials accessible online for children to experience the richness of contemporary and historical literary characters, themes, and genres that children and adults have cherished for generations (Hustin 2011). However, children with limited reading skills in use of strategies require guidance for applying necessary strategies to the reading process (Kulaga, 2011).

Digital accessibility

Children from remote areas or disadvantage families are characterized by inequality in obtaining access to ICT and digital reading as they are supposed to experience in the digital age. Inequalities and disparity in accessing learning resources among their children need to be addressed (Gudmundsdottir, 2010). Youths from remote areas might require much support from the society and community to help them develop necessary learning ability and skills for coping with learning obstacles (Hughes, Boyd & Dykstra, 2010). Among the support required, helping them to read and nurturing their learning skills are the most fundamental. It is suggested that children who get

encouragement to read from their living environment are more likely to enjoy reading, to read frequently, to have positive attitudes towards reading, and to believe that reading is important to success in their life (Clark & Hawkins, 2010).

Integrating modern technology into reading is essential for nurturing individuals' creativity and thinking skills in today's society so as to meet the needs in the rapid changing world. Further concern needs to be paid especially in the underserved communities to identify ways in which learning society and related policies can be more equitably implemented (Klimaszewski & Nyce, 2009; Yildiz, 2013).

Support and sharing of experience

With the aim to bridge the digital divide and to provide innovative reading opportunity, a charity foundation took the initiative in 2013 to donate a great number of tablets to children in remote areas of Taiwan. However, when new information and communication technologies are adopted, both technical and human supports were needed in underserved communities for bridging the digital divide (Govindaraju & Mabel, 2010). Fu-Jen Catholic University shared the duty to provide training to "seed teachers" (teachers who promote tablet-reading at remote learning sites) at learning sites. Implementing an innovative approach in learning activities on mobile devices requires considerations of pedagogical justifications, including relative advantage, compatibility, complexity, trial ability, and observability (Nedungad & Raman, 2012; Rogers, 1985). Supports in human resources and technical resources are both needed. A framework to organize and structure both human resources and technical support was established as shown in Figure 1.

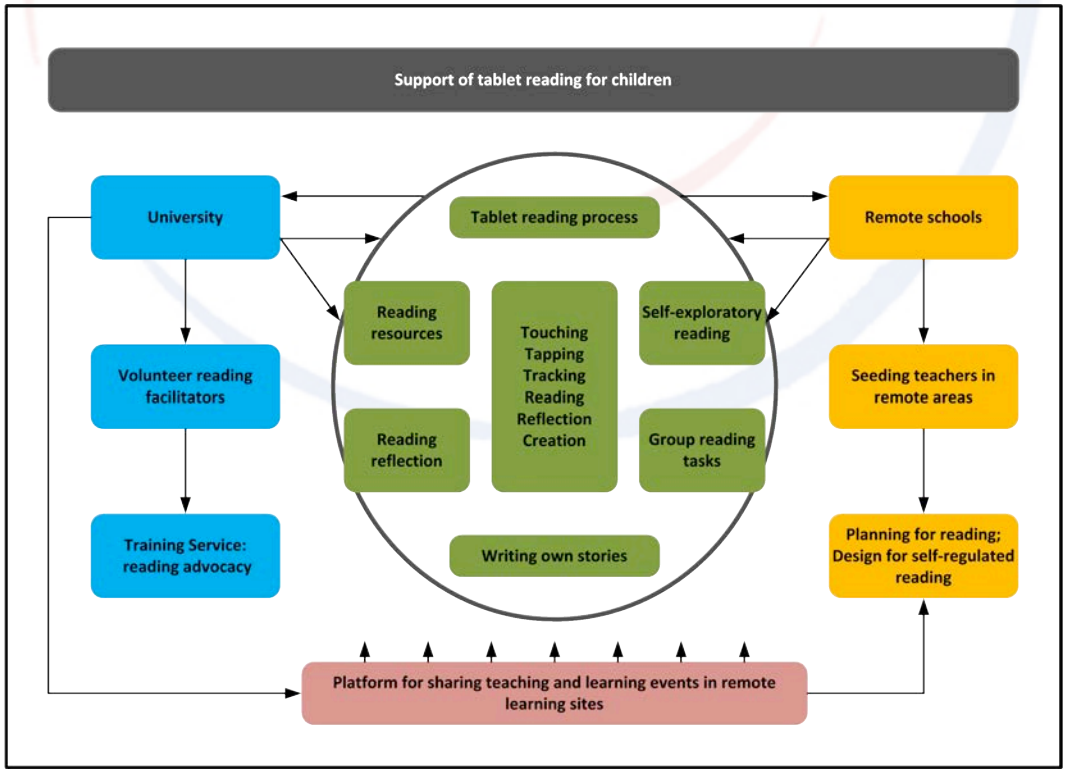

Figure 1: Support for mobile reading among children in remote areas

Preparation for promoting mobile reading entailed much planning, which included training for use of mobile devices, introducing electronic children's books, and guidance for reading. Basic hands-on guides and trouble-shooting techniques related to the use of tablet PC were provided to teachers. Teachers in remote areas were also invited to use children's reading resources available online. A wide variety of public resources on digital children's literature collections for school and library uses were introduced to teachers. With increasing digital children's literature collections and mobile applications currently available online, schools in remote areas are invited to access various reading materials free from the limitations of time and space.

A platform, "Mobile Reading in Action", was developed for exchanging experiences among learning sites. Guidance for innovative exploits of tablet PC in reading was provided. (Figure 2). Tutorials, technical supports for problem-shooting in using tablet PC, and links to various children reading resources were organized. "Mobile Reading in Action" also served as a platform for interactions among the community members (seed teachers at learning sites and supporting team members from the university library). To satisfy the community needs, various sharing and interaction functions were embedded in the platform. The website was developed by Drupal (http://drupal.org/), an open Content Management System (CMS) written in PHP. "Mobile Reading in Action" used various modules for serving the need among the community members, including setting up accounts, using features in interaction, sharing, storing, uploading/downloading documents, and managing these features. In addition to the core modules, other modules, such as user account registration and maintenance, menu management, RSS feeds, and page layout customization are also utilized.

Volunteer reading facilitators

Issues related to the value of students' involvement in service-learning actions in community are addressed (Kliewer, et al., 2010; Marichal, 2010; Molee, Henry & Sessa, McKinney-Prupis, 2010; Nanda & Scott, 2011; Ngai, 2009; Stenhouse & Jarrett, 2012). Service learning helps students to cultivate their civic behavior, and it is suggested that participation in service learning fosters students' intentions to continue their civic behavior. To provide college students with opportunity in engaging in community service, recruitment and training of volunteer reading facilitators (college students) was conducted. Electronic story books and online learning resources were also organized for tablet-reading activities. College students recruited as reading facilitators were trained to use tablet PC for promoting mobile reading.

Learning through experience in practical settings provides opportunity to encourage students' engagement in authentic activities, meet communities' needs, and enrich their lifelong social engagement (Bate, 2010; Baker, 2011). Well-organized, well-constructed and well-reinforced service-learning opportunities foster active engagement among participants within the community (Mottner, 2010). Moreover, planning for serving as a successful reading facilitator is essential to achieve intended purposes from students' service experiences.

The service tasks required skills in the use of tablet PC, access to the reading resources from the Internet, and strategies for guiding children to digital reading.

Regular training courses were provided to volunteer on weekly basis (18 hours). The course content covers: (1) How to become to become a volunteer reading facilitator, (2) Design for a specific reading topic, (3) Tool for concept map in reading (Xmind), (4) Tool for recording reading instruction (EverCam), (5) Design reading, content and extended activities and discussions, (6) Use of application software (for worksheet and poster), (7) Story guiding skills, (8) Sharing by senior volunteers, (9) Use of tablet PC, (10) invited talk of experts (instructors from the public library). In each training period, a set of questionnaire items (for formative purposes) was given to the volunteers to gather their responses toward each course.

Prior to on-site services, allocation of the human resources among team member was planned. Volunteers were assembled for rehearsing and practicing for service activities. Training for reinforcing the service skills included: (1) techniques for handling tablet PC, (2) selection of reading resources for children, (3) design of reading tasks for children (design of questions for encouraging exploration of reading contents), and (4) activities for reading with Tablet PC.

According to their on-site service experiences reported, college students enjoyed accompanying children in tablet reading. "*Good planning for various reading activities was essential for successful implementation of tablet reading for children*". "*Duration for specific reading activities should be appropriately arranged with children's attention span taken into consideration*".

College students participating in reading advocacy have experienced an innovative way of community engagement. Different from traditional promotion of reading advocacy, the use of tablet reading devices also added potential interest to college students. College students also experienced new way of planning for guiding children's reading.

Tutorials for tablet reading | Children reading resources

Figure 2: "Mobile Reading in Action" for teaching and sharing tablet reading experiences (http://tablet.project.lins.fju.edu.tw/)

Children's reading experiences reported by teachers

Reading experiences from learning sites were reported by school teachers. "Wow! Tablet PC" was the first reaction from the children. (REPORT-08L). According to the teachers' sharing, children's uses of tablet PC in reading are summarized as

follows: (1) pre-reading, (2) in-class reading assigned by teachers, (3) self-exploratory reading from the resource links provided, (4) group-exploratory reading for aboriginal tribes (stories about their own cultures), (5) reading comprehension test, (6) recording of reading reflections from children, and (7) documenting own stories from integration of reading resources. Tablet PC provided low-reading-capability children with greater access to reading facilitation. *"In order to help children with reading difficulty, tablet devices were allowed to be borrowed home for pre-reading with unfamiliar words and phrases checked in advance through dictionary app. Children's basic reading ability was thus enhanced"*.

Various strategies were used by teachers to promote tablet reading; for example, class reading competition, exploratory activities related to culture-related stories (e.g., "*Bawan shot sun*" – story for Tayal tribe), and the use of concept map to organize reading contents. "*Class websites were used for sharing reading reflections. Children enjoyed reading electronic books. In one class of my school, there were 13 students reading more than 40 e-books in one month.*" "*Children were more interested in reading e-books than traditional hard-copy books.*"

Along the reading process, students also learned to use the tablet device to record their reading reflections from the story they read and shared their reflections on Facebook. Requesting children to elicit questions while reading encouraged children to think and reflect more actively. *"Children learned to generate good questions while reading. When requested to elicit questions from reading, they were more focused on self-construction of meanings from reading materials*".

In a specific learning site, one of the group-exploratory activities was to write their own stories (such as "*Malapalu*" – at Hwa-Lien). Story-writing required reading and synthesis of various resources, guidance for access of information, and the format of presentation should be will planned and taught. "*Our children should develop ability to tell our own stories*". In the story-writing approach, children were encouraged to construct stories for introducing their language, rituals, songs, dances, and art in their own tribe. Through the process, children actively exploited and integrated relevant readings. "*In addition to reading from others' works, our children also write stories about our own tribe. They learned to search for relevant materials online, and write their own stories*".

Teachers from remote school appreciated the experiences of collaboration with the university. They also appreciated the opportunity for them to adapt new approach of reading. However, more sharing of children's work for using tablets to trigger more teachers' involvement in planning for tablet reading was suggested.

Conclusion

Mobile reading offers new opportunity for lifelong learning. With the scope of reading extending to the Internet sources, traditional reading culture shifts from paper-based to a wide variety of electronic formats. Children from remote areas or disadvantage families often experienced limited access to digital reading as they should in the digital age. In the present study, through community support, children in remote areas could experience the excitement of tablet reading. Mobile reading is changing dynamically, stimulated by new opportunities offered by advances in digital

technology. Children in remote areas require ongoing support from the society to keep pace with the dynamic reading culture. It is hoped that further research on the issues related to bridging the digital divide will be explored in the future.

Acknowledgement
The work described in this paper was supported by a research grant from the Ministry of Science and Technology whose financial support is gratefully acknowledged. We also would like to extend our sincere gratitude to Compal for the donations of tablet pc to promote tablet reading in children from disadvantage groups and remote areas.

References

Baker, M. M. (2011). Building community partnerships learning to serve while learning to teach. *The School Community Journal, 21*(1), 113-127.

Bates, L. (2010). *Service-learning as strategy of aging and environment: Developing generations of socially responsible interior designers.* M.F.A. 1476272, Iowa State University, United States -- Iowa. Retrieved from http://proquest.umi.com/pqdweb?did=2063853551&Fmt=7&clientId=29550&RQT=309&VName=PQD

ChanLin, L., Lin, H. & Lu, T. (2012). *Online after-school learning for bridging the digital divide*. Proceedings of 12th IEEE International Conference on Advanced Learning Technologies (ICALT 2012), 436-437. Rome, Italy, July 4-6

ChanLin, L. (2013). Reading strategy and the need of e-book features, *Electronic Library, 31*(3), 329-344.

Chang, S. et al (2011). Developing and validating a media literacy self evaluating skill scale (MLSS) for elementary school students, *TOJET, 10*(2),61-71.

Clark C, Hawkins L. (2010). Young people's reading: the importance of the home environment and family support. London: National Literacy Trust; 2010. Accessed 22 September 2010. http://www.literacytrust.org.uk/assets/0000/4954/Young_People_s_Reading_2010.pdf

Fontaine, S. J. & Todd, A. (2011). Community-based learning and the international student. *Review of Higher Education and Self-Learning, 4*(11), 35-44.

FJ News (2013). *Compal donates tablet PCs to children in remote areas.* (2013, January, 22). Accessed 17 July, 2013, http://140.136.114.206/blog/archives/005531.html

Gudmundsdottir, G. B. (2010). From digital divide to digital equity: Learners' ICT competence in four primary schools in Cape Town, South Africa. *International Journal Education and Development using Information and Communication Technology, 6*(2), 1-22

Houston, C. (2011). Digital books for digital natives - A tour of open access children's digital literature collections. *Children and Libraries, 9*(3), 39-45.

Hughes, C., Boyd, E. &, Dykstra, S. J. (2010). Evaluation of a university- based mentoring program: mentors' perspectives on a service learning experience. *Mentoring & Tutoring: Partnership in Learning , 18*(4), 361-382.

Kliewer, B., Sandmann, L. R., Kim, J., & Omerikwa, A. (2010). Toward understanding reciprocity in community-university partnerships: An analysis of theories of power. In P. Gandy, S. Tieszen, C. Taylor-Hunt, D. Flowers, & V. Sheared (Eds.), *Proceedings of 51th Adult Education Research Conference* (pp.256-261). Sacramento, CA: California State University.

Kulaga, A. (2011). Beyond basals: using a range of texts for guided reading. *Practically Primary, 16*(3), 21-24.

Larson, L. C. (2010) Digital readers: The next chapter in e-book reading and response. *The Reading Teacher, 64*(1), 15-22.

Dunn, H. S. (2013). Information literacy and digital divide: challenging e-exclusion in th global south, in *Digital literacy: concept, methodologies, tools, and application*, Chapter 2, 438-460. Hershey, PA : Information Science Reference

Maynard¸ S. (2010). The impact of e-books on young children's reading habits. *Publishing Research Quarterly, 26* (4), 238-248.

Ministry of Culture (2013). Children's Garden of Story Books, accessed 27 July, 201, http://children.moc.gov.tw/

Molee, L. M., Henry, M. E. Sessa, V. I., *McKinney-Prupis, E. R.* (2010). Assessing learning in service-learning courses through critical reflection. *Journal of Experiential Education, 33*(3), 239-257.

Mottner, S. (2010). Service learning in a nonprofit marketing course: A comparative case of pedagogical tools. Journal of Nonprofit & Public Sector Marketing, 22(231-245). DOI: 10.1080/10495142.2010.483274

Nanda, M. & Scott, P. (2011). Service learning and community-based partnerships: A model for teaching macro practice social work. *Journal of College Teaching & Learning, 8*(8), 25-37.

Nedungadi, P., & Raman, R. (2012). A new approach to personalization: Integrating e-learning and m-learning. *Educational Technology Research & Development, 60*(4), 659-678. doi: 10.1007/s11423-012-9250-9

Ngai, S. S. (2009). The effects of program characteristics and psychological engagement on service-learning outcomes: a study of university students in Hong Kong. *Adolescence, 44* (174), 375-389.

Resnicks, M. (2007). Sowing the seeds for a more creative society. *Learning and Leading with Technology, 35*(4), 18-22.

Rogers, E. M. (1995). Diffusion of innovations (4th Ed.) New York: The Free Press.
Segal-Drori, O., Korat, O., Shamir, A., & Klein, P. S. (2010). Reading electronic and printed books with and without adult instruction: effects on emergent reading. Read Writ, 23, 913-930.

Simons, L., Hirshinger-Blank, N.,Williams, E., Willis, K., Camiollo, L.,Dry, C. Floyd, C. and Russell, B. (2010). A pilot study of cultural-based service-learning: what did undergraduate students learn from elementary school teachers in an urban public school district?," *Kentucky Journal of Excellence in College Teaching and Learning,*8, Article 4. Available at: http://encompass.eku.edu/kjectl/vol8/iss1/4

Stenhouse, V. L. & Jarrett, O. S. (2012). In the service of learning and activism: service learning, critical pedagogy, and the problem solution project. *Teacher Education Quarterly, 39*(1), 51-76.

Yildiz, M. (2013). Digital divide in Turkey: a general assessment, in *Digital literacy: concept, methodologies, tools, and application*, Chapter 2, 721-734. Hershey, PA : Information Science Reference.

Contact email: lins1005@mail.fju.edu.tw

The Effects of Wiki-based Recursive Process Writing on Chinese Narrative Essays for Chinese as a Second Language (CSL) Students in Singapore

Chee Kuen Chin, Singapore Centre for Chinese Language,
Nanyang Technological University, Singapore
Cheng Gong, Singapore Centre for Chinese Language,
Nanyang Technological University, Singapore
Boon Pei Tay, Singapore Centre for Chinese Language,
Nanyang Technological University, Singapore

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

Abstract
This paper reports on the effects of using wiki-based process writing in Singapore's Chinese as a Second Language (CSL) scenarios. A group of 32 Secondary 1 (Seventh Grade) students ("Students") received various forms of online scaffolding at different steps of the writing process over two years. A whole set of teaching materials on 45 writing skills was developed and uploaded to the Wiki platform through five recursive cycles. In each cycle, the Students were encouraged to apply skills they learned via Wiki platform in their writing and afterwards work as a team in the platform to peer-review each other's first draft. With feedback received from peer revision, Students proceeded to edit their first draft, focusing on the content of narratives and the appropriateness on their use of micro writing skills. The scaffolding decreased as the project progressed. Students' pre-, mid- and post-writing tests were marked and compared. The authors analyzed the impact that the feedback in the process had towards the Students' overall writing performance. It was discovered that students' quality of written products were improved in general. It was also discovered that students benefited the most from giving remarks to their peers' writing. The revision patterns of high, medium and low language ability students were also compared. It was found that the higher the language ability of the students, the more concerned were they with macro level for their revisions. ICT-mediated process writing has not garnered much attention in the field of CSL. The study hopes to contribute to the literature of ICT-mediated writing instruction in the field of CSL.

Keywords: Process Writing, Chinese Narrative Essay, Peer Revision, Recursive Model, CSL

1. Introduction

Since educational reforms took place in 1984, the social linguistic environment in Singapore has been undergoing rapid transformation. The transformation is clearly represented by the percentage of ethnic Chinese students whose first home language is English, a figure which rose from 28% in 1991 to 59% in 2010 (MOE, 2010). Ethnic Chinese Singaporean students' linguistic capability in the Chinese language has been on the decline; most of these students find it a challenge to learn Chinese, especially where the acquisition of writing skills is concerned (Liang, 2000).

Today, people communicate using a multitude of methods other than conversing in person or via a telephone. It has become a norm to use highly interactive virtual environments to exchange information and ideas. The Internet provides an alternative outlet for students to publish their work, which gives them the satisfaction and pride of displaying their writing for a potentially enormous audience and encourages greater care in presenting their texts (Hyland, 2003). Language teachers should help students develop a sense of what it means to write for a broader, unknown audience beyond the classroom. This will heighten the writers' awareness that they are writing for an audience, rather than merely writing for the sake of writing.

The emergence of Web 2.0 technology provides new possibilities for language teachers to organize online learning experiences and provide opportunities for students to practice collaborative writing in their target language. It is hoped that by tapping on the advanced technology in the information era, Chinese language teachers in Singapore could better help their students who are taking Chinese as second language (CSL) to improve the writing competency.

This paper explores the effectiveness of collaborative process writing in the Web 2.0 environment for lower secondary CSL students with different language abilities in the Singaporean context. The study hopes to contribute to the literature of ICT-mediated writing instruction in the field of CSL.

2. Literature Review

2.1 Process writing and its effectiveness

Writing is a complex process which involves a lot of cognitive and meta-cognitive activities (Murray,1972). In the conventional product-oriented writing process, students are asked to formulate their ideas by using prescribed rhetorical frameworks set by teachers and to submit their written work for grading. The generation, formulation and development of ideas seem to be ignored throughout the whole writing process (Zamel, 1982).

Process pedagogy arose in the late 1960s in response to the dominance of product-centred pedagogy (Matsuda, 2003). In the 1970s, second language educators started to show interest in finding out how written work is produced by second language writers (Hedge, 2011). Many educators and language teachers have since done research about the teaching of writing to second language writers (Ramies, 1978, 1987; Taylor, 1976; Young, 1978; Zamel, 1976, 1982, 1983, 1987; Jacobs, 1982). Their findings have shown that writing is not a straightforward process and should be

viewed as "non-linear", exploratory and generative (Taylor, 1981, Zamel, 1983). Writing is a process of discovery in which ideas are generated and not just transcribed, as writers think through and organize their ideas before writing and revising their drafts (Lee, 2006).

The writing process is recursive in nature whereby revision and writing are integrated, and initial ideas get extended and refined (Zamel, 1982). To a large extent, a written product is "the outcome of a set of complicated cognitive operations" (Hedge, 2011: 303) that involves planning, drafting, revising and editing. Teachers should guide learners in the writing process in a recursive, interactive, and potentially simultaneous way (Hyland, 2003).

It was observed that revising took place throughout the writing process and generally involved considerable changes (Zamel, 1983). Proper and systematic guidance in the process will assist second language writers to generate logical, elaborate or consciously-written works. Providing constructive feedback is one useful way of guiding second language writers (Hyland, 1990). Group work is also frequently a key element in generating ideas, collecting information, focusing priorities and structuring a piece of text. This is often achieved in a group environment where practical, genuine communications abound (Hyland, 2003).

2.2 Peer-review for learning during process writing

Peer review is a form of collaborative learning. It requires students to act as the audience and collaborate in their peers' drafts as they share opinions and ask questions. It is a frequently-used technique in the process-oriented writing approach (Villamil and De Guerrero, 1996). Beaven's (1977) study shows that the students would most probably rely on the teacher during the writing process if the teacher was the only reader of the written product, whereas students would have more ownership of their writing and give more consideration to their audience if they were aware that there were readers besides the teachers. When students are to give feedback, they benefit from reading other students' work (Rollinson, 2005). Students also "[transfer] abilities they learn when reviewing peer texts" (Lundstrom and Baker's, 2009:38). Peer revision fosters communicative behavior because it provides a chance for students to explain, defend and clarify their points of view while peer feedback has a significant effect on the quality of writing and leads to more learner autonomy (Villamil & De Guerrero, 1996; 1998). Through peer review, L2 writers "discovered the discrepancy between their intended and understood meaning of their text"(Berg, 1999:231). In revising their peers' work, students highlight to each other the areas that did not make sense to audience and compel each other to make changes.

The research findings quoted above recognized the effectiveness of peer revision and the importance of guiding students in the revision process. However, most of those research findings did not make comparisons between peer feedback and teacher feedback and tended to undermine the teacher's role in the revision stage. Others have suggested that in comparison with peer feedback, teacher feedback is more valued and has a more important influence on students (Connor & Asenavage, 1994; Miao,Badger &Zhen, 2006; Paulus,1999;Zhang,1995). Some research findings have suggested that we need to combine both teacher review and peer review to improve the quality of writing (Tsui & Ng, 2000). The extent to which peer feedback and teacher feedback each contributes to the quality of written products is worth exploring

further.

2.3 Using Wiki to support collaborative process writing

By definition, collaborative learning is "learning in groups with a high degree of interaction between the group members in a defined setting" (Hoppe, 2010:6). Collaborative writing process requires students to work together to gain insight into the topic and refine their written works. Communication in an online collaborative environment helps in information exchange, knowledge building and promotes the quality and the relationship of ideas (Peres and Pimenta,2010; Karayan and Crowe, 1997), which will facilitate generating, organising and revising of ideas in the writing process. An online learning environment facilitates interaction as many students would be able to communicate ideas simultaneously and hence would be able to produce more feedback on peers' composition (Schultz, 2000).

The emergence of Web 2.0 technologies in recent years has created good prospects for the process-oriented collaborative writing approach. Among the wide range of interactive technologies, wikis are platforms where content can be created, edited and shared by users (O'Neill, 2005). Unlike traditional course systems, wiki provides users with features like simplicity, open editing and supporting newest social media tools (Elgort et al., 2008). It emphasizes "active participation, connectivity, collaboration, and the sharing of knowledge and ideas among users" (Wang et al., 2013: 216) and provides "an interactive process of review from a group of people who are also sharing the review as authors" (Clarke, 2008: 275). Wiki provides an environment for L2 students to write and edit collaboratively, creates a platform for L2 teachers to trace the content and timing of the revision and enables them to examine and derive revision patterns from students' writing, allowing them to plan and remedy their instructions according to students' needs in the next round of composition exercise.

The user-friendly and student-centered characteristics of the Wikis have opened up venues for language teachers to experiment with process-oriented approaches in the teaching of writing. Wong et al (2009) advocated a recursive, bottom-up process writing approach whereby groups of Chinese as a second language (CSL) secondary school students were required to collaboratively carry out "word/phrase pooling", "sentence making", "paragraph writing" and "outlining" on wiki, and eventually compose their essays individually. Results showed that students' micro-skills for writing were improved significantly due to peer coaching. Liou and Lee (2013) compared wiki-based collaborative and individual writing processes in a class of Taiwan university students taking English as their second language. Students started with planning and brainstorming together and composed their drafts on wikis. Results showed that students who worked in the collaborative groups produced longer and more accurately expressed written products than those who worked in individual groups. All students who participated in the study felt that collaborative activities improved their writing.

Although results of these studies reveal positive impacts of wiki-based collaborative writing, they are not without limitations. Wong et al.'s (2009) study only focused on micro-skills for writing that brought about surface changes. Their study did not investigate the impact of the model at a macro level which could involve changes in content organization, overall structure and meaning. Liou and Lee's (2013) studies

only involved subjects undergoing tertiary education. Their studies were not directly relevant to junior high or secondary level education. All of their studies did not investigate the revision patterns adopted by L2 writers of high, mid and low abilities. The inadequacies of their studies have hence created room for our present study.

To date, ICT-mediated process writing has not garnered much attention in the field of CSL teaching. Studies on the effects of wiki-based collaborative writing on secondary or junior high CSL students are scarce in present literature. Henceforth, the present study would like to tap on the advantages of Web 2.0 technology, using wiki as the study platform, to investigate the effect of process-oriented collaborative writing in CSL teaching with special reference to the Singapore context.

3. Scope of Study

For this study, we have formulated the following three research questions:

Question 1: Is the wiki-based process writing on Chinese Narrative Essay effective for lower secondary school CSL students in enhancing students' performance?
Question 2: Do the revision remarks or comments received and generated in the writing process contribute to students' overall performance?
Question 3: What revision patterns do lower secondary CSL students with different language abilities show during wiki-based process writing?

4. Methodology

The participants were 60 Secondary One students from a neighbourhood school, forming an experimental class (N=32) and a comparison class (N=28). The whole study lasted for two years. The experimental class was involved in five rounds of recursive writing activities, during which they were given parallel writing instructions and were asked to give group presentations. In the control class, the teacher went about her normal practice but arranged for her students to take the pre-, mid- and post-tests that the experimental class took. Artifacts produced by students of High, Medium and Low abilities from both classes were also analyzed.

4.1 Intervention

The intervention involved the following procedures:

procedures	activities
1. training	Orientation: Students are briefed about the purpose of the project and learn how to use the rubrics
2. writing techniques	Self-directed learning (SDL) of writing techniques via wiki platform
3. check SDL outcomes	Students take quiz in groups
4. in-class teaching	Teachers lecture about the writing materials, focusing on important points and some weak points that caused the students to fail the quiz
5. out-of-class study	Students study good and bad writing samples in groups, follow the scaffolded instructions and learn how to destruct a piece of writing
6. group presentation	After out-of-class preparation, students work in groups to present how they differentiate good writing from bad writing and how to improve bad writing using writing rubrics provided
7.first writing	Students draft their writing online outside class
8.peer review	Students do peer revision outside class in a given time using wiki platform
9.second writing	Students try to revise their first draft with suggestions given by their peers and teachers
10.comments	Teacher announces group scores and comments on the common mistakes made by the class during the writing activity
11.finalize writing	Students finalize their writing after class
12.reflection	Students reflect on their performance for this writing activity

Before the study, wiki accounts were created for each student within the class wiki platform. There were five writing activities in the two years' study, excluding pre-, mid- and post-tests. In each writing activity, the students wrote the first draft and then did revision and editing, adding up to a total of 13 attempts at writing. In the first writing activity, we practiced the 12 steps including the orientation and modeling on how to use the rubrics to assess others' writing. In the subsequent activities, the same 11 steps mentioned in the table above (step 2 to step 12) were practiced and followed in a recursive pattern.

During the orientation, the teacher provided a model by demonstrating how students should assess their peer's work and give feedback, using the structure of peer assessment rubrics and guiding questions, covering writing organization, content, and language. The orientation also covered 10 items of writing, such as theme, choice of materials, plot, emotions, consistency, cohesion, deployment, vocabulary, grammar, and rhetoric techniques. Teacher's modeling may again appear in the first and second writing activity, but will cease from the third writing activity onwards.

In order to strengthen the impact of peer assessment, besides the guiding questions, activities such as 'Tell me why this is a piece of good writing' and 'Come, let Dr. Woodpecker treat you' were blended in. In each of these activities, we provided several steps to guide the students in forming standards on how to appreciate good writing, how to break down/deconstruct texts and how to transform bad writing into good writing. All the activities were arranged for students to carry out in groups so as to facilitate discussion and collaborative learning. After some preparation, the

students did class presentations using the guiding tasks and questions. With this kind of 'comprehensible output' activity, the students learned to judge texts critically and to refine and consolidate vague ideas into principles to assess writing by doing oral presentations.

4.2 Data collection

We collected three sets of data related to the study. The first comprised pre-, mid- and post-test writings for scoring and analysis of the artifacts. The second is the feedback that the students received from their teachers and peers as well as the feedback that they gave out to their peers. Thirdly, we collected information on how students of different levels revised their writing by conducting face-to-face interviews with selected student representatives from all three High, Medium and Low ability level students after showing them the differences between their first draft and final draft. This case study data was intended to help us find out the revision patterns of students with different levels of proficiency, which could help teachers guide students of different levels to revise their writing. The interviews were audio taped and transcribed.

4.3 Measurement

In pre- and post-tests, students were asked to write a timed essay. The writings were marked by raters using the grading rubric of ten items, with a total score of 100. The grading rubric was developed by the project team but was validated by an external consultant who is a professor specialized in writing assessment and is now working at Hong Kong Polytechnic University. The scoring guide is based on a ten-point scale for each of the ten items. All the essays were graded by at least two raters and the scores were then averaged.

The three raters worked several times before and during the study to mark. They were given same essays to mark, compared their scores and discussed their reasons for choosing the scoring, followed by adjusting the scoring together until all the raters agreed on a common score. They repeatedly practiced this until all felt comfortable and equipped to rate within the same scale.

4.4 Analysis

In order to answer the first research question, an independent-sample t-test was conducted. This was accompanied by the calculation of the effect size (in terms of Cohens' *d*) to indicate the magnitude of the observed mean difference. In order to answer the second research question, we calculated the correlation between the post-test results and amount of feedback that the students received from both their teachers and peers as well as the feedback that they gave to their peers. The third research question was answered by analyzing the information gathered from face-to-face interviews with students with different levels of proficiency.

5. Findings

5.1 t-test and effect sizes for the writing scoring

Before answering the first research question of the effectiveness of intervention on process writing, we verified that the experimental and comparison classes were equivalent. This was done by running the independent t-test on the writing scores of the two classes. As shown in Table 1, for the pre-test, there is a mean difference of

-2.58 (t = -1.30, *d.f.* 58, p >0 .05) indicating that the two classes were equivalent but the experimental class scored lower than the comparison class. The Cohen's *d* = -0.34 indicates a small effect size which is not trivial to be dismissed.

On the post-test, however, the experimental class scored higher than did the comparison class, with a mean difference of 3.06 (t=1.67, *d.f.* 58. p<0.05). The corresponding Cohen's *d*=0.44 indicates a small but nearly medium effect size.

Table 1. Mean Comparisons on Writing Scores

	Experimental group (N=32)		Comparison group (N=28)		Mean differences	t-value	Cohen's *d*
	Mean	SD	Mean	SD			
Pretest	57.44	8.89	60.02	5.96	-2.58	-1.30	-0.34
Posttest	61.17	8.27	58.11	5.40	3.06	1.67	0.44
Gain	3.73	7.69	-1.91	5.10	5.64	3.29	0.86

Notes: (1) Effect size Cohen's *d* was calculated using the web-based Effect Size Calculator of the University of Colorado (http://www.uccs.edu/~lbecker/) which uses the pooled standard deviation as the denominator. For gain-scores, SD = $\sqrt{(S1^2 + S2^2 - 2*S1*S2*.6)}$, assuming a r = .6 between the pretest and post-test scores.

As noted previously, the initial difference favouring the comparison class is not so small that it can be totally dismissed. To offset this disadvantage to the experimental class, a gain-score analysis was attempted. As can be seen in Table 1, the experimental class has gained by 3.73 from the pretest to the post-test whereas the comparison class has in fact deteriorated by -1.91. This suggests that, by comparison, the experimental group has gained by 5.64 (t=3.29, *d.f.* 58, p<0.05) through the intervention. The corresponding Cohen's *d*=0.86 indicates a large effect size. This leads to an affirmative answer to the first research question: the wiki-based process writing on Chinese Narrative Essay was effective for lower secondary school CSL students in enhancing students' performance.

Effect size is typically used at the conclusion of a research project to ascertain its success or lack thereof (Soh, 2010). The obtained Cohen's *d*=.86 for the gain scores indicates a large effect size. This compares very favourably with the average effect size of Cohen's *d*=.40 recommended by John Hattie (1999, 2009, cited in Soh, 2010) as a benchmark. Hattie's (2009) study, with a large number of more than 800 meta-analysis covering 165,258 studies, helps us look at the average effect size of similar experiments in the same field. This helps us to examine the value of the effect size of our own project in a more objective and comparative perspective without focusing solely on the value itself.

According to Hattie's (2009) research, the average effect size of 566 computer-assisted instruction experiments is 0.31 and the average effect size of 122 studies on peer influence is 0.38. The obtained gain score effect size (.86) demonstrates that the combination of both computer use and peer review can greatly improve the effect of mere computer use and mere peer assistance in language teaching.

5.2 Correlation

To answer the second research question on whether revision remarks or comments received and generated in the writing process contribute to students' overall performance, Pearson's correlation coefficients between the students' individual scores and the number of remarks that the students gave and received from their peers and teachers were calculated. The resultant correlation coefficients are displayed in Table 2.

Table 2. Correlation Coefficients (between the writing scores and the number of remarks received/made)

	Pearson's r
Correlation of remarks only the students gave to their peers with post-test	0.69*
Correlation of all the remarks that the students received from their peers and teachers and gave with post-test	0.49*
Correlation of all the remarks that the students received from their peers and gave with post-test	0.48*
Correlation of remarks the students received only from their teachers with post-test	0.20
Correlation of remarks the students received only from their peers with post-test	0.07
Correlation of remarks the students received from both their teachers and peers with post-test	0.11

Note: Asterisked coefficients are statistically significant ($p<0.05$, *d.f.* 58, two-tailed).

As can be seen from Table 2, three of the six correlation coefficients are statistically significant. The largest $r=.69$ ($p<0.05$, *d.f.* 58, two-tailed) goes to remarks the students gave to their peers with post-test. This suggests the effectiveness of involving the students in peer review where they had to be able to evaluate their own works first. This is followed by two moderate correlation coefficients of $r=.49$ and $r=.48$ ($p<0.05$, *d.f.* 58, two-tailed) when the students both received and gave comments, where the involvement of teachers made very little difference. The statistically significant correlation coefficients echo some researches that address the effectiveness of peer review for writing (Berg, 1999; Rollinson,2005; Villamil & De Guerrero, 1998), the effectiveness of teacher review (Zhang, 1995; Connor & Asenavage, 1994; Paulus, 1999) and the combined effectiveness of both teacher review and peer review (Tsui &Ng,2000). It is of interest to note that students benefited the most when they were required to give remarks to their peers' writing using the rubrics; this corroborates with Lundstrom and Baker's (2009) findings.

5.3 Revision Patterns of Students with Different Ability

For the third research question on the revision patterns of lower secondary CSL students with different language abilities shown during wiki-based process writing, the researchers compared the written products and interviewed students from the three different levels. Revision patterns of high, medium, and low level students were

examined. Typical revision behaviours of the three types of students are summarized below.

High level students tend to examine the theme first when they review either their own or their peers' writings, followed by examining the selection of suitable themes or materials and whether the beginning and the ending cohere with each other. When all these are found to be suitable, they will then focus on checking whether they have used the right level of details in different parts of the writing as well as the rhetorical devices used. Last but not least, they will check the grammar and transitions between sentences and paragraphs.

Medium level students also tend to examine the theme first when they review either their own or their peers' writings, followed by examining the transitions between paragraphs. If they perceive no problems with the content in the writing, they will try to add some writing techniques and rhetorical devices to lengthen their writing. In addition, checking on grammar is considered to be quite important to them as marks will be deducted for grammatical mistakes and wrong words or Chinese characters. Selection of suitable themes or materials was reported as not important for them as they have already planned for the themes and content at the outlining phase of the writing. As long as the writing does not digress from the subject, according to them, writing a less fanciful or less extraordinary essay is not a problem for them.

Low level students are unlikely to focus on the grammar and wrong words or Chinese characters. After they have checked for the theme, they will proceed to check if the ending coheres with the beginning, and if the writing content is suitable. Limited by their language proficiency, techniques like transition, rhetorical devices and the portioning of details that can help improve sophistication are usually neglected.

6. Result and discussion

The wiki-based process writing of the Chinese narrative essay showed to be an effective model for lower secondary CSL students as far as this study is concerned. It is shown that the study is successful in helping students improve in their overall performance for Chinese writing. We attribute the improvement come from the skills and abilities that the students gradually acquired during the five recursive collaborative process writing activities, especially the peer review segment when they mutually engaged with each other in a coordinated effort to raise questions and solve problems together. Sometimes if the feedback is not accepted, they would discuss and justify themselves; this also provides chances for critical thinking and target language output.

As to the contributions of the revision remarks or comments that were received and generated in the writing process towards the overall performance of students' final written products, the findings are complex. Theoretically the amount of feedback received should correspond with the amount of the feedback that the students adopt in their editing of the draft. In this study we have found that the students benefited more from giving feedback and assessing each other through questioning, justifying themselves, discussing and sharing. '*To give is better than to receive'*; this saying also applies when we are talking about students' collaborative learning because only when they use the writing rubrics to assess their peers' work and give corresponding

suggestions can they really learn from this writing process. Without giving suggestions, questioning and answering to each other and using the feedback they accepted to edit the first draft, the feedback they received had no impact on their writing. Teachers incorporating this method into their teaching of writing must bear in mind that effective strategies and activities must be created and applied in order to make sure their students produce 'comprehensible output' which prove that the students have actually digested and absorbed the information.

Furthermore, peer feedback does not only help students to improve in overall performance in writing, it also encourages critical reasoning as the students need to consider the validity of their peers' suggestions and make decisions on whether to use them or how to use them. When their critical reasoning has been enhanced, it will again help students with their writing because writing is an act of discovering meaning. A willingness to engage with students' assertions is crucial, and response is a central means to initiate and guide ideas (Straub, 2000). Hence, teachers could focus more on the ideas that our students produce, rather than dwell on the formal errors (Hyland, 1990; Murray, 1985).

From the study, it was found that the revision patterns of students with different language abilities were different. We observed that in the peer revision process, the higher the language ability of the students, the more attention they pay to the macro level in their revisions. Students with higher language levels tend to examine the theme first followed by examining the suitability of the materials or coherence of the contents. Students with lower language levels tend to focus more on surface errors like grammar and word collocations. The study also found that the assessment rubrics significantly enhance the quality of writing for students from all three levels. However, if the teachers can provide students with different kinds of feedback and cater to their language proficiency, it will be more beneficial to them. Hence, based on the idea of differentiated instruction, the researchers suggested three different reviewing and editing procedures in the table below for the teachers and students to consider.

Table 3: Revision and Pedagogical Suggestions for Teachers and Students

Language Levels	Suggested Revision Patterns	Pedagogical Suggestions
High	Theme → Selection of Materials → Ending Echoes Beginning → Right Level of Details → Rhetorical Devices → Grammar and Spelling → Transition	Let students read more, especially literary works
Medium	Theme → Rhetorical Devices → Grammar, Collocation and Spelling → Transition → Ending Echoes Beginning → Right Level of Details	Let the students read more about writing techniques, and also help them with good examples on how to review others' writing
Low	Theme → Grammar, Collocation and Spelling → Ending Echoes Beginning → Selection of Materials → Simple Rhetorical Devices	Teachers should focus more on the grammar, collocation and spelling mistakes first, after which students can practice writing techniques starting from 're-write' paragraphs. If they make good progress, they can then follow the revision pattern of medium level students.

Though the positive effects of the process-oriented writing have been supported by the study, we cannot assume that it will take place naturally. It will be unrealistic to assume that students will be able to effectively read and respond to peers' writing and give constructive feedback (Berg, 1999). At the initial stage, teachers need to help students to compare original and reformulated copies and invite them to comment, question or suggest changes (Hedge, 2011). Students need to be empowered by teachers to perform the peer evaluation tasks. Crucially, students need to be trained and prepared for their participation in peer response activities and collaborative process writing. This is the underlying purpose of putting 'training' as the first step of our 12-step intervention procedures. Through the training, students are oriented to use assessment tools to evaluate organization, content and language of an essay.

7. Conclusion and implications

The study has shown the effectiveness of wiki-based recursive process writing and also identified the revision patterns of students of different proficiency levels. Wiki platform increased students' chances to read each other's writings. Feedback they gave and received not only enhanced their exposure to the target language but provided more opportunity for critical thinking.

The usefulness of giving peer feedback and reading feedback from both teachers and peers was strongly acknowledged in this study, especially giving peer feedback. The peer assessment rubrics and guiding questions as well as the presentations helped the students internalize what they have learned about differentiating good writing from bad writing and how to transform bad writing to better ones. In order to achieve this,

sufficient and appropriate scaffolding is needed. Teachers also need to learn how to allocate time and the level of scaffolding efficiently.

Where pedagogical implications are concerned, teachers conducting writing classes not only need to teach specific writing techniques, but also need to teach students to stand at a higher point to plan and assess writing as well to give them more ownership towards, confidence in and enjoyment from their writing. As the adage goes, *give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime*.

References:

Beaven.M. (1977). Individualized goal setting, Self evaluation and peer evaluation. In C. Cooper & L. Odell (Eds.), Evaluating writing: Describing, measuring, judging. Urbana: NCTE.

Berg, E.C.(1999). The effects of trained peer response on ESL students' revision types and writing quality. Journal of Second Language Writing, 8(3), 215-241.

Clarke, A. (2008). *E-Learning Skills*. New York: Palgrave Macmillan.

Connor, U., & Asenavage, K.(1994). Peer response groups in ESL writing classes: How much impact on revision? Journal of Second Language Writing, 3(3), 257-276.

Elgort. I., Smith, A.G.,& Toland,J.(2008).Is wiki an effective platform for group course work? Australasian Journal of Educational Technology, 24(2), 195-210.

Hedge, T. (2011). *Teaching and Learning in the Language Classroom*. Oxford: Oxford University Press.

Hattie, J. (1999). Influence on student learning. Professor of Education Inauguarl Lecture, University of Auckland, New Zealand.

Hattie, J. (2009). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. London, England: Routledge.

Hoppe, H. U.(2010). Educational information technologies and collaborative learning, In Hoppe, H.U., Ogata, H., & Soller, A. (Eds.), The Role of Technology in CSCL: Studies in Technology Enhanced Collaborative Learning, New York: Soringer.

Hyland, K.(1990). Providing productive feedback. ELT Journal, 44(4), 279-285.

Hyland, K.(2003). Second language writing. New York: Cambridge University Press.

Jacobs, S. (1982). *Composing and coherence: the writing of eleven pre-medical students.* Linguistics and Literacy Series 3. Washington: Center for Applied Linguistics.

Karayan, S. & Crowe, J. (1997). Student perspectives of electronic discussion groups. THE Journal: Technological Horizons in Education, 24(9), 69–71.

Lee, Y.-J. (2006). The process-oriented ESL writing assessment: Promises and challenges. Journal of Second Language Writing,15, 307-330.

Liang, R.L. (2000). The relationship between Singapore students' Chinese vocabulary and reading ability with their attitudes and Chinese learning achievement, In Zhang, H.G. (Ed)., *New Trends in Teaching Chinese*, 38-52, Hong Kong, ILEC.

Liou, H.-C., Lee, S.- L.(2013). How wiki-based writing influences college students' collaborative and individual composing products, processes, and learners' perceptions.

In Zou Bin(ed.). *Explorations of Language Teaching and Learning with Computational Assistance*, Hershey: Information Science Reference.

Lundstrom, K. & Baker, W. (2009). To give is better than to receive: The benefits of peer review to the reviewer's own writing. *Journal of Second Language Writing*, 18, 30-43.

Matsuda, P.K. (2003). Process and post-process: A discursive history, *Journal of Second Language Writing, 12(1)*, 65-83.

Miao, Y., Badger, R., and Zhen, Y. (2006). A compararive study of peer and teacher feedback in a Chinese EFL writing class. Journal of Second Language Writing, 15, 179–200.

Mother Tongue Languages Review Committee, (2010). Nurturing Active Learners and Proficient Users, Mother Tongue Languages Review Committee Report, MOE, Singapore. Retrieved from http://www.moe.gov.sg/media/press/files/2011/mtl-review-report-2010.pdf on 7th, Mar,2014.

Murray, D. (1972). Teach writing as a process not product. In Graves, R. (Ed.) Rhetoric and Composition; A sourcebook for teachers and writers (pp. 89-92). Upper Montclair, NJ: Boynton/Cook.

Murray, D. (1985).A writer teaches writing (2nd ed.). Boston: Houghton Mifflin.
O'Neill,M.(2005). Automated use of a wile for collaborative lecture notes. ACM SIGSCE Bulletin, 37(1),26-271.

Paulus, T.M.(1999). The effect of peer and teacher feedback on student writing. Journal of Second Language Writing, 8(3), 265-289.

Peres, P. and Pimenta, P. (2010). An experiment in collaborative writing, in Mendes, A. J.; Pereira, I.; & Costa, R. (eds). Computers and Education: towards educational change and innovation. London: Springer.

Ramies, A. (1978). *Problems and teaching strategies in ESL composition*. Arlington, Va.: Center for Applied Linguistics.

Ramies, A. (1987). Language Proficiency, writing ability, and composing strategies: A study of ESL college student writers, Language Learning, 37, 439 - 467.

Rollinson, P.(2005). Using peer feedback in the ESL writing class. ELT Journal, 59(1),23-30.

Schultz, J.M.(2000). Computers and collaborative writing in the foreign language curriculum, in Warschauer, M. and Kern, R. (eds). *Network-based Language Teaching: Concepts and Practice*. Cambridge: Cambridge University Press.

Soh Kay-cheng (2010). What Are the Chances of Success for My Project? And, What If It Was Already Done? Using Meta-Analyzed Effect Sizes to Inform Project Decision-Making, Educational Research Journal, 25(1),13-25.

Straub, R. (2000).The students, the text and the classroom context: a case study of student response. Assessing Writing, 7, 23-55.

Taylor, B. (1976). Teaching composition to low level ESL students. *TESOL Quarterly*, *10*, 309-313.

Taylor, B. (1981). Content and written form: A two-way street. TESOL Quarterly, 15, 5-13.

Tsui, A.B.M., & Ng, M. (2000). Do secondary L2 writers benefit from peer comments? Journal of Second Language Writing, 9(2), 147-170.

Villamil, O.S., & De Guerrero, M. (1996). Peer revision in the L2 Classroom: Social-Cognitive Activities, mediating strategies, and aspects of social behavior. Journal of Second Language Writing, 5(1), 51-75.

Villamil, O.S., & De Guerrero, M. (1998). Assessing the impact of peer revision on L2 writing. Applied Linguistics, 19(4),491-514.

Wang Dongshuo, Zou Bin & Xing Minjie (2013). Interactive learning between Chinese students learning English and English students learning Chinese on the platform of WiKi(pp. 212-229), In Zou Bin(ed.). *Explorations of Language Teaching and Learning with Computational Assistance*, Hershey: Information Science Reference.

Wong, L.H., Chin, C.K., Chen, W., Chai, C.S., & Gao, P.(2009).V.S.P.O.W.- An innovative collaborative writing process based on Web 2.0 technology to improve Chinese L2 students' writing skills. In *Proceedings of Global Chinese Conference on Computers in Education '09* (pp. 353-362). Taipei, Taiwan.

Young, R. (1978). Paradigms and problems: Needed research in rhetorical invention. In C. Cooper and L. Odell(Eds.), *Research on composing: Points of view* (pp. 29-47). Urbana, III: National Council of Teachers of English.

Zamel, V. (1976). Teaching Composition in the ESL classroom: What we can learn from research in the teaching of English. TESOL Quarterly, 10, 67-70.

Zamel, V. (1982). Writing: The process of discovering meaning. TESOL Quarterly, *16*, 195-209.

Zamel, V. (1983). The composing processes of advanced ESL students: Six case studies. TESOL Quarterly, 17, 165-187.

Zamel, V. (1987). Recent research on writing pedagogy. *TESOL Quarterly, 21*, 697-715.

Zhang, S. (1995). Reexamining the affective advantage of peer feedback in the ESL writing class. Journal of Second Language Writing, 4(3), 209-222.

Contact Emails
cheekuen.chin@sccl.sg
cheng.gong@sccl.sg
boonpei.tay@sccl.sg

iafor

T-STORY – Storytelling Applied to Training

Paola Chesi, ISTUD Business School, Italy
Cristina Godio, ISTUD Business School, Italy
Ana Barroca, Advancis Business Services, Portugal
Laura Malita, Romanian Institute for Adult Education, Romania
Peter Fruhmann, In Dialogue, The Netherlands
Tharrenos Bratitsis, University of Western Macedonia, Greece
Emilia Szczygielska, University of Humanities and Economics in Lodz, Poland
Raul Gonzalez, FASE.Net Training and
Consultancy in Selection and Employment, Spain

The European Conference on Technology in the Classroom
Official Conference Proceedings 2014

Abstract
The project is financed by the Transversal Actions (Key Activity 3 – Information and Communication Technologies) under the Lifelong Learning Programme from the European Commission. Between November 2012 to October 2014, seven institutions from seven European countries (Italy, Portugal, Romania, The Netherlands, Poland, Spain and Greece) will be carry out the intent of promote a wider use of Digital Storytelling as a pedagogical technique in education and training at all levels throughout Europe by developing a digital course for educators, teachers and trainers. Digital Storytelling is an innovative teaching method which combines the learning potential of stories with the latest technologies and interactive tools. Digital storytelling has the potential to be used in all educational settings, formal and informal, as well as work environment. In the first phases of the project 381 European educators have been involved in a survey to identify their training needs regarding key Digital Storytelling competences and ICT skills. Currently, the project is working on the development of the Digital Course, which intends to learn Storytelling through the use of a story, together with the elaboration of a Learning Handbook to support trainers. The partnership will promote in all the 7 Countries Pilot Sessions of the Digital Course, in order to collect feedback and fine-tune the training materials developed. T-Story will foster the target groups (representative from kindergarten to adult training) to develop their knowledge and skills by using Digital Storytelling technique - “learn Storytelling through Storytelling”.

Keywords: Digital Storytelling, Learning methodology, ICT, digital course

Introduction

The European project "TStory – Storytelling applied to training" concerns the use of Storytelling and digital instruments as innovative learning methodology, suitable for all educational levels [1].

Growing up with unprecedented access to technology has changed the way young people, "digital natives", communicate, interact, process information, and learn [2].

The EU states that new innovative pedagogical and didactical approaches are needed to take into account the future learning needs and changing skills and competences necessary for employment, self-development and participation in a knowledge-based, digital society.

EU traditional E&T institutions need to employ new formats and strategies for learning and teaching to be able to offer relevant, effective and high quality learning experiences in the future [3]. With the evolution of ICT, personalized learning and individual mentoring will become a reality and teachers/trainers will need to be trained, in order to exploit the available resources and tools to support tailor-made learning pathways.

Some, if not most, of the ICT resources are unfamiliar to teachers, but today's students are using them at an ever increasing pace and in ways that are helping to define a new generation of not just information gathering, but information-creating as well. Due to the relative newness of computer technology, many teachers have not received adequate training to select appropriate technologies and the lack of courses on digital tools increases the gap among them and students.

Storytelling and Digital Storytelling (DST)

Storytelling is the conveying of events in words, images and sounds. It represents an innovative pedagogical approach that has the potential to engage learners in student-centered learning, and improve learning outcomes like knowledge, communication, reflection, critical thinking, construction and collaboration**.**

Humans are storytelling organisms and, since the most ancient cultures, they communicate with each-others through Storytelling, to entertain, educate and convey the society's culture, values and history [4]; great leaders of all types have used stories as instructional tools in the form of parables, legends, myths, fables, and real life examples to convey important information [5], sometimes to convince and manipulate.

Storytelling implies an interactive process between the teller/writer and the listener/reader; together, they share and interpret past and present experiences, making a sense to the events. Additionally, Storytelling promotes expressive language development in both speech and written composition, as well as receptive language in reading and listening. The real value of Storytelling from a cognitive perspective is that it becomes a mutual creation involving interaction and understanding between teller and listener [6].

A story might be defined as a series of sentences that describe some sequence of actions, events or experiences, usually related to people as actors in the story. The characters in a story are usually presented in some human situations to which – together with the factors and changes which affect that situation from outside – they react and change [7].

The earliest documented reference to storytelling dates to 4000 B.C. and telling a story is one of the oldest method of communication. What is new today about the telling stories is the bottom-up approach (instead of the traditional top-down approach) to achieve shared processes and manage communication, education, training and innovation.

DST involves combining narrative with digital content, including imagines, sounds and interactive video; environments and words are connected to technologies. The result is a powerful instrument to approach and engage students and trainees in a transversal way. The combination of powerful, yet affordable, technology hardware and software matches perfectly the needs of many of today's classrooms, where the focus is on providing students with the skills they will need to "*thrive in increasingly media-varied environments*" [8].

DST can be applied to all educational levels, from kindergartens to high level specific professional training, and it is suitable for all the possible subjects of study and discipline, from the primary and STEM teaching, to humanities, arts, core skills. DST can be used as a method to teach ethics, values, cultural norms and differences, to transfer knowledge, to create a cultural, linguistic and age-related bridge, to promote innovative problem solving, to make connections, to seek best practices, to imagine new perspectives and possibilities, to be inspired and enhance innovation. All these elements lead to a higher level of social interaction, active learning ("learning by doing"), multiple literacy and cooperative skills, interdisciplinary connection.

Digital Storytelling in education can be used in numerous ways. Digital stories can be created by teachers, or by learners, or through a working group, using structured or free storytelling, metaphors, fairy-tales, case studies, interviews, semantic cluster mapping, horal histories. Also, there are several possible instruments: written form, audio, video, pictures, slide, drawings, theatre, music.

Despite many educationists have recognized the potential of DST, many of them still lack a cohesive plan for integrating multimedia into their instruction, and a well-designed framework for the same is still required [9].

T-Story project: objectives and methodology

The project intends to promote a wider use of DST in education and training at all levels throughout Europe by developing a Digital Course to teachers and trainers. Following the principle "learn Storytelling through Storytelling"**,** T-Story aims to foster teachers/trainers knowledge and skills development by using DST technique, giving the opportunity to learn and train how to implement the technique and how to engage students/trainees taking advantage of the digital potential.

This overall purpose has been developed according the following specific objectives:

- involve European teachers/trainers in a survey to identify their training needs regarding key DST competences and ICT skills;
- identify good practices from successful Storytelling educational projects, through a desk research activity;
- elaborate a Learning Handbook in order to support trainers delivering training through Storytelling and promote, in the 7 countries, a Digital Training Course through Pilot Sessions, so thus to collect feedback and fine-tune the training materials developed.

The target groups are teachers/trainers from kindergartens, primary and secondary schools, vocational schools, universities, adult education entities, education policy maker and authorities institutions, training and coaching agencies.

T-Story is based on a structured work programme which maximises the individual areas of expertise of each partner while encouraging a high level of collaboration, communication and generation of innovation.

The project began with a research that aimed to develop a need analysis of teachers/trainers regarding Storytelling and DST skills, which constituted the basis for the development of the learning contents. The research was carried out through a survey based on data collection and 381 questionnaires were collected among the partners' national surveys. Although 1/3 of teachers/trainers/educators does not know what storytelling is and 2/3 of them does not know what digital storytelling is, 90% of them declares to be strongly interested in learning this new methodology. Therefore, the transnational analysis shows that educators from all the questioned countries, are interested in applying Storytelling and Digital Storytelling methods in an educational context.

In a second phase, all partners conducted a desk research at national and global level to identify successful DST educational projects, analysing at least one best practice per Country.

Findings and results supported the consortium in defining the learning contents to be developed, namely for a Learning Handbook and for the Digital Training Course.

The Learning Handbook supports the Digital Course. It contains three chapters respectively on Storytelling, ICT& digital tools and Digital Storytelling, with proposed exercises, activities, examples and in depth analysis. The Digital Course is divided in three phases as well, with 10 online lessons, connected to the handbook. The first phase is on Storytelling and shows how to create a story from its main elements. The second phase guides learners to ICT and the use of the existing digital tools. Finally, the third phase lets to combine narrative with digital tools, to create a digital story. Following the purpose to "learn Storytelling through Storytelling", all the contents have been developed into a story which will foster learners during the whole course.

The learning material – both the Handbook and the Digital Course - will be tested and validated among representatives of the target-group in pilot training sessions

implemented in 7 countries. Teachers, trainers and educators will have the opportunity to follow the online lessons and work on the handbook, creating their own digital story. The aim of this phase is to validate the efficacy of the learning contents and collect feedback from participants, which will be at the basis of the last part of the project, dedicated to refining the digital storytelling course.

Expected results

"*Digital story and storytelling is more than just a technology or an art form, it is about engaging community, promoting intergenerational communication, as well as providing an innovative method of historical research*." (Cho, 2009) [10].

As a result of the project, the consortium expects to effectively map and disseminate at national and European level teachers/trainers' needs regarding key DST competences and ICT skills, and it aims to support the target groups to empower their skills to create and develop innovative courses using Storytelling and digital support.

Furthermore:
- the adoption of innovative learners-centered methodologies in education/training can contribute for the development of key transversal competences such as critical thinking, creativity and innovation;
- using ICT in education can empower the target group's digital skills development and foster digital inclusion;
- addressing the needs of the learners/trainees through personalization, collaboration and informal learning will increase their motivation, strengthen their links to training and education institutions and increase their investment in lifelong learning;
- the valorisation activities will allow for a wider awareness of the methodology and will foster new applications in professional contexts outside education.

All the solutions developed in this project are available for 7 countries which will test the practical suitability in their national environment. The benefit is considerably higher than with national solution-strategies. T-Story project's development and implementation can contribute to the reposition of the E&T institutions, and by consequence contribute to help Europe achieve its goals.

As it is stated by the EU: "The promotion of ICT for learning is a priority of the 'transversal' part of the EU's Lifelong Learning Programme. Effective integration of ICT into education must go beyond replacing, streamlining or accelerating current practices. Actions are not about developing technology itself, but about its use to enhance learning environments and experiences." [11].

Supported by an appropriate framework, teachers/trainers can experiment some practical uses of DST, like explaining concept and theories, evaluating teaching instruments, answering questions and problems, stimulating working groups and students' personalization of the learning process.

When students are able to participate in the multiple steps of designing, creating and presenting their own digital stories, they increase a full complement of literacy skills, including: research; writing; technology; presentation; problem-solving skills. The project contributes to improve the effectiveness of education, allowing for more

personalised learning, a better learning experience, and an improved use of resources integrating creativity and innovation. Storytelling also facilitates the development of innovative practices in adult education, motivating them through more flexible learning solutions.

Interest in Storytelling as instruction continues to build for at least two reasons: high-fidelity and media rich learning environments are becoming more and more common [12] and research into learning continues to indicate the value and effectiveness of the methods of Storytelling in general.

The combination of powerful, yet affordable, technology hardware and software meshes perfectly with the needs of many of today's classrooms, where the focus is on providing students, in a protective environment like school, with the skills they will need to "thrive in increasingly media-varied environments" [13]. With an estimated 90% of jobs requiring digital skills in the near future, it is thus essential that education and training systems provide individuals with the required skills [14].

While there is still some disagreement [15], many are finding that learners embedded in contextual, authentic, real world problems are more engaged, draw on more resources, and transfer learning more effectively [16].

The future role of schools will be to guide students in identifying and selecting the learning opportunities that best fit their learning styles and objectives; to monitor progress, realign learning objectives and choices and intervene when difficulties arise. For that reason, guidance is needed for educators and learners on how to best use and exploit technology's and new media potentialities [17].

References

[1] "T-Story – Storytelling applied to Training" Project Number: 530860-LLP-1-2012-1-IT-KA3-KA3MP; Project website: www.tstory.eu
[2] Oblinger D. and Oblinger J. (2005). Educating the Net Generation. EDUCAUSE, available at http://net.educause.edu/ir/library/pdf/pub7101.pdf.
[3]. Redecker, C., et al. (2011). The Future of Learning: Preparing for Change. Luxembourg: Publications Office of the European Union.
[4] Egan, K. (1989). Memory, imagination, and learning: connected by the story. The Docket: Journal of the New Jersey Council for the Social Studies. Spring, 1995, pp. 9-13. Teaching as storytelling. Chicago: University of Chicago Press.
[5] Brown, J.S. and Duguid, P. (1998). Organizing knowledge. California Management Review 40(3), 90–111. Davenport, T.H. and Prusak, L., 1998. Working knowledge: How organizations manage what they know. Boston: Harvard Business School Press.
[6] Peck, J. (1989). Using storytelling to promote language and literacy development. The Reading Teacher, 43(2), 138–141.
[7] Strahovnik V., Mecava B. (2009). Storytelling and Web 2.0 Services: A synthesis of old and new ways of learning. E-learning papers www.elearningpapers.eu Nº 15 • June 2009 • ISSN 1887-1542.
[8] Riesland E. (2005). Visual literacy in the classroom. New Horizons for Learning. http://www.newhorizons.org/strategies/literacy/riesland.htm. Retrieved October 17, 2005.
[9] Smeda, N., et al. (2010). Developing a framework for advancing e-learning through digital storytelling, in IADIS International Conference e-learning 2010, Ed. Miguel Baptista Nunes and Maggie McPherson. IADIS International Conference, e-Learning 2010 Freiburg, Germany, 26 - 29 July 2010, 169-176.
[10] Cho A. (2009). Teaching and Learning Digital Storytelling. Retrieved on 17 June 2010, from www.videofilmtechnology.suite101.com/article.cfm/teaching_and_learning_digital_storytelling#ixzz0YWlo01Vp
[11] Redecker, C., et al. (2011). The Future of Learning: Preparing for Change. Luxembourg: Publications Office of the European Union.
[12] Gee, J.P. (2007). What video games have to teach us about learning and literacy. New York: Palgrave Macmillan.
[13] Opening up education through new technologies http://ec.europa.eu/education/policy/strategic-framework/educationtechnology_en.htm
[14] Riesland, E. (2005). Visual literacy in the classroom. New Horizons for Learning, available at http://www.newhorizons.org/strategies/literacy/riesland.htm.
[15] Kirschner P. A. et al. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. Educational Psychologist, 41(2), 75-86.
[16] Davis, B. Et al. (2008). Engaging minds. New York: Routledge. National Research Council, 2000; Prevou, & Colorado, 2003.
[17] Redecker, C., et al. (2011). The Future of Learning: Preparing for Change. Luxembourg: Publications Office of the European Union.

Contact Email: PChesi@istud.it

iafor

Learning With The Tide: Enhancing ESL Education With CALL

Azizah Alogali, University of Rochester, USA

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

iafor
The International Academic Forum
www.iafor.org

ESL education has been progressing at a vigorous pace all over the world, with exemplary development programs emerging in the Middle East. The most progressive and rapid educational revolution has been taking place in Saudi Arabia. While Saudi schools have instituted myriad reforms and new programs, one type resource remains largely untapped: CALL (Computer Assisted Language Learning). Computers and the Internet have been proven to have many positive effects on student performance, classroom efficiency, and higher-level thinking skills among students, all while increasing the accessibility of materials. Through this literature review of the research on CALL in ESL education, it becomes clear that CALL has the potential to make a significant positive impact on student learning, and that CALL deserves a more prominent place in the Saudi education system.

Online learning has become an important component of most ESL classrooms, although CALL programs and curricula are still in development. The current literature on CALL focuses on critiquing new or existing programs and identifying ways in which they can be enhanced and revised. Grgovic (2010) laments the current pass/fail character of CALL evaluations and the lack of descriptive research on CALL experiences and processes. Although CALL is becoming increasingly popular, there are still many administrators and teachers who have reservations about its effectiveness. Fryling (2013) explains that teachers' perspectives and opinions on CALL vary across grade levels and geographic regions. Peng (2010) adds that internal consensus among teachers on the value of CALL is hard to find.

Despite its potential for positive impact on student achievement, schools struggle to implement CALL in a variety of ways. Certain unusual restrictions apply to online programs, such as the requirement of an I-20 form for international online students in the USA - regardless of their geographic location (Peng, 2010). While the I-20 requirement may seem absurd, it actually does serve a purpose: the documentation helps to ensure academic honesty and assists in the accreditation of schools on both sides of the screen. Educational marketing pushes the novelty of online learning, but pressure remains high for institutions to offer face-to-face learning. CALL is breaking down some of the boundaries between face-to-face and online learning with services such as Skype, chat rooms, and blogs. CALL, however, comes with high overhead costs - equipment, extensive training, and technical support are all necessary for proper implementation, but each carries its own price tag. (Peng, 2010, p. 122). While CALL improves the accessibility of learning to many disadvantaged groups of students, studies have shown that it is not sufficient to erase the inequalities of social class and physical environment (Bryan, 2011).

CALL programs have risen to popularity for numerous reasons. Programs range from intervention-type programs such as the Waterford Early Reading Program (Nauss, 2002), to programs such as Successmaker which are designed to improve standardized test scores (Gee, 2008). Enrichment and social communication are also taught using CALL, using both school-oriented programs and those designed for personal use. Contributing to the ascent of CALL into the arsenal of instructional techniques are physical constraints such as lack of classroom space, cultural shifts towards more electronically-integrated learning, and the vast improvements in student work when students are given access to online resources (Peng, 2010, p. 114).

Many changes have taken place in response to the emergence of CALL, and some general trends have become visible as more research on the topic is published.

Research has discovered that the success of CALL programs depends largely on teachers' perceptions and expectations of the technology, which vary a great deal across grade levels and geographic regions (Fryling, 2013). Although the teacher is largely responsible for setting the tone and integrating the software into classroom life, the teacher's role has experienced a shift away from its former centrality toward a more supportive, peripheral role (Meskill & Mossop, 2000). Online environments lack many traditional social markers, such as body language and tone of voice, but according to research they still act as facilitators of social interaction, and often level traditional social and academic hierarchies (Chang, 2010). However, CALL learners still require the same kinds of support from teachers, parents, and each other that traditional learning environments employ. In this literature review, these trends will be examined in detail, and their components analyzed with regard to positive application in the Saudi educational system.

Educational theorists have speculated widely on the possible benefits and drawbacks of CALL. What has come to light, however, is that online learning reflects various theories of learning much in the same way as traditional learning environments. Fryling (2013) makes an important point that teaching in an online format requires more than teaching in a typical classroom - CALL instructors must command pedagogical, content, and technological knowledge to teach effectively. For students of CALL, the mechanics of language learning as well as personal identity development have an expanded repertoire/ As Chang explains, "Through participation in social interaction and cultural practices, human beings construct who they are, give meaning to what they do, and understand what they know" (2010, p. 6). CALL allows students increased opportunities to observe and participate in the construction of identity. Further, it has the potential to offer an increased degree of cultural validation and appropriate, localized material for specific target groups (Black, 2006). CALL offers increased opportunities for self-teaching, and allows students to take on more responsibility for their own learning by problem solving, researching, and evaluating different resources independently (Black, 2006).

Chang (2010) states that human identities are "multiple, dynamic, and contextually situated" (p. vii). This cannot be more evident than within the CALL environment, where online discourse is employed as an "identity kit" that allows students to co-create their academic identities and observe the creation process in each other (p. 8). In doing so, students are exercising their human agency, choosing their own learning paths and taking control of their academic journeys (p. 40). In addition to increased self-awareness, CALL helps us reflect on the age-old debate in education: which is more important, product or process? CALL improves both, by allowing students to create more polished work, and by providing detailed evidence of the incremental and dynamic learning process (Chang, 2010).

Perhaps the most unique feature of online discourse is the heightened degree of intertextuality that it offers to both educators and students. The hyperlink is a defining characteristic of online communication, and has revolutionized the way in which online articles are written, for academic or personal use. As Hunt (2011) describes:

"hypertextual reading confers particular degrees of freedom to the reader who is able to determine not only the reading path taken, but also the level of attention and depth of reading allied to a text. While academics are well accustomed to citing and quoting widely, . . . blogs can also link directly to the other texts so that these other texts can

be read at source, in context, and all at one "sitting." The relationship goes two ways; the other texts gain an extra dimension too, in that they are now linked to another text or site." (p. 12-13)

Hunt's apt description and the other literary evidence show that online learning enhances many aspects of the student experience, and encourages students to take more ownership over their education. Formats like blogging "disrupt traditional classroom boundaries" and offer increased freedom and interconnectedness between texts (p. 16). In their diversity, CALL programs allow more opportunities for students to construct their identities and determine their educational values, all while engaging with educational content in more varied forms.

Literature on CALL reports both successful and unsuccessful programs in various regions and grade levels. The following programs were noted for their effectiveness and for the positive feedback they generated from both instructors and learners. Some schools rely on specially-designed programs and others use educational software publicly available for purchase. There are, however, many schools that rely on programs not created for educational purposes - blogging platforms, chat rooms, e-mail programs, word-processing software, and even games can all play a role in the CALL classroom. The most overwhelming success of CALL, reflected in the literature and in student feedback, has been in generating motivation and student self-determination. Time and again, the studies have shown that online learning that goes beyond simple drills contributes positively to students' feelings of ownership, accountability, and responsibility for their own learning (Meskill and Mossop, 2000).

One technique for developing students' autonomy involves the creation of online literature circles, in which small groups of students choose a book to read together, and each student is assigned a specific role with regard to the study of the text. These literature circles improved students' reading comprehension skills and their work ethic, and allowed younger students to work collaboratively with college students (Olmstead, 2001). An elementary-college collaboration of such length and depth would be impossible without the aid of the online setting. The exposure of middle-schoolers to higher-level thinking was also shown to be highly beneficial. Incorporating literature into reading instruction has also been proven to contribute to student motivation, interest, and pleasure (Black, 2006).

Other successful applications of CALL range from evaluation-based programs to writing platforms to creative and enrichment activities. Incorporating creative activities into literacy instruction within a culturally appropriate context yielded extremely positive results for English Language Learners, especially when activities honored the learner's native language and culture (Black, 2006). Most successful instructors balanced online and offline class time, following one of three major patterns. The first involves a brief introduction and explanation of the online activity to be completed, done in the traditional classroom style. The activity is then carried out, and afterwards, an offline reflection and discussion is held in order to process what was learned (Meskill and Mossop, 2000). Other successful modes of distributing educational content involve either in-class practice followed by online presentation of content, or online practice which is then followed by an in-class presentation of the content (Grgovic, 2010). These blended learning approaches allow the instructor to anticipate and respond to technical issues, and to place online activities in the familiar context of the traditional classroom setting. Students who participated in blended

courses involving blogging were found to contribute more, in terms of words written or number of assignments, than those in traditional classrooms (Hunt, 2011). Students who used the software program Successmaker achieved higher scores in reading comprehension and greater efficiency than those not on the program, an improvement which increased during subsequent years of use (Gee, 2008). Instructors found that, while their teaching methods and values did not change significantly, their range of educational tools was expanded considerably with the addition of CALL, and that they were able to take on a more supportive and less authoritarian role in class (Grgovic, 2010).

While it is less concrete than the evidence of improved test scores and language fluency, student and teacher feedback on the subject of CALL has been overwhelmingly positive. Both instructors and students reported enjoying the blended learning process and would recommend it to other institutions for future use (Grgovic, 2011). ELL's especially enjoyed the function of online chatting with classmates and teachers, due largely to the "safety net" that online learning, with its easily accessible language tools, such as dictionaries and search engines, provides (Ma, 2009). Students also reported that learning online afforded them more opportunities to practice independently, and to work at their own pace (Grgovic, 2010). ShengChieh Peng (2010) explores the elements that contribute to student and teacher perceptions of and satisfaction with CALL in depth, outlining both "fostering' and "inhibiting" factors for each of five schools. His research revealed that the role of CALL was influenced from many different directions. Top-down pressure from administrators, marketing forces, and economic considerations encouraged the adoption of CALL, but so did positive teacher and student attitudes towards this new technique. According to Peng, students have come to expect the integration of CALL into their classes, and enjoy it for its ability improve their academic self-development. Other fostering factors included comprehensive support from technology, human resources, and policy staff, the convenience of CALL, and the incentive of participation in professional conferences for schools that employ emerging computer technology. All of this research points to the many benefits of CALL, if applied correctly with a critical eye and an understanding of each institution's own culture and unique needs.

Research has unveiled that despite the numerous advantages of CALL, there are still some areas which continue to require further development. One facet of CALL that continues to pose a challenge to educators is the differing levels of student familiarity with technology. According to Fryling's (2013) research, students' proficiency with different forms of technology varies widely within the classroom. This creates inefficiency for teachers as they struggle to bring less-familiar students up to speed with the current technology and bridge the gap between them and their tech-savvy peers. There is no guarantee that any class will have a certain baseline of computer skills, and teachers lose instructional time attempting to familiarize all students with the programming (DelliCarpini, 2012). In the case of one school where students were each provided with laptop computers but not with additional training in computer use, the students in possession of computers failed to achieve better grades and rates of homework completion (Bryan,, 2011). This may be attributed to students' varying levels of technology experience, or to the developmental limitations of their age group (5th grade, ages 10-11) in areas such as time management and self-discipline (Bryan, 2011). Students who are performing at widely different levels are also extremely difficult to track within a single class. As one administrator explains, "...it is hard to

monitor student interaction and easy to lose sight of some of them. Some just do not participate on the same level as others." (Peng 2010, p. 112).

Perhaps the biggest obstacle to the effective implementation of CALL, however, is the lack of teacher training in technology, cultural competence, and online pedagogical values. Schools' failure to achieve internal consensus on the proper role of online learning has consistently been linked to poor implementation of programs and, subsequently, poor student performance (Peng, 2010). All too frequently, teachers are given insufficient time and support to master the programs they are expected to teach (DelliCarpini, 2012). In the case of the school instituting the one-to-one laptop program, teachers were only given one week's notice to prepare and adjust their curricula, as well as preparing to offer students technical support (Bryan, 2011). It is no surprise that this experiment was unsuccessful. The lack of teacher training often stems from budgetary concerns and financial constraints, but the disorder and inconsistent teaching that result from them actually sap institutions' finances more than investing appropriately in CALL would have initially (Butz, 1989). Additionally, when administrators and teachers fail to agree on CALL values, ineffective teachers resort to using CALL as a crutch or filler activity, while those who are suspicious of CALL's value might ignore or under-employ it (Gee, 2008, Nauss, 2002). Further, teachers who are required to provide constant support while attempting to teach in their content area become frustrated and over-extended (Peng, 2010). It is essential for technology support to be delegated among staff members instead of relying solely on teachers who are themselves underprepared.

Students who are learning a second language in an online or blended setting suffer from dual sources of confusion and frustration - the language barrier and the technology barrier. In order to make CALL accessible and enjoyable for ELLs, it is important to honor both English and the students' native language, an attitude which is not always cultivated among educators and policymakers. Black (2006) found that students excelled in their online coursework when instructional time was balanced between both language, despite the fact that in the US, Spanish-language education is not funded by federal programs. CALL software for ESL purposes is usually created entirely in English (including menus, instructions, and other peripheral communications). This monolingual bias had little effect on the language deficits of ELLs if not used in a setting that honored the students' first language (Nauss, 2002). Standardized tests are also administered almost exclusively in English in the US, which places yet another barrier before ELLs who struggle to read test instructions in a foreign language, even if they are performing at grade level in the language classes (Nauss, 2002). These shortcomings of current CALL instruction reflect the limitations of current educational policy more than those of the technology itself, but it has been argued that the software and online tools do have their own constraints.

Although technology opens many doors for students and educators, there are some purposes and functions which it still cannot satisfy in the current day and age. Technological devices are still subject to wear and tear, theft, and damage, just like traditional instructional materials, and even with the advent of the Cloud data can still be lost and erased (Bryan, 2011). Regardless of new software which allows virtual face-to-face communication, it is still more difficult for online students to cultivate friendships and create social bonds - especially younger elementary students (Bryan, 2011). Some families continue to struggle with limited access to technology, even if

the resources are available at school, making socioeconomic status a lingering determiner of academic success (Bryan, 2011). Negative or non-constructive associations between certain CALL functions, such as chat, and other social activities require students to focus and modify their behaviors, which is not always effective (Ma, 2009). Even when programs appear to be effectively administered and students participate as they should, CALL programs do not always succeed in providing increased grades or test scores (Nauss, 2002). Whether due to the artificial nature of online groupings, the limits of programs' designs, or concerns about test security online, CALL is still an educational discipline in progress (Ma, 2009, Peng, 2010). As one program director explains:

"The real interaction between human beings, the affective and kinesthetic elements of face-to-face instruction, the feeling of pressure and frustration,the interactive joy of language learning, and the cultural aspects of classroom learning are something that an online environment has yet to duplicate." (Peng, 2010, p. 93)

It is clear that CALL can be improved and refined in many ways in order to improve trust, cultural appropriateness, and the ability of programs to meet a wider variety of student needs.

This literature review offers many insights on how online education can be incorporated into schools, as well as exploring how current programs might be improved. These discoveries could be put to great use in the Saudi education system, especially in light of the recent educational revolution and the flourishing of Saudi schools. The advances in CALL can be incorporated into Saudi K-12 education in order to improve student fluency and literacy skills, and to make use of the vast resources technology offers.

Time and time again in CALL literature, one challenge continues to present itself as the root of so many program failures and inefficiencies: lack of teacher training. Meskill and Mossop (2000) demonstrated that the relationship between teacher training and the success of CALL programs is direct and essential. Bryan (2011) also argues that teachers should be more extensively trained in the use of CALL, and attributes the lack of teacher preparation to the failure of the one-to-one laptop initiative. However, teacher training, which often takes the form of seminars, webinars, and workshops, must be conducted in a "smart way" (DelliCarpini, 2012). The literature points to several considerations that make for more "smart," or efficient, teacher training. First, teachers should be given more time to become acclimated to new technology. In Bryan's (2011) study, the teachers were only given one week to prepare for their students' new laptops. Clearly, this period could have been extended and supported with more technology staff, training in technological problem-solving, and an exploration of common problems associated with student laptop use (Bryan, 2011, p. 81). Training teachers is extremely important because it gives them a sense of ownership and confidence over their new teaching resources. Increased training might help to combat the stigma against technology as something that will replace human teachers or render them irrelevant, and confirm that technology is a useful tool, but not capable of functioning without a teacher.

Teaching with CALL is a task which requires several different types of knowledge. Fryling (2013) described the concept of "TPACK" - technological, pedagogical, and content knowledge - to explain the variety of skills that teachers must have in order to

effectively teach with technology. However, teachers' responsibilities in the CALL classroom often become over-extended when they are expected to simultaneously offer tech support to individual students while teaching the class. This places an unfair strain on teachers and creates frustration and conflict, reducing teachers' motivation to use CALL and making classes less efficient and effective (Grgovic, 2010). Increasing the amount of support staff for technology, although it increases costs, will ultimately improve student progress and allow teachers to excel in CALL-enhanced instruction. Teachers' beliefs and values about technology and its merits vary widely, often due to negative experiences such as those brought on by the lack of tech support (Grgovic, 2010). In order to ensure internal consensus about CALL's importance - a necessary step toward greater effectiveness, according to Peng (2010), there should be a place for the role of technology in schools' mission statements, and teachers should be required to attend training until they are proficient in the required tech skills. This will help all instructors realize the importance of technology in education and overcome their negative prejudices or past experiences. Teachers who embrace technology and find creative ways to integrate it into the classroom should also be rewarded appropriately.

Since Saudi education has experienced such a radical shift in recent years, many modern educational values and methods have found their way into Saudi schools. One technique of ESL education that has been celebrated by many prominent scholars and institutions is that of bilingual instruction in a culturally sensitive and appropriate context. DelliCarpini (2012) argues that CALL learners benefit immensely from receiving instruction in both their native and second languages, in a fashion which does not value one language over the other. Teaching with CALL and valuing both English and Arabic literature equally will allow for each language to retain its contextual and cultural significance. Online texts, or "e-texts" as Meskill and Mossop (2000) refer to them, can be extremely useful in ESL instruction, but the authors caution instructors against relying too heavily on them. Like all the tools of CALL, the best place for e-texts is as a supplement and support for regular instruction, not a substitute for it. CALL also lends itself well to more modern educational techniques, such as collaboration across age groups, self-evaluation, and more democratic student dynamics (Olmstead, 2001). One of the strongest advantages of CALL is that it opens up the possibilities of instruction to "accommodate a variety of learning styles... because there are always a mix of styles" that work best for different students within the same ESL classroom (Peng 2010, p. 110). More diversified instruction, more individual attention, and more collaborative opportunities are all benefits that come with embracing CALL.

In conclusion, the literature illustrates clearly that there are many benefits to adopting CALL techniques in ESL instruction when they are properly applied. The applications for CALL within the Saudi educational system have the potential to improve efficiency, reduce costs, and make students more self-motivated, independent, and fluent in both English and Arabic. While technology is still a growing and evolving field, there are many programs which have proven success in varying levels of education in the US. These programs can be utilized by Saudi schools in order to make our educational system more robust and competitive.

References

Black, D. B. (2006). *We're becoming bilingual and biliterate: an ethnographic study on how a dual-language program in Florida contributes to the literacy development of English-language learners* (Doctoral dissertation). Retrieved from ProQuest (UMI 3305176)

Bryan, A. (2011). *Elementary reading fluency and comprehension: do laptops make a difference?* (Doctoral dissertation). Retrieved from ProQuest (UMI 3475631)

Butz, C. W. (1989). *Student and parent satisfaction with online education at the elementary and secondary levels* (Doctoral dissertation). Retrieved from ProQuest (UMI 3143377)

Chang, Y. (2010). *Discourse and identity in online language learning: a case study of a community college ESL classroom* (Doctoral dissertation). Retrieved from ProQuest (UMI 3398184)

DelliCarpini, M. (2012). Building computer technology skills in TESOL teacher education. *Language Learning & Technology,* 16(2), 14-23. Retrieved from http://lit.msu.edu/issues/june2012/action.pdf

Fryling, M. J. (2013). *Bridging the divide: second language teachers, pedagogy, content knowledge, and technology* (Doctoral dissertation). Retrieved from ProQuest. (UMI 3558163)

Gee, A. P. (2008). *An investigation of the impact of Successmaker on reading and math achievement at an elementary school* (Doctoral dissertation). Retrieved from ProQuest (UMI 3326592)

Grgurović, M. (2010). *Technology-enhanced blended learning in an ESL class: a description of a model and an application of the Diffusion of Innovations theory* (Doctoral dissertation). Retrieved from ProQuest (UMI 3438697)

Hunt, B. (2011). *Wait, am I blogging? an examination of school-sponsored writing spaces* (Master's thesis). Retrieved from ProQuest (UMI 1503598)

Ma, M. L. (2009). *An exploratory case study of the participation and interaction among elementary school English language learners and native speakers in online discussions (Master's thesis)*. Retrieved from https://tspace.library.utoronto.ca/bitstream/1807/

18103/1/Ma_MeiLan_200911_MA_thesis.pdf

Meskill, C. & Mossop, J. (2000). Electronic texts in ESOL classrooms. *TESOL Quarterly,* 34(3), 585-592. Retrieved from http://www.jstor.org/stable/3587747

Nauss, D. A. (2002). *The effects of a supplemental computerized reading program on the comprehension of first grade readers in rural south Florida* (Doctoral dissertation). Retrieved from ProQuest (UMI 3054602)

Olmstead, C. J. (2001). *Improving reading comprehension using online literature circles: a university-elementary school collaborative project* (Master's thesis). Retrieved from ProQuest (UMI 1404902)

Peng, S. (2010). *The implementation of online learning for ESL programs: factors and perspectives* (Doctoral dissertation). Retrieved from ProQuest. (UMI 3418148)

The Effect of Constructivist ICT-Mediated Instruction and Programmed Instruction on Children's Learning Outcomes in Science

Tijani Fatimah, Michael Otedola College of Primary Education, Nigeria
Delphonso Bamidele, Michael Otedola College of Primary Education, Nigeria
Oludipe Oladele, Michael Otedola College of Primary Education, Nigeria

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

Abstract
This paper studied the effect of constructivist ICT-mediated instruction and programmed instruction on the learning outcomes of children in science. The research employed a quazi-experimental design using a 3x2x2 factorial matrix. The design involved three groups; pretest, posttest and control group. Forty (40) pupils from both MOCPED International Nursery and Primary school and SPEB Demonstration Primary School, at Epe Local Government Area of Lagos State were purposively sampled. The instrument used were a researcher designed Programmed Instructional Package (PIP,) Science Achievement Test (SAT); and Science Attitude Questionnaire (SAQ). The experimental groups were instructed using the PIP and a constructivist ICT-mediated instruction while the control group was not introduced to any treatment. The pretest and post-test scores of the groups were analyzed using the Analysis of Variance (ANOVA) and T-test statistics at 0.05 level of significance. Interaction effect was controlled using the Analysis of Covariance (ANCOVA). The result shows that children taught using the Programmed instruction performed better than both students in the constructivist ICT-mediated instruction and the traditional group. There was no significant effect of the treatment on the gender of the pupils. Also, the attitude of the children to learning science in the three groups was statistically different. It is recommended that PIP and constructivist ICT- mediated instructions be introduced into the science curriculum as media of instruction among other things.

iafor
The International Academic Forum
www.iafor.org

Introduction

The pace of change brought about by new technologies has had significant effects on the way people live, work and play. As technologies changes everyday, its use in every aspect of the society cannot be overemphasized. Worldwide acceptance of its integration into the teaching and learning process has therefore posed an urgent demand on learners to develop higher order thinking. In order for students to meet up with this demand, there is need to learn at the primary school level, science, which is an indispensable part of the curriculum. Science education has come a long way towards improving information systems worldwide, and the drive so far has been towards educating people to be scientifically and technologically conscious and literate. The primary school which is the preparatory stage for the learning of science in our children is the stage to inculcate science skills in order to be useful within the society. Since today's education is no longer adequate preparation for tomorrows computerized society, the teaching of science which forms the basic scientific and technological growth of any nation requires a high quality teaching force to be able to cope with the dynamics of the changing world.

Researchers (Seweje & Jegede, 2005; Ogundola, 2010) were of the opinion that several instructional strategies that have been employed by teachers for the teaching of science and mathematics over the years are teacher-centered which do not cater for individual differences in the learner. They stressed further that students are taught the same thing at the same rate without taking into consideration student's assimilation rates, thereby unable to identify weak students in the class. Also Odubunmi, (1996) and Murphy (2003) among others opined that student performance is low and the problem of declining interest in science is now an international issue. This was corroborated by Ogunleye (1999), that adduced reasons such as explosion of primary schools, teachers low knowledge about the goals of science teaching, lack of basic process skills of science that is necessary for imparting the knowledge, language of instruction, inadequate and shortage of primary science instructional materials as well as overloaded curriculum content and methods as impediment to the understanding of science by students.

However, it is hoped that with the integration of necessary ICT tools in primary science, pupils interest, curiosity and understanding of science will be heightened. Currently, the primary use of computers in education has been to deliver programmed instruction including drill and practice programs, computer based tutorial and more recently intelligent tutoring systems. These computer softwares are used in schools to teach students like what the teachers normally do. The prominent form of programmed instruction is the drill and practice programs especially in the areas of mathematics. He said further that drills are based on behaviorist beliefs about reinforcement of stimulus response association. Unfortunately the behaviourist principles underlying drill and practice are unable to develop the complex thinking skills required for meaningful learning to take place in science. Although drill and practice applications train learners, to perform the lower level sub-skills automatically but do not facilitate the transfer of those skills necessary for solving real and meaningful problems in science. With constructivism, learners are engaged in knowledge construction. They come to classroom with their unique backgrounds, experience, and conceptual understanding, learning styles and personal circumstances. Teachers now become learning facilitators rather than reservoirs of knowledge. That

was why Piaget (1972) opined that psychology of learning has shifted from behaviorism to cognitivism. It is believed that activities such as enquiry, investigation, problem solving, inferences, predicting when carried out collaboratively and accompanied by effective teacher dialogue can bring about understanding of scientific concepts. Murphy (2003) in support of the above assertion said if such type of activities is promoted by a constructivist approach to science teaching as opposed to behaviourist programmed instruction will be most beneficial in bringing out good learning outcomes in our children. The researchers are therefore interested in studying the effect of constructivist ICT-mediated instruction and programmed instruction on children's learning outcome in science.

Literature Review

Science is simply the dynamic study of nature and is in itself social and culture related, hence the environment is extremely significant when considering various aspects of science. Globally, science education programmes have afforded tremendous opportunities to young scientists in training in terms of acquisition of skills for solving, in particular, environmental problems. As stated by Akpan (1996) secondary school science curriculum is designed towards making everybody to become a specialist in the science professions later in life, but at the end of the day, many people are increasingly being alienated from science. The number of science and engineering graduates is falling, just as demand for scientific advances and technological innovation is increasing (OECD 2006), and many students tend to switch to other subjects that are more interesting and less demanding because a white coated, hardworking and poorly paid scientist in a laboratory is not a role model for many of today's young people. The reason for this is not farfetched, the objective of science education is the development of science process skills among school age children but in Nigeria, science teaching at the various levels retains the old conservative approach with the teacher, in most cases acting as the repertoire of knowledge and the student the dominant recipient. There is an over reliance on textbooks, shortage of scientific equipment, cognitive functioning of students, school conditions, teachers methodology, overloaded science content among others.

Moreover, current science curricular reform efforts throughout the world have re-focused on the necessity of teaching students to make informed and balanced decisions about how science impacts their lives and to use scientific knowledge to solve problems (Council of Ministry of Education, 1997). It is on that note that the researcher tends to study how both programmed instruction and constructivism affects learning outcomes in science.

The programmed and Constructivist-based learning environment

Programmed instruction and constructivism are both theories of learning. Programmed instruction is based on operant conditioning, it is a reductionist and focuses on external control and reinforcement. Skinner in Karen (1995) described programmed instruction as having a clearly defined context which is presented in small increments. As small units of the contest are presented, a learner is presented with a question that must be answered (stimulus). The student answers (response) and is told whether the answer is correct (consequence). On the other hand, constructivism

approaches view learning as a process in which individual students construct or build their own internal interpretations of external events.

Constructivism has its root in psychology, philosophy, sociology, and education. Constructivist teaching approach is based on the work of Rousseau, Dewey, Piaget, Bruner and Vygotsky and they all believed that human learning is constructed and active rather than a passive process. It has major implications for science teaching and it calls into question the traditional practices and places the child at the centre of the learning process. While Piaget and Bruner's work contributed towards cognitive constructivism, Vygotsky's work contributed towards social constructivism. In a constructivist learning environment, learners may work together and support each other as they use a variety of tools and information resources in their pursuit of learning goals and problem solving activities (Wilson, 1995), and learning is a personal interpretation of the world, where learners create interpretations of the world based on their past experience and interpretations (Jonassen, 1994; Jonassen and Henning, 1999). Their learning depends not only on the learning environment as set up by society, school and teacher but also on their prior knowledge, attitudes and aspirations. In constructivism the teacher is no longer perceived as the sole authority of the knowledge, but rather as the facilitator of learning, guiding and supporting learners in the process of constructing knowledge (Berg, 1999) and providing students with experiences that allow them to develop problem-solving, critical thinking and creative skills, and apply them in a meaningful manner.

Murphy (2003) states that computer tools are one of the easiest means of incorporating constructivist theory into education use. Learners are then working in authentic situations which should increase their comprehension of how to use ideas and information (Duffy and Jonassen, 1991). They also suggest that such things as hypertext, databases, and expert systems can be used as mindtools by individuals. Nevertheless, criticisms have been leveled against the constructivist approach to science teaching in the primary school. The most frequently quoted is while research advices that teachers identify children's alternative frameworks, there is little advice for teacher regarding specific strategies to develop these ideas so that they become more scientific particularly in class in which there might be up to 30 alternative frameworks for each concept.

Hypotheses

The study will make an attempt to answer the following questions.

1. There will be no significant difference in the performance of those pupils exposed to constructivist ICT-mediated instruction and programmed instruction in science teaching?
2. There will be no significant difference in the performance of those pupils exposed to constructivist ICT-mediated instruction and programmed instruction and conventional instruction in science teaching?
3. There is no significant effect of the treatments on gender of the students?
4. There will be no significant difference in pupil's attitude towards science when exposed to constructivist ICT-mediated instruction and programmed instruction?

Proposed Methodology

Research Design
The research adopted a quazi-experimental design using a 3x2x2 factorial matrix. The design involved randomized three groups; pretest, posttest and control group.

Population
The target population for this study was primary six pupils in public and private schools, Epe Local Government of Lagos State, Nigeria. Primary school pupils (Primary six) offering science at Michael Otedola College of Primary Education, {MOCPED} International Primary School, and Demonstration School, MOCPED, both at Epe Local Government Area of Lagos State. The choice of primary six pupils for the study is that they will soon transit to secondary school, and having the knowledge of science they can easily construct their own meaning.

Sample and Sampling procedure
The nature of this study required a purposive selection of the research sample, since this study requires such schools where computers, CD-ROMs, word processors, projectors, etc are used in science teaching. A total of Forty (40) pupils from the two schools were sampled out of the population.

Research Instrument
The instruments used were a researcher designed Programmed Instructional Package (PIP,) Science Achievement Test (SAT); and Science Attitude Questionnaire (SAQ). The PIP which is a multimedia program covers topics from Basic Science and Technology curriculum. The pupils were taught simple machines, with the subtopic: {Meaning and types of simple machines, types of lever, Pulleys and Inclined planes}. The PIP was designed using PowerPoint and in such a way that the pupils can refer back to the previous section in case they don't understand the previous section. Constructivist ICT-mediated instruction, the pupils worked in small groups of 4,4, 3 and 3. The lesson was carried out under the five steps to a constructivist teaching viz-a-viz: situation, grouping, bridge, questions, exhibit and reflections. Each group was given a chart which comprises the simple machines coupled with some real objects. They pupils were given a sheet of paper that provides series of questions on the name and the use of the machines given. The information gathered was then recorded on the computer data processor {MicrosoftWord 2007}. The control group on the other hand was taught using the traditional method. The lessons were taught for a period of two weeks after the pretest was conducted. The three groups were given the test items of the pretest and post test differently in their schools. On completion of the test, the scripts were collected, collated, mixed together and marked.

The Science Attitude Questionnaire (SAQ) was a 20-item structured questionnaire which was rated using the four point likert scale {strongly agree, agree, disagree and strongly disagree} in the form 4, 3, 2, and 1.

Validity of the Instrument
The face and content validity of the instruments were established by giving them to colleagues who are vast in the field and test and measurement professionals in the school of Education, MOCPED. Also, the PIP was made to pass through educational software developers in the department of Computer science, MOCPED.

Reliability of the Instrument
A pilot study was conducted on the pupils using the test-retest method. The established reliability coefficient for the instrument was 0.74 and 0.78 respectively and they were suitable for the study.

Administration of the instrument
Pre-treatment Phase
The three groups (constructivist ICT-mediated instruction, programmed instruction and the control group) were given the test without teaching them. The test was marked and recorded. The posttest was conducted after the treatments were applied on them. The scores were marked, collated and recorded.

Method of Data Analysis
Data analysis will be carried out using Analysis of Covariance to test the significance difference at 0.05 level of significance using Statistical Package for Social Scientists (SPSS) 20 as the statistical tool.

Table 1: Gender of Respondents

GENDER

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MALE	18	45.0	45.0	45.0
	FEMALE	22	55.0	55.0	100.0
	Total	40	100.0	100.0	

The table above shows that 18{45%} are male while 22{55.0} are female.

Hypothesis One: There is no significant difference in the performance of those pupils exposed to constructivist ICT-mediated instruction and programmed instruction in science teaching?

Table 2: Mean table of Pretest and Posttest achievement of science of pupils in constructivist ICT-mediated, programmed and conventional instruction

	Teaching Methods	N	Mean	Std. Deviation	Std. Error Mean
Pretest Achievement	CONSTRUCTIVIST ICT MEDIATED INSTRUCTION	14	4.714	3.7505	1.0024
	PROGRAMMED INSTRUCTION	9	5.556	4.6128	1.5376
	CONVENTIONAL INSTRUCTION	17	7.235	3.2506	.7884
Post Test	CONSTRUCTIVIST	14	10.214	5.5077	1.4720

Achievement	ICT MEDIATED INSTRUCTION				
	PROGRAMMED INSTRUCTION	9	14.778	4.1164	1.3721
	CONVENTIONAL INSTRUCTION	17	9.412	2.9960	.7266

The table above shows the mean performance of pupil's in the pretests. The result reveals that the conventional group {7.235} performed better than the constructivist ICT-mediated instruction {4.714} and programmed instruction {5.556}. Constructivist ICT-mediated instruction has the lowest mean score. Pupils in the conventional group had a high score because they have been taught the first part of the lesson before the researcher got to the school. So, they had a brief knowledge of the topic which other groups did not have.

In the post test achievement however, the programmed instruction group {14.778} performed better than the Constructivist ICT-mediated instruction group {10.214} and the conventional group {9.412}.

Table 3: T-test table of pupils achievement in constructivist Science ICT-mediated and programmed instruction

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Post Test Achievement	Equal variances assumed	3.212	.088	-2.126	21	.046	-4.5635	2.1462	-9.0268	-.1002
	Equal variances not assumed			-2.268	20.390	.034	-4.5635	2.0123	-8.7560	-.3710

The analysis of table 4 above shows the test analysis of pupils exposed to constructivist ICT-mediated programmed and conventional instruction. The result shows that there is a significant difference in the performance of pupils with the mean score {10.214 {t= -2.126; p <.05} and {14.778{t= -2.268; p <.05} when exposed to constructivist ICT-mediated and programmed instruction. The null hypothesis of no significance difference was therefore rejected.

Hypothesis Two: There will be no significant difference in the performance pupils exposed to constructivist ICT-mediated instruction, programmed instruction and conventional instruction in science teaching?

Table 4: Analysis of Covariance {ANCOVA} table of pupils achievement in science in constructivist ICT-mediated, programmed and conventional instruction

Tests of Between-Subjects Effects

Dependent Variable: Teaching Methods

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Model	143.041[a]	1	143.041	93.040	.000
VAR0002	143.041	1	143.041	93.040	.000
Error	59.959	39	1.537		
Total	203.000	40			

a. R Squared = .705 (Adjusted R Squared = .697)

An examination of the results in table shows than an F {1, 39} = 93.040α = .000 for the treatment was significant at 0.05 level of significance. The result shows that the means scores of pupils in the three groups {constructivist ICT mediated instruction, programmed instruction and conventional instruction} produced a significant difference on the post test performance of students when the covariate effect {pre-test} was statistically controlled.

Hypothesis Three: There is no significant effect of the treatments on gender of the students?

Table 5: Analysis of variance {ANOVA} on the effect of treatments on the gender of the pupils

ANOVA

GENDER

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.200	14	.371	1.976	.067
Within Groups	4.700	25	.188		
Total	9.900	39			

From the analysis of the ANOVA on the effect of treatments on the gender of the pupils, it shows that {F = 1.976 = 0.67; p > 0.05}. This shows that F is not significant.

Hence we accept the null hypothesis and agree that there is no significance effect of the treatment on the gender of the pupils in science teaching.

Table 6 : Chi-square analysis on the effect of treatments on the attitude of pupils

Statements	Chi-square	df	Asymp. Sig.
I enjoy being taught science	12.600	3	.006
Science is not too abstract	8.400	3	.038
I do not like performing experiment on science	6.600	1	.086
Solving problems in science has widen my horizon	19.800	3	.000
I like reading about science	6.400	3	.011
Some science concepts are not too difficult, confusing and misleading	23.400	3	.000
Learning science has made me to know more about the world around me	17.150	3	.000
Learning science is not a worthwhile exercise	6.200	3	.102
Working problems in science is like a magic	1.800	3	.615
Science is not too technical for my liking	1.000	3	.801
The learning of science is fascinating and interesting	19.400	3	.000
I do not like to learn science subject	20.600	3	.000
I like the different courses one can study as a result of learning science	27.000	3	.000
The knowledge of science helps to develop good reasoning ability	3.400	3	.334
The knowledge of science is not relevant to my daily leaving	2.600	3	.457
Science has many technical terms which are difficult to understand	11.800	3	.008
I do not like watching documentaries on science	4.200	3	.241
Only very brilliant students can understand science	7.800	3	.050
Experiments in science are not interesting	30.000	3	.000

The table above shows the chi-square analysis on the effect of the treatments on the attitude of the pupils. It reveals that majority of the attitude questions are significant. Hence we reject the null hypothesis and agree that there is a significant effect of the treatment on the attitude of students after the post test was conducted.

Conclusion and Recommendation

The paper investigated the effect of constructivist ICT-mediated instruction and programmed instruction on children's learning outcomes in science. Four hypotheses were tested at 0.05 level of significance. Based on the findings of the researchers, it was concluded that

1. There is a significant difference in the performance of pupils exposed to constructivist ICT-mediated, programmed and conventional instruction.
2. That mean scores of pupils in the three groups {constructivist ICT mediated instruction, programmed instruction and conventional instruction} produced a significant difference on the post test performance of students when the covariate effect {pre-test} was statistically controlled.
3. There is no significant there is no significance effect of the treatments on the gender of the pupils in science teaching.
4. There is a significant effect of the treatment on the attitude of students after the post test was conducted.

Therefore it is recommended that:

1. Programmed instruction and constructivist ICT-mediated instruction should be introduced into the teaching of science curriculum as a media of instruction.
2. The government should train teachers both {pre-service and in-service} on the use of constructivist based learning and programmed instruction.
3. Curriculum planners should include the development of course content using ICT tools in the pre-teacher training curriculum.
4. Teachers should also be encouraged and motivated to search for new knowledge that will aid the teaching learning process.
5. Government should provide funds to schools because good teaching learning process with the aid of ICT cannot be achieved without enough fund.

References

Aigbomian, D.O (2002). Science for All: Implication for the Teacher and National Development. Inaugural Lecture in Ambrose Alli University, Ekpoma 27th June, Ambik Press

Akpan, B.B (1996). Towards reduction in the contents of primary and secondary school science curricular. *Journal of Science Teachers Association of Nigeria (JSTAN)*. 31 (1 & 2), 1-5

Council of Ministers of Education (1997). Common framework of science learning outcomes K to 12. Pan-Canadian protocol for collaboration on school curriculum for use by curriculum developers.

Duffy, T.M. and Jonassen, D.H (1991). Constructivism: New implications for Technology. *Educational Technology*. 31 (5), 7-12

Murphy, C (2003). Literature Review in Primary Science and ICT future lab Series.

Jonassen, D.H (1991). Objectivism versus Constructivism: Do we need a philosophical paradigm? *Educational Technology Research and Development*, 39 (3), 5-14

Karen, S.G (1995). Toward Combining programmed Instruction and Constructivism for Tutorial Design. http./www.coe.uh.edu/insite/elec_pub/html

OECD (2006). Evolution of Student interest in science and technology studies. Policy report; *Global Science Forum*

Odubunmi, O.O (1996) levels of performance of Students exposed to laboratory and Lecture Methods in integrated Science. *Journal of Research in Curriculum* 4(1), 3-9

Ogundola, I.P (2010). Design and Use of Various Instructional Strategies in the Dynamics of Instruction edited by Jegede, S.A and Popoola, A.A

Ogunleye, A.O (1999). Science Education in Nigeria: Historical Development Curriculum Reforms and Research. Lagos. Sunshine international Publications

Piaget, (1972). Psychology and Epistemology: Towards a Theory of knowledge. London: Penguin Press

Seweje, P. O and Jegede, S.A (2005). Science Education and Science Teaching Methods. Atlantic Associated Publishers, Lagos.

Wilson, B.G (1995) Constructivist Learning environments: Case studies in Instructional Design. Englewood Cliffs, NJ: Educational Technology Publications.

iafor

Learning From Eliciting Questions in Exploring Global Knowledge

Te-Lien Chou, National Taiwan University of Science and Technology, Taiwan
Lih-Juan ChanLin, Fu-Jen Catholic University, Taiwan
Wei-Hsiang Hung, Fu-Jen Catholic University, Taiwan

The European Conference on Technology in the Classroom
Official Conference Proceedings 2014

Abstract
Twenty first century learning is characterized as technology-supported, student-centered, collaborative, context-based, and globalized learning. Higher education emphasizing practices for incorporating learning experiences serves as a means to prepare students for professional development. Advances in information and communication technology are influencing the instructional formats and delivery modes of Library and Information Science professionals. Integrating ICT (information communication technology) literacy into classroom learning environment is essential. In order to prepare students to face the challenges of the global marketplace, encouraging students to explore world knowledge entails instructional planning to enhance learning engagement. An elective course "Exploration of the Library World" employed question eliciting strategy into a technology-facilitated learning environment. Self-generated questions by students were used to help them deeply process learning and explore contents. The process also develops students' critical thinking, self-awareness and analytical skills. Students' learning was facilitated through active participation in generating and sharing questions based on the course content. Various learning media were used, including video clips (produced for providing interactive scenarios) and web-based resources together with assigned tasks. In order to fulfill the course requirements, students needed to submit both individual and group assignments on a weekly basis. Students' self-generated questions were summarized and discussed in each class. Reflective learning practices from 40 college students were summarized. Most students stated that learning through eliciting questions helped them focus on reading and exploring the materials. At the end of the course, students' self-regulated dispositions and skill development were assessed through various aspects.

Keywords: Inquiry learning, reflective learning, collaborative learning, self-regulated learning

Introduction

Twenty first century learning is characterized as technology-supported, student-centered, collaborative, context-based, and globalized learning. Learners are required to possess the capability to manage rapid changes of world knowledge and information. A recent study shows that, as technology races ahead, within a decade or two, nearly half of American jobs could be taken by computers; only jobs that require both creative and social intelligence will be left (Frey & Osborne, 2013). This finding indicates that the transformation of the pedagogy paradigm from drilling factual knowledge to facilitating an innovation motivation environment is crucial. Higher education around the world emphasizes various practices for incorporating learning experiences to prepare students for professional development. Dewey (1933) believed that education begins with the curiosity of the learner. Along this line, recent researchers have found that non-cognitive skills, such as curiosity, problem solving, information inquiry, and self-regulated learning are highly correlated with academic outcomes (Rosen, et al., 2010). Encouraging students to explore world knowledge entails instructional planning to enhance learning engagement, empower learners by giving them greater autonomy over the use of information in the learning process, develop an appreciation in learners of the value of independent learning, and enable learners to become lifelong learners (Hsieh, Jang, Huang & Chen, 2011).

This study discusses how question eliciting strategy was implemented in an ICT facilitated learning environment for freshmen students majoring in Library and Information Science. The instructional approach aimed to develop students' critical thinking, self-awareness and analytical skills through inquiry-based activities. Students' learning was facilitated through active participation in online exploration, question generating and sharing. Multimedia was used in the class, including self-made video clips (for providing interactive scenarios), web-based resources, and instant response tools. Reflective journals inviting self-generated questions were used each week to help students deeply process and explore learning contents. The framework for integrating ICT into classroom activities was structured using mixed theoretical approaches: inquiry-based learning, the question eliciting approach and reflective learning.

Inquiry-based learning

In the past, learning resources were mainly print-based textbooks, the learning setting was teacher-centered, and additional resources were prepared by teachers and functioned as supplement materials "that act as a vehicle for delivering information to the learner" (Clark, 1983; Kong & So, 2008). As technology races ahead, knowledge no longer comes from one single channel. Rather, students can access a variety of authentic knowledge online. Inquiry-based learning is a student-centered, active learning approach focused on questioning, critical thinking, and problem solving. Inquiry-based learning engages learners in searching, comprehending, organizing, synthesizing and evaluating information from different resources. Learners actively understand problems, investigate information, and discuss solutions (Kong & So, 2008). Inquiry experiences can provide valuable opportunities for students to improve their understanding of both learning content and professional practices (Edelson, Gordon, & Pea, 1999). Inquiry-based learning is reinforced by effective peer interaction. This process encourages students to experience a genuine learning

community and a shift from passive knowledge acquisition to active utilization of knowledge (Morrison-saunders & Hobson, 2013). Different from traditional learning settings, this approach encourages collaboration among learners in an inquiry-based learning atmosphere. Knowledge is shared and constructed by the learners as its central focus. In contrast, quite often, the voice of learners is excluded in teacher-centered classrooms. Collaborative learning in the classroom setting empowers learners' voices, cultivates critical thinking, and enhances learning and achievement (Gerstein, 2013).

Question eliciting approach

Inquiry-based learning activities begin with raising questions followed by eliciting solutions, creating new knowledge as information is gathered and understood, discussing discoveries and experiences, and reflecting on new-found knowledge (Savery, 2006). Allowing students to generate their own investigative questions stimulates curiosity and encourages profound thinking about relationships among questions, tests, evidence and conclusions (Chin & Brown, 2010). However, Edelson, Gordin & Pea (1999) found that the implementation of inquiry-based learning in classrooms often brings about challenges related to students' motivational contexts, the selection and sequencing of activities, the design of investigation tools, and the creation of process supports. Skills in the art of questioning for essential to proper scaffolding. Chin & Brown (2010) stated that problem-solving activities elicit more and a wider range of good questions than teacher directed activities. Although students do not always ask good questions spontaneously, they are able to generate such questions when prompted to do so. In recent years, new mobile devise based instant response systems have been adopted in face-to-face classes. Tools, including Nearpod and Socrative formative assessment apps improve the attendance and engagement of students. Teachers can make in-class polls or questionnaires and check responses on site. Students can stimulate and probe deeper conceptual understanding and enhance pedagogical outcomes (Liu & Taylor, 2013; Caeiro-Rodriguez, Gonzalez-Tato, Llamas-Nistal, 2013).

Reflection for a self-regulative process

Self-regulated learning is viewed as personally directed forms of learning. Learners manage to self-select reading, or seek information (Zimmerman, 2008). However, learners need to be guided, given the choices regarding the academic tasks to pursue when carrying out complex assignments and learning strategies related to the self-regulative process (Zimmerman & Schunk, 2001).

To foster the self-regulative learning process, reflective journal writing encourages students to be more critical and reflective about their learning. Reflection has been recognized as being a metacognitive process that examines and explores constructed knowledge and experience (Boyd & Fales, 1983; Dewey, 1933). Journal writing serves as a vehicle for reflection before, during, and after a learning experience. Journals provide a venue for students to develop personally and professionally (Dyment & O'Connell, 2010). This approach provides a learning experience in which students record and reflect deeply on their thoughts and feelings on issues and events that are an essential part of their learning (Le & Le, 2007). Reflection is an active, persistent and careful consideration toward self-constructed knowledge and meaning

through using one's experience, action, and beliefs (Dewey,1933; Schon,1987). It is initiated through one's experience, thinking, consideration, and evaluation to examine and explore the concerned issues, opinions, feelings, and behaviors (Boyd & Fales, 1983; Carver & Scheier, 1998). It is also a learning process which helps learners express and evaluate their attitudes and feelings, expand their learning cognition; this process is intimately related to holistic comprehension (Hsieh, Jang, Huang & Chen, 2011).

The study

Subject and setting

This study was conducted at a university in northern Taiwan. Forty Library and Information Science freshmen enrolling in the elective course "Exploration of Library World" participated in this study. An 18 week first-year general world library introduction course has been developed based on inquiry based learning.

Implementation

The course led students to explore world libraries via online media. Students followed guided inquiry worksheets to develop and understand the course objectives. Groups of six students were formed and shuffled randomly every other week. The instructor moved among the groups, serving as a facilitator. Through collaborative learning techniques, students were active participants in the learning process. No lectures were given. Basic English communication skills of library professionals were practiced. Students were guided to write reflective journals based on a structured format as listed in Table 1. The reflective journals were framed based on: What did the students know? What did they want to know? How were these questions answered? What were their reflections? The class was held in a multimedia interactive studio; where WIFI, laptops, tablets, and a projector were available to students for accomplish assignments, e.g. inquiry learning, library conversation video creation and instant response gathering. The self-generated questions were summarized and discussed in each class. Students were asked to complete inquiry worksheets both individually and by group. Students' worksheets and reflective journals were collected at the end of class.

Data collection and analysis

In this study, both qualitative and quantitative data were collected. Qualitative data were collected from the semester-end summative questionnaire. The questionnaire items were organized in four categories, including: exploration of knowledge, collaborative learning activities, the use of the online instant response system, and reflective journal writing. Descriptive analysis was used in data analysis, as presented in Table 1 to Table 4. Qualitative data were retrieved from reflective journals from 40 college students written on a weekly basis. Detailed descriptions are shown in Table 5.

Findings

Students' reactions toward exploration of foreign knowledge, collaborative learning activities, online instant response, and reflective journal writing are summarized in Tables 2 to 5. "The class gives me the opportunity to obtain professional knowledge in Library and Information Science" was rated the highest (Mean = 4.58, SD = 0.501)

in the category of "exploration of foreign knowledge". "T.As' assistance stimulates my innovative thinking ability" was rated the highest (Mean = 4.48, SD = 0.640) in the category of "collaborative learning activities". "Reviewing others' peers' response encourages my motivation to respond in the class" was rated the highest (Mean = 4.45, SD =.552) in the category of "collaborative learning activities". "Reflective questions help me review what I have learned during the class" was rated the highest (Mean = 4.23, SD =.577) in the category of "reflective journal writing".

Table 1: Students' perceptions of exploration of foreign knowledge

Exploration of foreign knowledge	Mean	S.D
The class encourages me to explore updated knowledge of library professionals.	4.35	.622
The class inspires my motives to explore and acquire more knowledge about world libraries in different countries.	4.55	.552
The class gives me the opportunity to obtain professional knowledge in Library and Information Science.	4.58	.501
I learned to think about professional knowledge in English	4.15	.700

N=40 missing =0

Table 2: Students' perceptions of collaborative learning activities

Collaborative learning activities	Mean	S.D
This class creates an atmosphere that makes me comfortable sharing my thoughts with others.	4.23	.620
I learned to cooperate with different people and the cooperation inspires me.	4.40	.545
International collaboration increases my motivation toward learning.	4.25	.742
T.As' assistance stimulates my innovative thinking ability.	4.48	.640

N=40 missing =0

Table 3: Students' perceptions of the online response system

Instant response system	Mean	S.D
The instant response system helps me focus on class activities.	4.38	.586
Through the instant response system, I observe others' feedback.	4.40	.632
The instant response system can increase my enjoyment of learning.	4.35	.700
Compared with oral expression, I love to give my feedback through the instant response system.	3.85	.834
The instant response system triggers my critical thinking ability.	4.40	.632
Reviewing others' peer responses encourages my motivation to respond in the class.	4.45	.552
Compared with other classes, the use of instant response system encourage my active learning	4.15	.802

N=40 missing =0

Table 4: Students' perceptions of reflective journal writing

Reflective journal writing	Mean	S.D
Reflective questions help me review what I have learned during the class.	4.23	.577
Reflective questions help me clarify my expectations of knowledge exploration.	4.05	.677
Reflective questions encourage my learning reactions.	4.13	.648
The reflective journal helps me clear my thoughts.	3.98	.768
Reflective questions help me develop my descriptive skills.	4.08	.764
The reflective journal helps me review my learning progress.	4.15	.736
The reflective journal consolidates my learning.	4.02	.733
Reflective journal writing improves my English writing skills.	3.88	.757
From the questions raised in the reflective journal, I gained motivation to explore further.	3.88	.791
Sharing of questions triggers my new interest in specific information raised by others	3.93	.656
Reflective journal writing enhances my creativity	3.95	.714
Reflective journal writing makes me love my professional field.	3.88	.757

N=40 missing =0

Based on students' reflections each week, most students believed learning through eliciting questions helped them focus on the reading and exploration materials. Reflective journals reinforced the knowledge they learned. They felt like they had "*traveled to many world famous libraries*". Through question raising and discussion, they "*learned not only how to communicate with others in English, but also to understand and respect different opinions"*. Also, collaboration learning stimulated students' creativities: "*Peers' presentation and creativities inspire me"*. Lastly, the instant response system "*made the class fun, so students feel more like engaging in class activities"*.

Conclusion

This study adopts mixed methods of question eliciting, and reflection and discussion, using inquiry based learning and instant response system. The researchers attempt to promote a new approach to engaging students in learning. Learning begins with curiosity of learners. We encourage students to explore world knowledge by giving them greater autonomy over the use of information in the learning process. Hopefully this study can develop an appreciation in learners of the value of independent learning, and enable them to become lifelong learners.

Acknowledgement

This research was sponsored under the Teaching Excellence Project of the Ministry of Education of Taiwan (ID: 94E205). Their generous support is highly appreciated.

References

Boyd, E., & Fales, A. (1983). Reflective learning: the key to learning from experience. *Journal of Humanistic Psychology*, *23*(2), 99–117.

Caeiro-Rodriguez, M., Gonzalez-Tato, J., Llamas-Nistal, M. (2013, March). *Experiencing a web-based audience responses system in engineering lectures*. 2013 IEEE Global Engineering Education Conference. Technisiche Universitat Berlin, Berlin, Germany, 513-519.Carver, C. S., & Scheier, M. F. (1998). On the self-regulation of behavior. UK: Cambridge University Press.

Chin, C., & Brown, D. (2010). Student-generated questions: A meaningful aspect of learning in science. *International Journal of Science Education, 24*(5), 521-549.

Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research*, *53*(4), 445 – 459.

Dewey, J. (1933). *How we think*. Boston, MA: D.C. Heath and Co.

Dyment, J. E. & O'Connell, T. S. (2010). The quality of reflection in students journals: a review of limiting and enabling factors. *Innovative Higher Education*, *35*, 233-234.

Edelson, D. C., Gordin, D. N., & Pea, R.D. (1999). Addressing the Challenges of Inquiry-Based Learning Through Technology and Curriculum Design. *Journal of the Learning Sciences*, *8*(3-4), 391-450.

Edelson, D.C., Gordon, D.N.,& Pea, R.C. (1999)Addressing the Challenges of Inquiry-Based Learning Through Technology and Curriculum Design. *The journal of the learning sciences*, *8*(3&4), 391-450

Frey, C. B., & Osborne, M. A. (2013). The future of employment: how susceptible are jobs to computerisation?. Sept, 17, 2013.

Gerstein, J. (2013). Team and Community Building Using Mobile Devices. In Z. Berge & L. Muilenburg (Eds.) *Handbook of Mobile Learning*. New York: Routledge. http://www.routledge.com/books/details/9780415503693/

Hsieh, S.H., Jang, Y.R., Huang, G. J., & Chen, N.S. (2011). Effects of teaching and learning styles on students' reflection levels for ubiquitous learning. *Computer and education*. 1194-1201.

Kong, S. C., & So, W. M. W. (2008). A study of building a resource-based learning environment with the inquiry learning approach: Knowledge of family trees. *Computers and Education*, *50*(2008), 37-60.

Le, T and Le, Q (2007) Reflective learning on online communication. In: *Technology and Teaching*. Nova Science Publishers, New York, USA.

Liu, Y. T. & Taylor, C.E. (2013, September). *Engaging students in large lectures of introductory biology and molecular biology service courses using student response systems*. Proceedings of the Australian Conference on Science and Mathematics Education, Australian National University, 154-162.

Morrison-saunders, A. & Hobson, J. (2013). Being sub-centred: A philosophy of teaching and implications for higher education. *Issues in Educational Research, 23*(2), 212-226.

Rosen, J. A., Glennie, E. J., Dalton B. W., Lennon, J. M., and Bozick, R. N. (2010). *Noncognitive Skills in the Classroom: New Perspectives on Educational Research*. RTI Press publication No. BK-0004-1009. Research Triangle Park, NC: RTI International. Retrieved June 30, 2014, from http://www.rti.org/rtipress.

Savery, J. R. (2006). Overview of Problem-based Learning: Definitions and Distinctions. *Interdisciplinary Journal of Problem-based Learning, 1*(1), 9-20.

Schon, D. (1987). *Educating the reflective practitioner*. San Francisco: Josse-Bass.

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: historical background, methodological developments, and future prospects. *American Educational Research Journal*, *45*(1), 166–183.

Zimmernan, B. J., & Schunk, D. H. (2001). Theories of self-regulated learning and academic achievement: an overview and analysis. In B. J. Zimmerman, & D. H. Schunk (Eds.), *Self-regulated learning and academic achievement: Theoretical perspectives* (pp. 1–36). Mahwah, NJ: Lawrence Erlbaum.

Contact email: D10211001@mail.ntust.edu.tw

Language Learners Perceptions and Experiences on the Use of Mobile Applications for Independent Language Learning in Higher Education

Ana Niño, The University of Manchester, UK

The European Conference on Technology in the Classroom
Official Conference Proceedings

Abstract
With the widespread use of mobile phones and portable devices it is inevitable to think of Mobile Assisted Language Learning as a means of independent learning in Higher Education.

Nowadays many learners are keen to explore the wide variety of applications available in their portable and always readily available mobile phones and tablets. The fact that they are keen to take control of their learning and autonomy is thought to lead to greater motivation and engagement, and the link with games-based learning suggests that the fun factor involved should not be overseen.

This paper focuses on the use of mobile applications for independent language learning in higher education. It investigates how learners use mobile apps in line with their classes to enhance their learning experience. We base our analysis on a survey carried out in autumn 2013 in which 286 credited and non-credited language students from various levels of proficiency at The University of Manchester express their perceptions on the advantages and disadvantages of the use of mobile applications for independent language learning, together with examples of useful apps and suggestions of how these could be integrated in the language class.

Keywords: mobile assisted language learning (MALL), mobile language learning, Higher Education (HE), student perspectives, independent language learning

iafor
The International Academic Forum
www.iafor.org

1. Introduction

This investigation looks at the results of a survey on the use of MALL apps by students at HE to learn about the language learners' perceptions and experiences on their use of mobile apps for independent language learning.

We will start by defining MALL and its relation to m-learning and CALL, for it provides the theoretical foundations of this investigation. Then we will guide you through the results of this study, which will provide answers to the following research questions:

1. how do students use MALL?
2. how do they perceive its usefulness?
3. how MALL can be integrated in the class according to students? and
4. what implications does this have for the future? both from the learning and teaching point of view.

Research questions 1 and 2 will be answered in the Results and findings section, whereas questions 3 and 4 will be dealt with in the sections Students suggestions for integrating MALL in the language class, and Pedagogical implications and conclusions.

2. Theoretical background

Mobile Assisted Language Learning (MALL) constitutes the theoretical framework for this study. MALL describes an approach to language learning that is enhanced through the use of a handheld device or mobile technology, such as pocket electronic dictionaries, e-books, personal digital assistants (PDAs), MP3 players and, most recently, ultra portable tablet PCs and smartphones.

MALL is a subset of both m-learning and CALL. M-learning or mobile learning is defined as "learning across multiple contexts, through social and content interactions, using personal electronic devices" (Crompton 13: 4). In this paper we will explore contexts in which MALL can be used and examples of social and content interactions for independent language learning as suggested by students at Higher Education.

According to Kukulska-Hulme and Shield 2008, MALL differs from CALL mainly "in its use of personal, portable devices that enable new ways of learning, emphasizing continuity or spontaneity of access and interaction across different contexts of use". This emphasises the role of students as main experimenters/explorers and the role of teachers as mere guiders in their mobile applications endeavours outside the class. Let's not forget that, precisely, one of the main advantages of MALL is the freedom to use language-learning resources at anytime from anywhere, as well as the freedom to communicate with fellow students and with the tutor. In this sense it makes sense to learn more about the students' preferences, needs and motivations to use mobile devices with a view to experiment innovative effective ways to maximise their language acquisition.

In terms of how can MALL enhance language learning, Kukulska-Hulme (2006) identified four main ways in which mobile devices are typically used at the moment:

1. *to support communication*, arranging students in groups to encourage collaborative practice
2. *for content delivery and creation*, for mobile devices allow for a faster turnaround of learning resources creating a continuum of in-class and outside-class learning resources and opportunities
3. *to encourage personal engagement* by social interaction and personalisation
4. *in contextual learning*, where students use mobile devices as part of a larger activity, e.g. for data collection, location awareness, collaboration or to support retention or understanding of specific learning items

These main uses of mobile technologies will be revisited in the last sections of this paper where we will present various examples of the use of mobile apps for independent language practice by students, together with discussions around their prospective use in the language class.

3. Rationale and methodology

Given the growing availability of mobile devices in the university language class, we were interested in investigating the educational use of this ubiquitous mobile technology from the students' perspective. We sought to find out whether students use mobile apps for their independent language learning, and, if so, which are these and how they use them, what do they think about their use for independent language learning purposes, and whether they had any recommendations on how language tutors can implement MALL in the class.

For this purpose in autumn 2013 we run a survey for language students at The University of Manchester. Participants ranged from credited students studying a language or more as their main degree, to credited non-specialist students, non credited students and MoPs (members of the public). As represented in table 1, there were a total of 252 respondents and the languages being studied ranged from widely studied languages such as French (74), Spanish (67), German (53), English (32), Arabic (27) or Chinese (21), to other languages such as Italian (21), Portuguese (9), Korean (7) or Urdu (1).

LANGUAGE	RESPONSE TOTAL	RESPONSE PERCENT
FRENCH	74	29%
SPANISH	67	27%
GERMAN	53	21%
ENGLISH	32	13%
ARABIC	27	11%
CHINESE	21	8%
ITALIAN	21	8%
JAPANESE	15	6%
RUSSIAN	10	4%
PORTUGUESE	9	4%
KOREAN	7	3%
POLISH	6	2%
PERSIAN, HEBREW, DUCTH	2	1%
URDU	1	
		252 TOTAL RESPONDENTS

Table 1: Respondents' languages of study

As for the level of the language of the students participating, the great majority of them had an A1 level (91%), followed by a B1-B2 level (21 and 19% respectively), A2, 17%, with only a 14% having a C1 and just 7% with a proficient /C2 level (see figure 1).

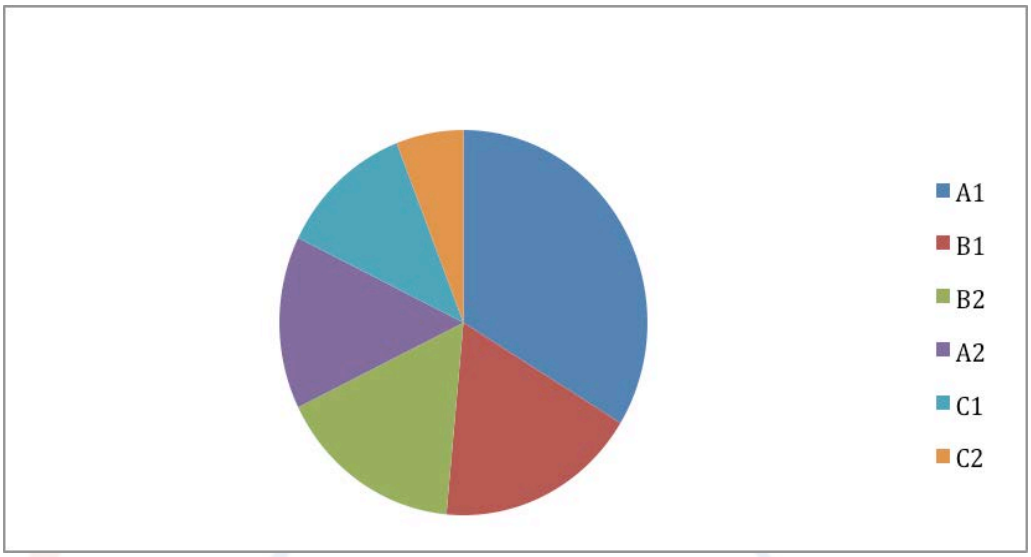

Figure 1: Respondents' language level

4. Results and findings

As pointed out before, one of the main purposes of this paper is to provide some indication of how do HE students use MALL. To the question *Have you used mobile apps to support your language learning?* 33% of the respondents replied Often, followed by a close 31% Sometimes, however, 36% of them had Never or rarely used them and this will show in their comments later on.

To the question *How often have you used mobile apps?* it is clear that they great majority of them used them often or sometimes with a total of 80% as opposed to just a 20% who never or rarely used them.

With regard to the students' actual use of mobile apps for language learning, students were enquired to complete the statement *For my language learning I use mobile apps in order to ...* and prompted with various suggestions of use (see table 2 below). These were the results by order of frequency:

	RESPONSES	%
Look up words, phrases and idiomatic expressions	156	72
Translate words/phrases I do not understand into my language	115	53
Translate words/phrases into the language I am learning	106	49
Listen how words are pronounced	93	43
Look for definitions in the target language	92	43
Revise and practise vocabulary	84	39
Help me conjugate verbs	68	31
Look up synonyms in the target language	59	27
Listen and repeat to improve my pronunciation	51	24

	RESPONSES	%
To read	48	22
To revise and practise grammar	47	22
To listen to mp3s, podcasts, radio, etc.	45	21
For social networking	40	19
To listen to music	35	16
To speak with my friends, conversation exchanges, etc.	30	14
To watch authentic videos and TV	26	12
To play games	22	10
To chat	20	9
For professional networking	8	4
For checking infographics for inspiration	5	2

Table 2: Use of mobile apps for language learning

By far the most frequent use was looking up words, phrases and idiomatic expressions with a 72% of responses, followed closely by translating words/phrases into the L1 first (for comprehension purposes), and into the L2 secondly (for production purposes). Two other main uses were listening how words are pronounced, looking for definitions in the target language or revising and practising vocabulary. This suggests that the meaning of small chunks of language (and their pronunciation) is at the top of students' priorities when checking their mobile apps and suggests we can be mainly looking at beginners' level students.

Surprisingly, the conjugation of verbs only had a 31% of responses. This is a common concern at all levels, especially in Romance languages such as French or Spanish, followed by looking up synonyms into the target language (27%), which suggests a more advanced level.

Reading use reported a 22% with apps such as e-books, digital newspapers and magazines, followed by a 22% of grammar revision use and 21% listening use, mainly MP3s, podcasts and radio.

Social networking had a return of 19% followed by other leisure-associated uses such as listening to music, speaking to friends over *Skype*, watching authentic videos, playing games, chatting, professional networking or checking infographics for inspiration.

As for the usefulness of mobile apps for independent language learning, an overwhelming 88% of the students questioned considered them helpful for this particular purpose.

Mirroring the results from an aforementioned question (For my language learning I use mobile apps in order to …), table 3 below shows answers to the question *In what ways do you find mobile apps useful?* 73% of the students thought the main usefulness of these apps is their helping increase vocabulary. The portability and freedom of use for extra practice at any time and at the students' own pace was regarded as the second most important practicality, followed by help memorising (41%), reading comprehension (32%), and the fact that it makes revision fun (39%).

	RESPONSES	%
Helps increase vocabulary	154	73
Provides resources for extra practice at any time and at my own pace	100	48
Helps memorising words, phrases, genders, conjugations, etc.	86	41
Helps improve reading comprehension	68	32
Makes revision easier/ fun	82	39
Helps improve pronunciation and intonation	70	33
Helps sentence building	69	33
Helps improve oral comprehension	68	32
Helps improve grammar accuracy	67	32
Helps me write properly	44	21

Table 3: Usefulness of mobile apps for language learning

Other ways in which students found mobile apps useful were in improving pronunciation and intonation, in sentence building and oral comprehension, which also suggests a lower level (A1-B1), or, at least, that the student is still exploring the first stages of learning a language. Last in the list stand help improve grammar accuracy and help write properly, which usually demand more formal learning and a more deep knowledge of the language, together with contextualised practice and feedback or some way of interaction.

Most of the students questioned were widely aware of the various mobile apps available for language learning and this showed in their answers to the question *Can you mention examples of apps that you found useful for your independent language learning?* (see table 4 below).

TYPE	APPS
DICTIONARIES AND CONCORDANCERS	WordReference, Dict CC, LEO Pons, Jisho, Pleco, Arabic Dict, Linguee
TRANSLATORS	Google Translate, iTranslate
L PRACTICE	Duolingo, Busuu, Babble
FLASHCARDS	Quizlet, Memrise, Brainscape, Anki
CONJUGATORS	Iverbs French, I Verbi, Wiktionary, El Conjugador
PODCASTS	Itunes Podcasts, Chinese Pod, Deutsche Welle, France Culture, Tfs Radio Germany
NEWSPAPERS	Courrier International, Der Spiegel, El País
VIDEOS	YouTube, RTVE, Atres Player
GAMES	Mind Snacks
NOTES	Notes, Notability
MESSENGERS	Whatsapp, FaceBook Messenger

Table 4: Examples of mobile apps respondents found useful for independent language learning

These mobile apps could be grouped in the following categories:

- **Dictionaries and concordancers** such as *Wordreference* with fast accurate translations of words, idioms and collocations, and language forums to discuss various linguistic issues; the overlay *QuickDict* and bidirectional offline dictionaries such as *Dictionary CC* or *Arabic Dict,* online dictionary apps such as *Pons*, *Jisho*, *Pleco*, or even a powerful combined offline and online dictionary plus concordancer such as *Linguee*.
- **Translation apps** such as *Google Translate* that students use to translate words between two languages back and forth quickly and easily. They were aware, though, that it does not work as well with full phrases, sentences to use in real life or grammar. Of Google Translate they liked the fact that it produces a list of synonyms with the translation and that it enables audio so you can hear the words you are translating and input words into the translator through your own voice and play back the words.
- **Language practice apps** such as *Duolingo*, which students find good for revision of basic and more advanced language skills. The fun and interactive tasks help enhance reading, writing, oral and listening skills and you can also set goals and do mini tests to monitor your progress and achievements. Their comments on this app provide lots of clues of mobile features they value such as the fact that they can have grammar and meaning explanations, translate to and from the language, practice their vocabulary and conjugations for a limited period of time (5 minutes), listen to the correct pronunciation of words, do speaking practice, and even compare themselves with their friends because the app is paired with *Facebook*. They also like the fact that

they receive a reminder to practise every day. Similar apps to *Duolingo* are *Busuu* and *Babble*, a speech to text and text to speech app to practice accurate pronunciation of short phrases and sentences and challenges to you repeat them correctly in 4 seconds. Some advantages pointed out by students were that it has various levels to help you build up, you are given feedback and you can see your improvements over time.

- Among the **Flashcard applications** that they highlighted were *Quizlet*, to record their own vocabulary and be tested on it, *Memrise* which combines memorising and gaming features, and similar tools such as *Brainscape* and *Anki*. Students seemed to enjoy not only the sharing and personalisation of resources that these apps allow, but also the challenge and competition involved.
- Many of the students also suggested the use of **conjugation apps** such as *I Verbs French*, *I Verbi, Wiktionary* or *El Conjugador* to check for irregular verb use and help with their grammatical accuracy.
- For **listening comprehension** they seemed to make extensive use of podcasting apps and tools such as ITunes podcasts, *Notes in Spanish*, *Chinese pod*, *France Culture* , *tfs Radio Germany* with different accents and increasing oral understanding, or *Deutsche Welle* where they found useful its manageable speaking speed and transcriptions.
- They also mentioned **newspaper apps** such as *Courier International*, *Der Spiegel* or *El Pais* not only for reading and cultural awareness, but also for oral comprehension skills.
- **Video apps** such as *YouTube*, *RTVE* or *Atresplayer* with multiple opportunities for practice (watching video clips, TV extracts, full movies, listening to music with lyrics, etc.).
- **Games** such as *MIndsnacks,* which are great incentives, fun and allow you to unlock more games as you go up. On the negative side, they mentioned they can get repetitive after some time.
- **Note taking apps** such as Notes or *Notability* to write words and phrases and make learning more accessible and easier to memorise.
- And, finally, **chat or messenger apps** such as *Whatsapp* or *Facebook Messenger* to communicate with other people on the go.

These types of mobile apps suggested by the students cover areas and skills such as grammar, vocabulary, reading, writing, pronunciation, listening, speaking and culture, which were already identified by Levy (2009) as benefiting learning and contributing to language acquisition in CALL.

5. Students' suggestions for integrating MALL in the language class

Our research also looked into how can MALL be integrated in the class. To the question *Would it be helpful if your tutor would embed the use of mobile apps for language learning as extra materials in class or via the VLE?* a great majority, 82% of the students, found this Always (50%) or Sometimes helpful (50%), as opposed to a 16% who would Rarely or never find it useful, mainly claiming that mobile apps are not for everybody, that they work best as additional optional practice to use in their own time (for independent revision, rather than as a main part of the course), and that not everybody has smart phones so some people would be missing out.

In the last part of the survey we asked students to share their views on the educational potential of mobile apps inside and outside the language class. Students comments

will be commented on in the form of suggestions for integration in a language course as well as pedagogical advantages and hindrances of their use.

Among the suggestions for integration in a language course, students provided the following:

- giving links on the VLE to some useful apps and sign posting these in class
- if possible, link apps to pop up on your mobile to be able to learn at your own pace during the day
- set problem-solving tasks as homework or challenges within class e.g. looking for synonyms
- as a 15 min. revision exercise in class
- incorporate interactive games to support covered topics per week for fun extra practice on the move, together with vocabulary lists, translation of phrases/words and short grammar/pronunciation online tests to help learning and progression, or even to compete against the class, in order to link them to contents seen in class so there is a sense of progression and to post on discussion fora about new apps as recommended by their fellow students

Based on these suggestions, it appears that students are realising the educational potential of mobile apps for language learning. However, they seem to need guidance to link them to the contents seen in class and realise the usefulness of these to practise the various linguistic skills involved in language learning. Tutors could encourage this by providing good examples of app use and presenting relevant contexts with clearly set learning outcomes in which these could be used as part of a larger language in-class or outside-of-class learning task for authentic, collaborative practice. We believe that, well conducted, this can improve learner engagement and motivation as well as foster language retention in the long term.

6. Pedagogical implications and conclusions

Finally, we will discuss some of the pedagogical implications of the use of MALL for the future. From the results of this survey and to conclude we can say that among the pedagogical benefits of MALL we can highlight its suitability for passive language skills such as vocabulary acquisition, written and oral comprehension, pronunciation, vocabulary and grammar practice in particular.

Students also indicated that other advantages of the use of mobile apps for language learning include convenience (as a quick check they are always available, at any time and from any place), use of authentic resources (which always trigger cultural awareness) for various L skills, the fact that they provide fun and interactive progression over a wide range of topics in a limited period of time, offer immediate feedback and several opportunities to personalise language practice (for example setting goals, creating quizzes on students' own created resources, beating game scores, etc.).

Overall, it is clear that MALL has a lot of potential for blended VLEs, that it encourages autonomous learning, motivation and, we believe, social interaction as well, especially if the app is somehow connected to a form of social networking or there is a degree of competition involved. In this respect, we can find a connection

between the students' views and the main ways in which mobile devices are used as summarised by Kukulska-Hulme (2006) at the beginning of this paper, namely, for communication, content delivery and creation, personal engagement and contextual learning. Key attributes such as the use of personalised, situated, authentic, spontaneous and informal tools (Kukulska-Hulme and Traxler, 2007) are also to be taken into consideration in the "rethinking" pedagogy for the use of mobile apps by language learners.

On the other hand, some pedagogical hindrances of the use of mobile apps for language learning identified include the fact that there is not much current scope for extensive practice of speaking and writing skills. As opposed to authenticity, some words or phrases as used in mobile apps may become obsolete or different to real life use. Similarly, the free version of some apps may become boring and repetitive after a while, therefore affecting motivation. Students also realised that the quick automatic translations, especially of phrases and sentences, as produced by apps such as *Google Translate*, cannot always be trusted. This provides a good example of positive students' evaluation of language learning resources, where readiness and quickness of use does not necessarily lead to misuse and plagiarism. Students will then be free to explore more fruitful resources such as concordance apps to look for parallel collocations and structures in the target language.

It is also true, as identified by students, that mobile technology is not suitable for all kinds of students and learning styles, that some students may not have smart phones and would automatically be left out, and that some apps are just condensed versions of websites.

Students realised that some apps demand further guidance for their proper use and therefore are commonly left unused. Finally, we will recap on the fact that MALL does not always facilitates synchronous collaborative practice among students. We have seen a few example apps for this purpose such as messenger apps or videoconferencing apps, however, their use for independent language learning is still rather unexplored and the design of the tasks and appropriate /relevant context of learning would make it only suitable for one-to-one distance learning. In other words, students enrolled in a language course may still prefer the face-to-face interactive conversation practice with their fellow students, for example.
Overall, our survey revealed that, although there is evidence of the use of mobile apps by Higher Education students for independent language practice, students and, undoubtedly, tutors still could benefit from further guidance and support to ensure effective educational use inside and outside the language class. In this respect, listening to students' needs and preferences, together with a close collaboration between language tutor communities and educational technologists can help in the search of innovative, meaningful and appropriate activities that involve the use of mobile apps and can be successfully integrated into the language curriculum.

References

Crompton, H. (2013) A historical overview of mobile learning: Toward learner-centered education. In Z. L. Berge & L. Y. Muilenburg (Eds.), *Handbook of mobile learning*, pp. 3–14. Florence, KY: Routledge.

Kukulska-Hulme, A. (2006) Mobile language learning now and in the future. In Svensson, P. (Ed.) *From vision to practice: language learning and IT*. Sweden: Swedish Net University, pp. 295-310

Kukulska-Hulme, A. and Traxler, J. (2007) Designing for mobile and wireless learning. In Beetham, H. and Sharpe, R. (Eds.) (2007) *Rethinking pedagogy for a Digital Age: Designing and Delivering E-learning*. London: Routledge.

Kukulska-Hulme, A. and Shield, L. (2008) An Overview of Mobile Assisted Language Learning: from content delivery to supported collaboration and interaction. *ReCALL, 20(3),* pp. 249-252. http://dx.doi.org/10.1017/S095834400800013X

Levy, M. (2009) Technologies in use for second language learning. *The Modern Language Journal, 93*, pp. 769-782.

iafor

Parental Concerns Towards the Use Of Social Networking Sites Among Adolescents and the Impact on the Family

Emmanuel A. Abimbola, Michael Otedola College of Primary Education, Nigeria

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

Abstract

The study aims to focus on the perception of parents towards the use of social networking sites (SNS) and its impact on the family. The research employed a descriptive survey design and the data of 150 parent and 100 adolescents from tertiary institutions in Lagos state. The instrument used was a questionnaire. Two sets of questionnaire were drawn for adolescents and parents on the use of SNS and were used to test two hypotheses at 0.05 level of significance. The analysis was done using chi-square. The result indicated a significant difference between parental concerns over the use of SNS in tertiary institutions, there was a significant impact of SNS on the family. The finding highlights a prompt need for SNS usage regulation for parents in order to direct and control their adolescents.

iafor
The International Academic Forum
www.iafor.org

Introduction

The 21st century is an era of the globalization of the enabled, empowered and enjoined individual. It is characterized by a dynamic force for individuals to collaborate and compete in a world which is driven by technology and information and operated in a global community, one of which is social networking sites. Social networking sites engage students in online learning communities using technologies familiar to and accepted by their generation (Oradini & Saunders, 2008). Social Networking Sites (SNSs) are one of the latest examples of communications technologies that have been widely-adopted by students. Students are increasingly using new generation technologies, such as social networks, text, messaging, media sharing, blogs, wikis, web 2.0 and other applications, to communicate and collaborate (Pence, 2007; Underwood, 2007). Social media sites offer multiple daily opportunities for connecting with friends, classmates, and people with shared interests.

An adolescent from an educator's perspective is someone who is between the ages of 12-18. Adolescents have intellectual, physical and social characteristics. Some of the social skills includes: modelling bahaviour after that of older students, not necessarily that of parents and other adults, immature bahaviour when social skills lag behind mental and physical maturity, experimenting with ways of talking and acting as part of searching for a social position with peers, exploring questions of sexual identity in visible or invisible ways, feeling intimidated or frightened by the initial middle school experience, liking facts and being interested in popular culture, seeking approval of peers and others with attention-getting behaviours, Engaging in various forms of social media is a routine that research as shown to benefit adolescents.

During the last few years, the number of preadolescents and adolescents using such sites has increased dramatically. According to a recent poll, 22% of adolescents log on to their favourite social media sites more than 10 times a day, and more than half of adolescents log on to a social media sites more than once a day. Seventy-five percent of adolescents now on cell phones, and 25% use them for social media, 54% use them for texting and 24% use them for instant messaging (Gween and Kathleen, 2011). This means that the large part of this generation's social and emotional development is occurring while on the internet and on cell phones. However, the use of social networking sites is not without potential risks and limitations because of their limited capacity for self-regulation and susceptibility to peer pressure. Questions regarding content ownership, privacy, stalking and cyber bullying, and virtual integrity, clique forming, sextual experimentation, sexting, internet addiction, and concurrent sleep deprivation are often issues that require consideration (Cluett, 2010; McCarthy, 2012; Willems & Bateman, 2011; Gween and Kathleen, 2011). In addition, concerns about *social networking sites* as a form of distraction (Wise et al., 2011) and the influence it has on academic performance (Kirschner & Karpinski, 2010) have been raised. Seven major social network categories as stated in (http://socialnetworking.lovetoknow.com/What_Types_of_Social_Networks_Exist) are:

1. Social Connections: Keeping in touch with friends and family members is one of the greatest benefits of social networking. **Examples include:** Facebook, Twitter**,** Google +**,** MySpace **etc.**

2. Multimedia Sharing: A social networking that makes it easy to share video and photography content online. Examples are: YouTube, Flickr, Picasa etc.
3. Professional: Professional social networks are designed to provide opportunities for career-related growth. Some of these types of networks provide a general forum for professionals to connect, while others are focused on specific occupations or interests. A few examples of professional social networks are listed below. Examples include: LinkedIn, Classroom 2.0, Nurse Connect etc.
4. Informational: Informational communities are made up of people seeking answers to everyday problems. For example, when you are thinking about starting a home improvement project or want to learn how to go green at home, you may perform a web search and discover countless blogs, websites, and forums filled with people who are looking for the same kind of information. A few examples include: Super Green Me, HGTV Discussion Forums, do-it-yourself community etc.
5. Educational: Educational networks are where many students go in order to collaborate with other students on academic projects, to conduct research for school, or to interact with professors and teachers via blogs and classroom forums. Educational social networks are becoming extremely popular within the educational system today. Some examples of such educational social networks are: The Student Room, UK-based student community, The Math Forum, ePALS School Blog etc.

6. Hobbies: A few examples of hobby-focused social networking sites include: Oh My Bloom, My Place at Scrapbook.com, Sport Shouting,

7. **Academic:** Academic researchers who want to share their research and review results achieved by colleagues may find academic-specific social networking to be quite valuable. A few of the most popular online communities for academics are: Academia.edu, Connotea Collaborative Research,

Gween and Kathleen (2011) reported that many parents today are good at technology use, feel comfortable and capable with the programs online Venuses that their children and adolescents are using online. Nevertheless, some parents may find it difficult to relate to their digitally savvy adolescents for several reasons. Such parents may lack a basic understanding of these new forms of socialization, which are integral to their adolescents' lives.

They said parents frequently do not have the technical abilities or time needed to keep pace with their adolescents in the ever-changing internet landscape and they often lack a basic understanding that social networking sites are an extension of their adolescents' offline lives. The end result is often a knowledge and technical skill gap between parents and adolescents.

This paper therefore sought to research into parental concerns towards the use of social networking sites among adolescents and the impact on the family.

Research Questions

The following research questions guided the study:

1. Do adolescents in Lagos State make use of SNS?
2. What types of SNS are used by adolescents in Lagos state?
3. What is the frequency of adolescent engagement with each SNS?

4. Do parents have any concern on the use of SNS by adolescents?
5. Does the use of SNS by adolescents have any impact on the family?
6. What remedies can be employed to reduce parental concerns over the use of SNS by adolescents

Hypotheses

Ho_1: Parents' location is not a significant determinant of their concern on the use of social networking sites by adolescents.
Ho_2: The use of SNS among adolescents has no significant impact on the family**.**

Methodology

Research Design
The research employed a descriptive survey research design.

Population
The target population for the study comprised of parents and adolescents in Lagos State.

Sample and Sampling procedure
From the population, one hundred and fifty {150} parents and one hundred adolescents from tertiary institutions and secondary schools respectively, were sampled using simple random sampling.

Research Instrument
The instrument used was a structured questionnaire. The questionnaire is of two types viz-a-vis: parents and students questionnaire. The parents' questionnaire has four sections {demographic variables, parental concerns on the use of SNS by adolescents, the use of SNS among adolescents and impact on the family, and remedies that can be employed to reduce parental concerns over the use of SNS. It was rated in the form strongly agree, agree, disagree, and strongly disagree using the four point likert scale in the range 4, 3, 2, and 1. The student questionnaire on the other hand was divided into section A, B and C. Section A elicited information on the demographic variable of the respondents, section B also elicited information on the types of SNS the adolescents use with a Yes/No option while section C elicited information on the frequency of engagement with each SNS with the options {daily, less than a week, weekly, Less than a month, monthly, and only when a new post has been made}.

Validity and Research of the Instrument
The instrument was face validated by co-lecturers in the department of home-economics and a further content validity was done by experts in the test and measurement department of the College. Also, a pilot study was conducted on twenty {20} adolescents and fifty {50} parents using the test-retest method and a reliability coefficient of 0.74 and 0.81 was obtained respectively and this is suitable for the research.

Administration of the instrument

The instrument was administered to the respondents with the help of two research assistants. Some of the questionnaires were collected on the spot while some are collected later.

Method of Data Analysis

The data collected were analyzed using frequency counts, percentages, and charts. The two hypotheses were tested at 0.05 level of significance using linear regression and Chi-square analysis. The SPSS package version 20 was used for the analysis.

Results

The demographic variables of the respondents were reported, pertinent answers were given to some of the research questions and two hypotheses were tested.

Table1: Socio-demographic characteristics of the Adolescents

Variable	Category	Frequency	Percentage (%)
Gender	Male	46	46.0
	Female	54	54.0
Age range	12-15	56	56.0
	16-18	44	44.0
Course	Arts	27	27.0
	Commercial	47	47.0
	Science	26	26.0
Location	Epe	47	47.0
	Mushin	53	53.0

From table 1 above, 46.0% are male while 54.0% are female, 56.0% are aged between 12 to 15 years, 44.0% are aged between 16-18 years. Also 27.0% are arts students, 47.0% are commercial students, while 26.0% are science students. 47.0 are located in Epe local government while 53.0% are located at Mushin area of Lagos State

Table 2: Socio-demographic characteristics of the Parents

Variable	Category	Frequency	Percentage (%)
Gender	Male	73	48.7
	Female	72	48.0
	Total	145	
CONTENDISS	7-8	54	40.0
	9-10	12	9.0
	11-12	25	18.8
	13-14	22	16.5
	15	20	15.0
	Total	133	
Educational Background	NCE/OND	33	22.0
	B.Sc and Equivalents	65	43.3
	B.Sc and Equivalents	28	18.7
	Ph.D	2	1.3
	Total	128	
Location	MOCPED	77	51.3
	LASPOTECH	73	48.7

In table 2 above, some of the respondents did not fill the questionnaire very well and that accounts to the variation in the total frequency as against 150. Hence, 48.7% are male while 48.0% are female. Majority of the respondents are at the lower cadre {40.0%} awhile 15.0% are at the higher cadre. 43.0% of the respondents have B.sc degree and its equivalents while only 1.2% had a Ph.d certificate. Also 51.3% are aged between 12 to 15 years, 44.0% are aged between 16-18 years. Also 27.0% of the sampled respondents are located at Michael Otedola College of Primary Education {MOCPED} while 48.7% are located at Lagos State Polytechnic {LASPOTECH}.

Answering of Research Questions

Research Questions 1: Do Adolescents in Lagos State make use of social networking sites?

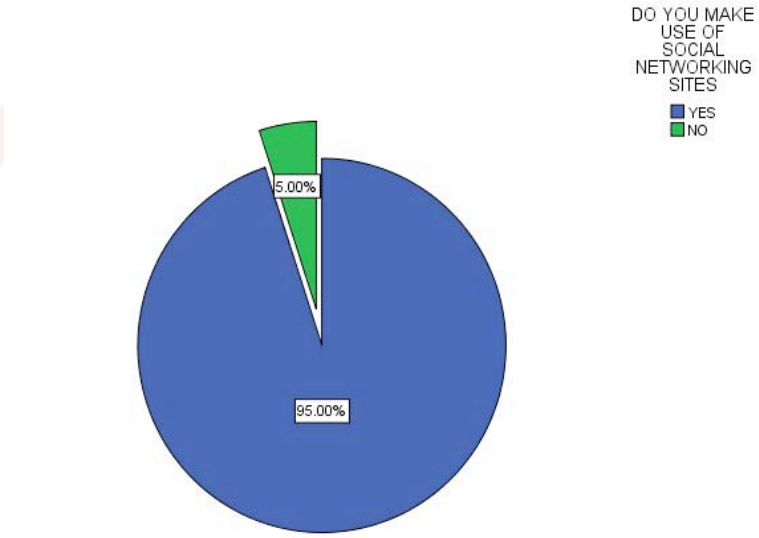

Fig 1: Pie chart on Adolescents use of social networking sites

From the fig 1 above, only 95% of the adolescents make use of social networking sites while 5% did not use it.

Research Questions 2: What types of SNS are used by adolescents in Lagos State?

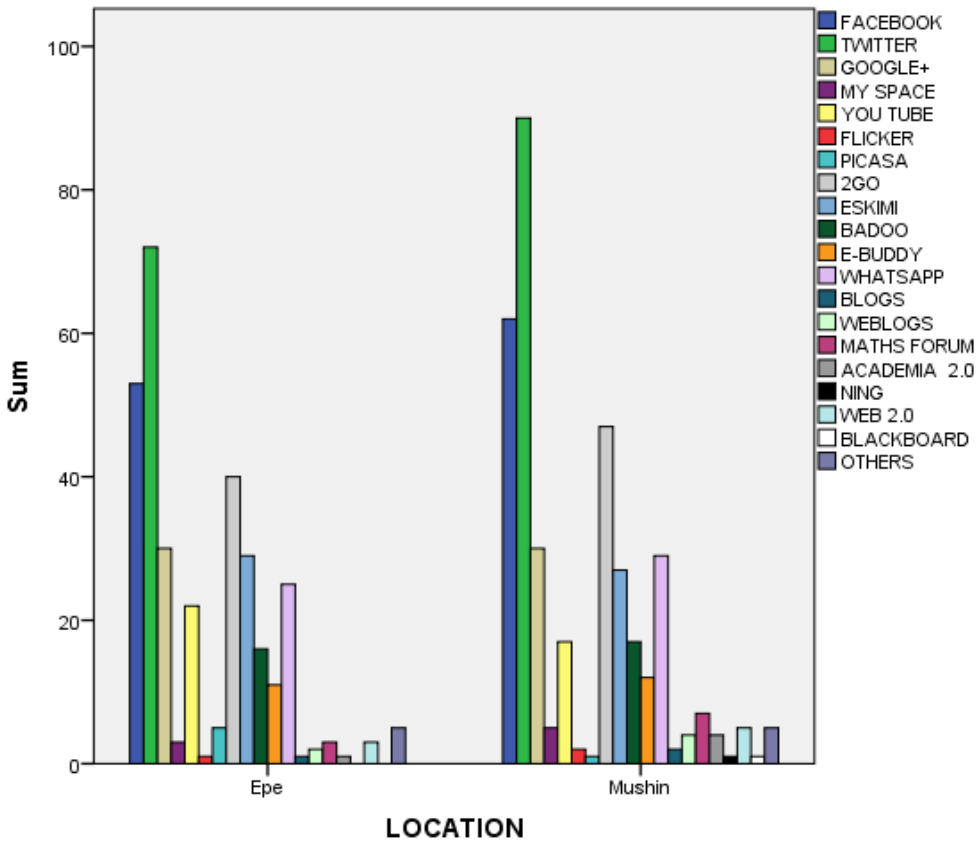

Fig 2: Clustered Bar chart on types of social networking sites used by adolescents in Lagos state

From the bar chart above revealed that the social networking sites the adolescents use mostly are face book, twitter, and 2go at both Epe and Mushin area of Lagos State. Google+, You tube, Eskimi, and Whatsapp are averagely used while My space, flicker, blogs, weblogs, math forum, academia 2.0, Ning, web 2.0 blackboard and other which are not mentioned here are rarely used at both locations.

Research Questions 3: What is the frequency of adolescent engagement with each SNS?

Table 3: Frequency of adolescents' engagement with each SNS?

SNS Types	Daily {%}	Less than a week {%}	Weekly {%}	Less than one month {%}	Monthly {%}	Only when a new post has been made {%}	Total items picked	Missing
Facebook	37 {37.0}	27{27.0}	13{13.0}	3{3.0}	2{2.0}	4{4.0}	86	14
Twitter	10 {10.0}	9 {9.0}	10{10.0}	9 {9.0}	5{5.0}	4{4.0}	40	60
Google+	31{31.0}	13{13.0}	1010{10.0}	1{1.0}	3{3.0}	1{1.0}	59	41

My Space	3{3.0}	4{4.0}	0{0.0}	5{5.0}	2{2.0}	1{1.0}	15	85
You Tube	4{4.0}	15{15.0}	5{5.0}	6{6.0}	4{4.0}	2{2.0}	36	64
Flicker	1{1.0}	0 {0.0}	1{1.0}	0{0.0}	2{2.0}	0{0.0}	4	96
Picasa	3{3.0}	4{4.0}	1{1.0}	4{4.0}	0{0.0}	0{0.0}	12	88
2go	67{67.0}	4{4.0}	4{4.0}	1{1.0}	4{4.0}	3{3.0}	83	17
Eskimi	21{21.0}	16{16.0}	8{8.0}	6{6.0}	2{2.0}	2{2.0}	55	45
Badoo	9{9.0}	13{13.0}	3{3.0}	5{5.0}	3{3.0}	0{0.0}	33	67
Ebuddy	8{8.0}	5{5.0}	6{6.0}	1{1.0}	1{1.0}	1{1.0}	22	78
WhatsApp	26{26.0}	12{12.0}	8{8.0}	5{5.0}	1{1.0}	1{1.0}	53	47
Blogs	1{1.0}	2{2.0}	0{0.0}	0{0.0}	0{0.0}	1{1.0}	4	96
Weblogs	3{3.0}	2{2.0}	4{4.0}	0{0.0}	1{1.0}	1{1.0}	11	89
Maths Forum	10{10.0}	1{1.0}	2{2.0}	1{1.0}	2{2.0}	0{0.0}	16	84
Academia 2.0	4{4.0}	1{1.0}	0{0.0}	1{1.0}	1{1.0}	1{1.0}	8	92
Ning	1{1.0}	2{2.0}	0{0.0}	0{0.0}	0{0.0}	1{1.0}	4	96
Web 2.0	2{2.0}	2{2.0}	1{1.0}	1{1.0}	1{1.0}	1{1.0}	8	92
Blackboard	2{2.0}	0{0.0}	0{0.0}	1{1.0}	1{1.0}	1{1.0}	5	95
Others	0{0.0}	1{1.0}	0{0.0}	0{0.0}	0{0.0}	4{4.0}	5	95

From the table 3 above, the social networking sites the adolescents mostly used daily are 2go{67.0%}, facebook {37%}, google+{31.0%}, WhatsApp{26.0%} and Eskimi{21.0%} while others {Twitter,{10.0%}, Maths Forum{10.0%}, Badoo {9.0%} sparingly used and some are not used daily at all. Also, facebook{27.0%}, Eskimi, 16{16.0}, You tube {15.0%}, Badoo 13.0}, and WhatsApp{12.0} are used less than a week, other social networking sites are either used sparingly or not used at all in less than a week. {13.0%}, {10.0%} and {10.0} of the adolescents uses facebook, twitter and google+ weekly while Eskimi {8.0%}, WathsApp{8.0%} and Ebuddy {8.0%} are also used with a lesser percentage. Only {9.0%}, {6.0%}, {6.0%} of the adolescents uses twitter, You tube and Eskimi less than one month respectively. A lesser percentage of the respondents uses each of the social networking sites monthly and only when a new post has been made.

Research Questions 4: What remedies can be employed to reduce parental concerns over the use of SNS by adolescents

Table 4: Remedies for reducing parental concerns over the use of SNS by adolescents

Statements	**Agreed {%}**	**Disagree {%}**	**Total**
Parents should learn and get familiar with social networking sites	115 {86.47}	18 {13.5}	133
Parents should join their adolescent social network groups to know what they post and their comments	17 {12.32}	121 {90.8}	138
Parents should teach then to think critically before responding to messages or comments made on social networking sites	130 {95.9}	6 {4.51}	136
Parents should model good behavior	132 {100}	0 {0}	132
Parents should encourage the adolescent about what	128	5	133

is and isn't appropriate to post online	{96.24}	{3.76}	
Parents should teach and model social skills and empathy	125 {96.15}	5 {3.85}	130
Parents should know the content of the type of social network sites their child is consuming and watch with them	126 {94.03}	8 {5.97}	134
Parents should discuss content viewed online	102 {78.46}	28 {21.54}	130
Parents should confront the adolescent about inappropriate post to/from friends	102 {72.27}	30 {22.73}	132
Parents should remind them not to post content that could help strangers find them in real world	98 {74.24}	34 {25.76}	132
Parents should set limits on the use of social networking sites per day	106 {80.30}	26 {19.70}	132

From the analysis in table 4 above, many of the parents did not fill some sections of the questionnaire, and that gives the reason for the variation in the total score of each option as against 150. Therefore, the greater percentage {86.47%}, {95.59%}, {100%}, {96.24%}, {96.15%}, {94.03%}, {78.46%}, {72.27%}, {74.24%}, and {80.30%} of the parents agree that the remedies can be employed to reduce parental concerns over the use of social networking sites but {90.98} of the parents disagree that parents should join their adolescents social network groups to know what they post and their comments.

Testing of Null Hypotheses

Ho_1: Parents' location is not a significant determinant on their concern on the use of social networking sites by adolescents.

Table 5: Chi-square table on Parents' location on their concern on the use of social networking sites by adolescents

Statements	Chi-square	df	Asymp. sig
It leads to loss of concentration/time consumption	97.027[a]	3	.000
It increases social interaction	56.182[b]	2	.000
It improves self-control/discipline	18.000[c]	3	.000
Creates distraction	48.519[d]	3	.000
Facilitate better assistance	80.921[e]	3	.000
Ensures adequate relaxation/recreation	65.048[e]	3	.000
Communication	107.438[f]	3	.000
Not relevant to academic work	38.182[g]	3	.000
News/knowledge/update	85.492[e]	3	.000
Awareness of others experience with cyber bullying threatening	108.061[g]	3	.000
Online dating and relationships	68.061[g]	3	.000
Decreased face-to-face communication	89.515[g]	3	.000
Personal experience with cyber bullying	112.936	3	.000
Less time on other activities including academ2.827ic	85.750	3	.000
Less time reading	114.063	3	.000

Sharing of private information	89.563	3	.000
A potential for greater anxiety	31.778	3	.000
They are always influenced by negative interactions	77.188	3	.000

The analysis of table 5 above reveals that all the statements are significant. Hence hypothesis one is rejected. This implies that parent's location is a significant determinant on their concern on the use of social networking sites by adolescents.

Ho_2: The use of SNS among adolescents has no significant impact on the family**.**

Table 6: Chi-square analysis on the use of SNS among adolescents has impact on the family

Test Statistics

	Reduced interaction with family members	Increased exposure to violence which result in aggressive behavior, thought or feeling	poor attitude towards women	An increase in rape myth acceptance	Increase in violence against women	Withdrawal from other areas of life due to the time spent on social networking site	Escape from real world interactions	Restlessness and irritability when not online
Chi-Square	29.692[a]	2.278[b]	9.394[c]	7.576[c]	13.625[d]	94.174[e]	9.810[f]	44.182[c]
df	3	3	3	3	3	3	3	3
Asymp. Sig.	.000	.517	.024	.056	.003	.000	.020	.000

The analysis of table 6 shows that majority of the variables are significant. Hence hypothesis two is therefore rejected. This shows that the use of social networking sites among adolescents has impact on the family.

Discussion of Findings

The paper investigated parental concerns towards the use of social networking sites among adolescents and the impact on the family. Two hypotheses were tested at 0.05 level of significance. It was therefore revealed in hypothesis one that parents' location is a significant determinant on their concern on the use of social networking sites by the adolescents. The meaning of this is that the location of parents in Lagos state (Epe and Mushin) determines the level of concern on the adolescents use of social network sites. Since the rate of use of these SNS is high among the adolescents in the urban area in Lagos State (Mushin) than in Epe, parents in the urban area will be more concerned about their adolescents use of SNS.

Hypothesis two also shows that the use of SNS has impact on the family. From the result of the hypothesis the variable that shows significant difference are (Reduced interaction with family members, poor attitude towards women, Increase in violence against women, Withdrawal from other areas of life due to the time spent on social networking site, escape from real world interactions, Restlessness and irritability when not online. This result is in support of (Cluett, 2010; McCarthy, 2012; Willems

& Bateman, 2011; Gween and Kathleen, 2011). The said use of social networking sites is not without potential risks and limitations because of their limited capacity for self-regulation and susceptibility to peer pressure. Questions regarding content ownership, privacy, stalking and cyberbullying, and virtual integrity, clique forming, sextual experimentation, sexting, internet addiction, and concurrent sleep deprivation are often issues that require consideration. In addition, Wise et al., (2011), Kirschner & Karpinski, (2010) views are in support of the result.

Conclusion and Recommendation

From the results obtained it was concluded that

1. Parents' location is a significant determinant on their concern on the use of social networking sites by the adolescents.
2. The use of SNS has impact on the family.

It is therefore recommended that:

1. Parents evaluate the sites on which their adolescents wishes to participate to be sure that the site is appropriate
2. There should be an enlightenment campaign where parents will be advised to talk to their adolescents about the use of social networking sites and the specific issues that today's adolescents face.
3. Parents should try to become educated about many technologies their adolescents are using.
4. Families need to have online-use plan that involves regular family meetings in order to discuss online topics and checks of privacy settings and online profiles for inappropriate posts.

References

Cluett, L. (2010). Online social networking for outreach, engagement and community: The UWA Students' *Facebook* page. In *Educating for sustainability. Proceedings of the 19th Annual Teaching Learning Forum,* 28-29 January 2010, Perth: Edith Cowan University. http://otl.curtin.edu.au/tlf/tlf2010/refereed/cluett.htmlKirschner, P. A., & Karpinski, A. C. (2010). Facebook and academic performance. *Computers in Human Behavior, 26*(6), 1237-1245.

Gween, S.O and Kathleen, C (2011). The Impact of Social Media on Children, Adolescents and Families. *An Online Pediatrics publication*. Vol. 127 No 4 April 1, 2011. Retrieved on 20th May, 2014 at pediatricsaapublications.org

McCarthy, J. (2012). International design collaboration and mentoring for tertiary students through *Facebook*. *Australasian Journal of Educational Technology,* 28(5), 755-775. http://www.ascilite.org.au/ajet/ajet28/mccarthy.html

Oradini, F. & Saunders, G. (2008). The use of social networking by students and staff in higher education. Paper presented at the iLearning Forum, Paris. http://www.eife-l.org/publications/proceedings/ilf08/contributions/improving-quality-of-learning-with-technologies/Oradini_Saunders.pdf

Pence, H. E. (2007). Preparing for the real web generation. *Journal of Educational Technology Systems*,

Underwood, J. D. M. (2007). Rethinking the digital divide: impacts on student-tutor relationships. *European Journal of Education*, *42*(2), 213-222.

Wise, L. Z., Skues, J. & Williams, B. (2011). *Facebook* in higher education promotes social but not academic engagement. In *Changing demands, changing directions. Proceedings ascilite Hobart 2011.* http://www.ascilite.org.au/conferences/hobart11/downloads/papers/Wise-full.pdf

Willems, J. & Bateman, D. (2011). The potentials and pitfalls of social networking sites such as *Facebook* in higher education contexts. In *Changing demands, changing directions. Proceedings ascilite Hobart 2011.* http://www.ascilite.org.au/conferences/hobart11/downloads/papers/Willems-poster.pdf *35*(3), 347−356.

http://socialnetworking.lovetoknow.com/What_Types_of_Social_Networks_Exist

Case Study: The use of Wikis as a Teaching-Learning Tool in Science Subjects

Ascensión Hernández Encinas, Cristina Prieto Calvo, Araceli Queiruga Dios,
Concepción Rodríguez Puebla, University of Salamanca, Spain.

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

Abstract
In recent years the university education programs established initiatives moved away from a teaching-as-instruction system towards a student-center system. This reform is focused on what the students need to learn and led us to modify the usual teaching tools to get advantages from the technologies. Some professors at the University of Salamanca (Spain) from different science departments and diverse subjects have shared teaching experiences together to develop methodologies, and resources for improving our teaching activities. The Wiki resource has been one of the experiences developed. Here we present results about the effectively of this activity in different matters of Physics, Climate, Mathematics, and Cryptography in Bachelor's Degrees as Biotechnology, Agrifood Engineering, Industrial Engineering, Computer Engineering in Information Technologies, and Physics. Furthermore, we show details on the assessment process by using Wikis, and provide comparisons of the methodology applied to different courses.

One of the objectives regarding the Wikis is to approach research in the learning process and engage students in scientific debate of publications in journals and books. A first evaluation of the Wiki indicates that it is an effective teaching support for discussion group work, group presentations, and to encourage in science learning.

Keywords: cooperative learning, wiki, skills and competences, Moodle

Introduction

The educational potential of collaborative work has been widely recognized in recent years and included at university levels with the new Bachelor's Degrees. Many tools have been developed to achieve overall objectives. At the same time, generic skills like constructive criticism, dissemination of the results, students' autonomous workload, information-seeking, and sharing of knowledge with other students, are achieved.

One of the skills included in the degrees course specifications is the group work. In qualified jobs several tasks have increased difficulty making their individual resolution impossible. It is for this reason that companies claim, now more than ever, the transversal competence: teamwork. Among the utilities needed to work in groups, Wikis allow coordinated action by sharing knowledge and files within the group (Adell, 2007). A Wiki is a software tool for communication, cooperation, and collaboration. Using Wiki resource, web pages are created collaboratively (González Pareja, 2007). With the use of Wikis we tried to involve students in their learning processes, giving them a chance to develop ideas and disseminate them to their classmates. Wikis also keep a history of changes and record the one who made the change, which facilitates the assessment of individual tasks.

During the last years, the participants of this project have been incorporating innovation activities and collaborative work in the field of science subjects. The massive use of mobile devices that allow easily access to the Internet has encouraged us to include Wikis as tools for group work. It is proven that students find very useful the use of technology in their learning process (Cengiz & Demirtas, 2005; Ramanaua, 2009), particularly this ICT-based tool has an enormous potential for collaborative work (González Pareja, 2006). We believe that these activities will enable cooperation in larger groups, incorporating a richer dynamic views and the development of more comprehensive documents.

This paper is organized as follows: in Section 2, we will describe the Wikis as collaborative and cooperative tools. In Section 3, the methodology use during Wikis development will be detailed. Finally, in Section 4, we will show some conclusions and results.

The Wiki as a collaborative and cooperative tool

As was suggested by Thousand et al. (2002), three ways of interaction between students can be considered: the competition to see who is "best", the individual work ignoring other students, and the cooperative work as part of a group.

Teamwork is of great importance in the European Higher Education System as a methodology that facilitates the acquisition of skills through active and participative work. Some degree curricula have been designed around learning outcomes rather than content (Cole, 2009). Furthermore teamwork is currently one of the most valued skills in professional environments.

Students use to consider each subject separately, they do not usually see the relation between mathematics modules and mechanics, or between physics contents and electrical installations. In order to effectively verify the integration of different subjects, we propose some collaborative activities in which communicating tools play an important role. Wikis allow the acquisition of generic and transversal skills of organization in a collaborative work. Students need to manage large amount of data, the great majority comes from the Internet, so they should select, analyze, process, interpreting, and structure the information they will need.

Activities that combine ICT and new teaching methodologies facilitate learning and allow the development of organizational skills, decision making, teamwork and application of knowledge in practice (Ramanau and Geng, 2009). Also, they represent a considerable improvement in the student motivation.

Wikis can be used in learning as an information resource, a collaboration tool (Parker and Chao, 2007), or a tool for building e-learning contents (see some characteristics included in Figure 1).

Figure 1: Some different uses of Wikis

Methodology

Although there are many programs that allow the development of Wikis, in this work we have used the activity with the same name (Wiki) that appears in the Studium online platform (Moodle-based virtual learning environment used at the University of Salamanca). The same configuration is similar to other activities of the virtual platform, providing assistance on its operation in the system and also tutorials that could be found online (http://docs.moodle.org/).

One of the most important decisions when setting a Wiki is the possibility of collaboration between all students in the class. Another option would be to have different Wikis for different groups. The option chosen depends on the size of the course and the objectives pursued with the Wiki. We have used the first option in the Physics course in Biotechnology Degree. In the case of Climate Physics and

Climatology subjects both options were combined. In the course of Cryptography in Computer Engineering in Information Technologies Degree, the whole group option was used. The goal to achieve is the development of an online document where the whole group collaborates, and in which all members have the same opportunity to make changes. The first page of the Wiki provides the starting point for successive contributions. It highlights certain concepts or links for which an extension is suggested. When users pass with the mouse over some words, these change the icon indicating the possibility that this term could become the title of a new page that will enrich the Wiki. It is possible to update the Wiki doing changes in various pages, and also to maintain an historical copy with all versions.

Since the beginning of the course, students know the weight of their contributions to the Wiki in their final mark (Ng, 2013). It was not easy to establish the quality of a contribution. We thought about the advantages of developing rubrics for assessing this type of activity. Interesting rubric for a Wiki could be the one proposed by Wever et al. (2011), which assesses four aspects: (1) the contribution (contributions are relevant with information and oriented toward the goal to achieve); (2) discussion (if students formulate opinions with arguments and they are justified); (3) sources (the student creates relevant material to the Wiki); and (4) social behavior (student work, interact, discuss, comment, and help others).

In the case of Physics course in Biotechnology Degree, Wikis are used for discussion and as an extension of scientific articles related to the curriculum (Prieto et al., 2013). Emerging issues are chosen to attract the students: Particle physics in life sciences, laser in biology or determination of the *c* value using a microwave. The teacher developed the first page, in which the main article with the topic under study appeared as an annex, and it established basic concepts, methods and instruments in a few lines. There is also the possibility that the student did a summary article in colloquial but proper terms. Students are instructed in the sense that every scientific paper must refer to quality sources (bibliography). As most of Moodle activities, the time that the Wiki is accessible can be established. In this case, the Wiki remains open to the student's feedback from the first time the item is considered to the end of the semester.

In the same way, the subject of Cryptography for Computer Engineering in Information Technologies used Wikis: Issues related to the history and evolution of the cryptography, of the most famous cryptosystems and its application, also some machines built to keep security in transmissions.

The objective of the different Wikis that have been developed in Climatology subject is to introduce students in climate research tasks. The work consists on analyzing climatic data. Thus, it is intended that the students check the physical processes that relate the different climatic variables. In this case, the course is divided into four groups. Each group discusses a problem and incorporates all the information in the Wiki, so it could be analyzed, compared and discussed by all students. An example of one of the Climatology topics is the study of thermal indices and global warming in relation to agricultural production and phenomenological phases. The design of the Wiki is very important to maintain uniformity in the final document. It is also important to provide adequate guidance, and a scheme to approach to participation is the most interesting aspects of the syllabus. Figure 2 shows a presentation from one of these groups from Climatology course.

Figure 2: Presentation of the group work during class time.

Conclusions and results

When evaluating the results of the proposed activity, we found aspects that highlight the potential of Wikis as a tool that facilitates the collaboration. We also found areas where improvements were needed.

The participation of students in the subjects of Climatology & Cryptography was majority; however, it was around 50% in Biotechnology. One explanation for these differences is the different methodologies used by different teachers, and the purpose behind the Wiki (its goal inside the whole subject).

We believe that some Moodle technical aspects of the Wiki activity need to be improve to facilitate collaboration and presentation of work. For example, in many cases difficulties were related to the tool itself, since the system did not allow the addition of new pages and they should be included as annexes. It seems that the problem is related to the browser. Anyway, it was a limitation. There were also problems to include images, which generated non-attractive documents. We hope that these technical problems will be solved with new versions of Moodle.

The collaboration of students often limited to make contributions that expand the information on the main page. Therefore, the new page is not linked to the old pages. At this point a proactive activity by the teacher was fundamental.

Regarding the most commonly used source of documentation that students used, it was Wikipedia. Unfortunately, students do not dare to correct contributions made by their peers. This Wiki's potential for constructive criticism was missed. The reason is probably the lack of critical spirit or the lack of a common idea about the final result.
The results of the use of Wikis in the subjects of Climatology are quite preliminary because the experience takes place in the semester in progress, but we hope the effectiveness of the methodology because students are motivated to develop tasks to build Wikis.

The results of the Wikis experience could be compared with the results on the use of discussion forums. Certainly, these are more dynamic in terms of specific contributions, but the general result is not a unique document, but rather brainstorms on various topics. Perhaps they could be seen as complementary activities:

establishing a forum discussion on the characteristics of the document that the group wants to develop and finally Wiki document that reflects the results.

Our preliminary results on the use of Wikis have demonstrated the potential of the tool for the development of a joint document that involves more students and includes diverse viewpoints. This activity develops transversal competences, like innovation and collaboration among students. We have noticed that to ensure the achievement of the final goals it is necessary that teachers follow-up the progress of the Wiki, also having a dynamic role in the activity. It would be desirable to combine the Wiki with a forum for discussion of the objectives pursued. We also believe that we should develop assessment items as rubrics to assess the results of this activity.

So, to summarize the conclusions:

- A Wiki helps to develop the creativity, the engagement, the interpersonal and communication skills. Moreover, a Wiki also improves writing, and builds connections between old and new knowledge.
- Wikis are a gateway for students to acquire and build knowledge.
- It allows students to take ownership and builds trust between all members involved in the Wiki (Schweder & Wissick, 2009). It is an exceptional collaboration tool.
- Wikis also create an environment where students are responsible for their own learning.
- Wikis prepare students for real life applications. Today's students must be prepared to work with others. A Wiki is a great way to incorporate these skills in the classroom.
- One of the advantages of Wikis is that students develop transversal skills and also specific skills.
- Students learn to work in groups and answer questions to peers. They appreciate the efforts of the other members of the group.
- Being critical of other groups. Improved capacity for reflection and analysis, and improve their learning ability.

References

Adell, J. (2007). *Wikis en educación*. J. Cabero & J. Barroso (Eds.), 323-333.

Cengiz Gulek, J., & Demirtas, H. (2005). Learning with technology: the impact of laptop use on student achievement. *The journal of technology, learning and assessment*, 3(2).

Cole, M. (2009). Using Wiki technology to support student engagement: Lessons from the trenches. *Computers & Education*, 52(1), 141–146.

González Pareja, A. et al. (2006). Experiencia del uso conjunto de WebQuests y Wikis en una asignatura universitaria no presencial. XV Jornadas de ASEPUMA y III Encuentro Internacional.

González Pareja, A. et al. (2007). Uso de Wikis para la realización de trabajos colaborativo en el aula. XIV Jornadas de ASEPUMA y II Encuentro Internacional

Ng, E.M. (2014). "Using a mixed research method to evaluate the effectiveness of formative assessment in supporting student teachers' wiki authoring." *Computers & Education*, 73, 141-148.

Parker, K., and Chao, J. (2007). Wiki as a teaching tool. *Interdisciplinary Journal of e-learning and Learning Objects*, 3(1), 57–72.

Prieto Calvo, C., Rodríguez Puebla, C., Hernández Encinas, A., and Queiruga Dios, A. Experiencia sobre el uso de wikis en materias de ciencias. *Jornadas de Innovación Educativa*, Universidad de Salamanca, Salamanca, Spain.

Ramanau, R., & Geng, F. (2009). Researching the use of Wiki's to facilitate group work. *Procedia-Social and Behavioral Sciences*, 1(1), 2620-2626.

Thousand, J. S., Villa, R. A., & Nevin, A. I. (2002). *Creativity and collaborative learning: The practical guide to empowering students, teachers, and families*. Paul H. Brookes Publishing Co., PO Box 10624, Baltimore, MD 21285-0624.

Wever, B.D., Van Keer, H., Schellens, T., Valcke, M. (2011), Assessing collaboration in a Wiki: The reliability of university students' peer assessment, *Internet and Higher Education* 14, 201–206.

iafor

Computer-Mediated Lessons for the Development of Knowledge of Rehabilitation for Patient Undergone Laminectomy for Nursing Students in Thailand

Jinpitcha Mamom, Thammasat University, Thailand

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

Abstract

The purposes of this study were to develop and test computer-mediated lesson efficiency in relation to laminectomy knowledge for nursing students. The investigator developed the Computer-mediated lessons utilizing 7 steps: (1) preparation; (2) instruction design, based on the concept of the interaction between the learner and the lesson; (3) development of a flowchart lesson; 4) storyboard creation;(5) program lesson development, using Adobe Captivate version 4.0, including tutorial, simulation, and test formats; (6) supporting materials production; and (7) evaluation and revision. After that, it was tried out by individuals and groups of nursing students. The contents of the Computer-mediated lessons were composed of principle of rehabilitation and a video of rehabilitation for patient undergone laminectomy. After that, efficiency was used with 30 third-year nursing students from the Faculty of Nursing, Thammasat University. The process/outcome efficiency was 85/87, which achieved 80/80 efficiency. Subjects rated the Computer-mediated lessons as good and very good regarding the information, presentation, applicability, and instruction. This result is suggested that Computer-mediated lessons can reduce learning time, can be accessed at any time, and are cost-effective. Computer-mediated lessons are also regarded as one of the major functions of the instructor to cause the development of teaching in Thailand, a developing country that is about to step into the Asian Economic Community (AEC).

iafor
The International Academic Forum
www.iafor.org

Introduction and Background

Education policy of the country in 2009, with guidelines on teaching and learning by providing students were the most significant person and considered that all students can learn and develop themselves. Teaching process must encourage students to develop their knowledge of nature and full potential. Therefore, lecturers should provide a learning environment and educational media and technology related to educational facilities for the students to learn and encourages critical thinking. Providing other educational resources are used to develop the students' knowledge increased to achieve the objectives and goals of the course. The creation classroom environment and educational technology, will help promote self-learning beyond learning in the classroom can help students understand the lessons of the rise and lead to the most accurate and efficient.

The nursing education system faces challenges in preparing students to live and work in an information, communication and technology driven world, which is characterized by constant innovations and revolutionary changes. The digital revolution has brought about transformation in the way people communicate, gain access to and process information. Digital technologies are revolutionizing the manner in which education is provided. It enables nurse educators to utilize information communication technologies in nursing education to provide learning experiences that support students' optimal learning in spite of differences in learning styles [1]. Nursing Education is the process of improving the quality of nursing education to nursing students with the knowledge and skills to be a nurse quality. Education to develop learners need to focus on using learner-centered teaching-learning process and emphasis on practice in real situations to achieve learning to be utilized to the maximum. The development aims to develop students' critical thinking skills, problem solving ability and self-learning by using appropriate technology and full potential [2]. Therefore, teachers should create learning materials to help students achieve learning to help students to learn by practice in real situations. Teaching materials will help to achieve the learning objectives and goals of nursing education programs. Education today is considered the medium of instruction is a priority to help the teaching process with good quality and performance for media arouse the interest of learners, participate on learning helps students understand clearly, remember faster and remember them for the students to learn faster in time is limited [2], so that the study was effectively are therefore required. The development process of teaching and learning at all times. Computer plays an important role in different fields of Education. Nowadays, government provides good Infrastructural facilities like faculty of nursing, Thammasat University to promote education-technology based learning and with the effort of teachers, teaching learning process makes effective and interesting. Using modern computers are rapidly growing. Computer-Mediated Lesson (CML.) has been important role in the field of management education because CML as a high instructional technology for teaching using computers as aids to present learning content to the learner. CML represent knowledge content in text, images file, graphics, charts, graphs, animations, video file and audio file that aims to teach similar content knowledge in classrooms [2]. CML is the interaction between the learner and the computer, and a reinforcement learner immediately [3] make the learning fun never bothered studies have found that most students were satisfied with the CML offers that help support learning, fun, colorful images in particular are invited to follow exercises to practice, remember to make students understand the

theory more knowledge .In addition, computer-assisted instruction is a teaching that helps students learn to meet their own skill level and needs. Previous Studies have found that students who were taught by teachers with computer-aided instruction score higher knowledge than students who were taught by teachers only [3]. Therefore, the use of CML may be help students learn and experience more efficient patient care.

Spinal surgery as a way to treat patients with disorders of the spine such as herniated disc (HNP), scroll, degeneration of the spine, the sliding motion of the spine and spinal narrower [4-6], the patient with back pain, some cases with symptoms radiating to the leg, calf and heel and may have muscle weakness in conjunction with, some case may have been crushed nerve, spine, particularly the small of the patient cannot control the excretion of urine and feces. These causes are indications that doctors consider treatment by surgery [4-6]. Currently, the disease is spinal increasing in Thai people and maintaining the most efficient method is spinal surgery. Spine surgery is minimally important to the life, career and image of the patient because it is major surgery that requires a long period of time and the patient needs to be sedated throughout the body, thus affecting both physical, mental, emotional, social, and economic [4-6]. By the impact of the body including spine surgery, complications from receiving anesthesia throughout the body affects the respiratory system, such as the lung tissue of lung ischemia is not fully expanded, the exchange. Gas in the lower body cause lung collapse [4] may be due to blood loss from surgery, which can affect the cardiovascular system. The amount of blood that flows back to the heart decreases, low blood pressure, rapid pulse, breathing fast and deep, skin cold, body temperature decreased tissue oxygen deficiency [4]. In postoperative patients must bed rest, restricted movement, routine down can cause complications from the bed up as pressure ulcers, infections of urinary tract, flatulence, constipation and atelectasis. It may be cause to nerve damage neighbouring increasing irritation or injury to the spinal cord and nerve roots, causing bleeding and a blood clot pressing on the spinal cord. The impact of psychological and emotional after spinal surgery that will cause the patient stress and suffering from pain, fear cannot return to your career and uncertainty about the illness and treatment have been sent that results in patients with mood changes and behavioural expressions such as restlessness, excitement, fear, and depression. It also affects the society is made to perform the role of family and social change, cannot serve as head of the family, the family roles, cannot be held responsible for it. normal and everyday lifestyle changes, there must be someone who will help in activities of daily living and affect the image of the patient, the patient have body movements using a back support and walk using a walker. It can also affect the economic condition of the patient, the patient must lack the income, and the patient and family are responsible for various costs higher. So, to prevent the impact of potential patients and their families need to be prepared before going home only to get knowledge about the disease and treatment received, which prepares you both physically and psychological. From the study of the needs of patients who have undergone surgery found that patients who underwent surgery with the information requirements such as surgery, the purpose of the surgery, the pros and cons of surgery, complications may occur and correct behaviour after surgery. Therefore, the most important method to prevent the complications one is the use of discharge planning by multidisciplinary care team especially nurses who care for patients 24 hours and nursing students who are involved in patient care should be more knowledge, understanding, as well as recognizing the importance of rehabilitation

after surgery to strength in a short time and without complications. Experience of the researcher in the care of patients who received spinal surgery patients with complications arising after surgery, particularly pressure ulcers, muscle atrophy , the patient must lie admitted to the hospital, high cost of treatment without any benefit. Our objective was to study the development of computer assisted instruction on spinal surgery for nursing students to help students achieve a better understanding and ability to apply knowledge to apply in practice and can advise on rehabilitation in patients and their families , which will effectively guide the teaching and learning in practice anyway.

Conceptual Framework.

The development of Computer-Mediated Lesson (CML.) based on concepts of Alessi & Trollip (1991) [7] aims to use as learning tools for the third-year nursing students to achieve the learning principles of principle and method of rehabilitation for patient undergoing laminectomy to nursing students by taking into account the individual differences, the students can learn based on their own needs and dialog and interaction with the computer immediately. Computer has been prepared in the form of media, including text, images, animations, sounds and colours. Computer has been prepared in the form of media, including text, images, animations, sounds and colours. Process of interaction between students and the lessons are an important part of learning with CML and provide immediate feedback to reinforce learning and increase student morale happy. Students do not feel pressured and fun to use CML, especially doing the quiz provide increased students knowledge and processes to explain the reasons of the answers in the form of sounds and texts that make students happy and willing to learn. There is also the scenario presented by the students to review the images, video content to understand more. Students can practice the test and review the content frequently and repeat as needed until satisfied with no time limits on learning. The opportunity to practice or review frequently to help nursing students can use to practice nursing in particular, patients who received spinal surgery in adults and elderly nursing courses effectively. In this CML content consist of principles, practices and methods of rehabilitation after spinal surgery to provide nursing students' knowledge to educate and advice on the correct practices rehabilitation after spinal surgery is increasing.

Research objectives

1. Development of Computer-Mediated Lesson in title principle and method of Rehabilitation for patient undergone laminectomy for nursing students.
2. Evaluate the effectiveness of Computer-Mediated Lesson that comparison between the knowledge points of the sample before and after learning by Computer-Mediated Lesson.

Hypothesis

1. Computer-Mediated Lesson entitles principle and method of rehabilitation for patient undergone laminectomy performing above the standard 80/80.
2. Posttest knowledge score of the subjects with Computer-Mediated Lesson entitle principle and method of rehabilitation for patient undergone laminectomy is higher than previous enrolled

Definition

Computer-Mediated Lesson (CML.) refers to computer assisted instruction, multimedia presentation formats include text, images, graphics, animation, sounds, movies that can interact to the students appropriately. [8] In addition, CML embraces a wide range of ICT applications and approaches to teaching and learning foreign languages. In addition to CML as a form of computer-based learning which carries two important features: individualized learning and bidirectional learning. This is a form of student-centred learning materials, which promote self directed learning; moreover, it is an interactive way of teaching that helps learners achieves the goals of learning, and the ability to learn on their own. And researches have been shown that using the computer is efficient on education. People use technology because technology can do certain necessary or desirable tasks more efficiently or effectively than people. The principles and factors of education for applying technology into education are as follows:

1. Motivation
   (1) Attract students' attention
   (2) Enhance the perception control of students
   (3) Encourage students to participate in activities
2. The special function of teaching
   (1) Help students to find problems and solutions
   (2) To trace the students performance of learning
   (3) Help students to connect and get information and educational resources
3. Help new teaching strategies
   (1) Cooperative learning
   (2) Shared intelligence and distributed intelligence
   (3) The solution to problem
4. Enhance teachers' productivity
   (1) Deal with heavy burden
   (2) Save time to do many designs of curriculum
   (Roblyer, 2003)[10]

Applying computer technology makes teachers have rich productivity, teaching effect, and change students learning styles, which can make the relationship of interaction and connection between teachers and students closely. So more and more educational researchers emphasize the issue of integrating technology into teaching.

Target group

The target group was a class of 37 the third-year nursing students in the first semester of the 2010 academic year at Faculty of Nursing, Thammasat University,Thailand. All of them studied in the course NS 391 (Practicum in Nursing Care of Adults and the Aged I).

Methods

This Development Research was to develop a Computer-Mediated Lesson in title principle and method of rehabilitation for patient undergone laminectomy for nursing students. The test 3 times is one single person, group of 6 people and the field of 30.

Research instruments

The instruction and data collection instruments were constructed as follows.

1. Instructional instruments

Instructional instruments were divided into two categories (1) the lesson plans based on CML and (2) CML materials selected from the Adobe Captivate 4.0 program.

1) Lesson plans: The lesson plans were divided into five sections; spine surgery, laminectomy indications, principles, practices, accurate and rehabilitation after surgery.
2) CML materials: CML entitle principle and method of rehabilitation for patient undergone laminectomy for the third year nursing students generated by Adobe Captivate 4.0 program with the following 7 steps including:
   (1) Research data and content analysis: the material used in this study consists of the following content knowledge, spine surgery, and indication for surgery, principles and practice correct rehabilitation after spinal surgery. Researched how to build a computer-assisted instruction, content analysis, set objectives, learning activities, the test, to measure and collect / analyze content knowledge appropriate to the learning objectives.
   (2) Development of Computer-Mediated Lesson.
   (3) Import content from content analysis knowledge to write about the activities carried out, design template.
   (4) Creating lesson objectives by bringing content into the lessons as a unit test using standard SCORM.
   (5) Structure Determination presentation sequence by sorting the content as intended.
   (6) The Computer-Mediated Lesson is created successfully performed to determine the efficiency of the CML by bringing to trial the next step.

2. Data collection instruments:

Questionnaire measuring knowledge consist of the questions about the principles of rehabilitation after spinal surgery were evaluated by 3 experts consisting of orthopedic doctors who exported in spine surgery procedure and lecturer specialized in teaching computer media and nursing lecturer. Following objective criteria scoring is the "+1" on some tests that directly measure learning objectives to " 0" when not sure that the test is consistent with the purpose and " -1" on some items not directly. measurable learning objectives And calculate the index of the corresponding entry purposes (IOC) , which is the index of the corresponding entry purposes (IOC) of this query is 0.8 to 1.00 .The IOC must be between 0.80-1.00, it can be considered a good test. After that, brought questionnaire to determine the reliability of the test using the formula KR20 and the index of difficulty (P) and the Discrimination Index (r) by 10 the fourth year students have been studying in this lesson. Criteria for determining the value of p and r by choosing a particular benchmark test in which p values ranged from 0.20 to 0.80 and the 0.20 r over 10 questions. This quationare showed that knowledge about rehabilitation after spinal surgery with confidence KR 20 was .70 average difficulty indexes (p) 0.47 and the average discrimination index (r) 0.64.

Ethical Considerations

Ethical approval was obtained from the Research and Ethics Committee of Faculty of Nursing, Thammasat University. Verbal permission from the researcher in charge of the third year respondents was obtained. Voluntary, informed consent was obtained from each respondent. Verbal information was given to the respondents regarding the purpose of the study and the importance of their participation. This information was also indicated in the cover letter accompanying each questionnaire. The respondents were assured that anonymity and confidentiality would be maintained. No personal details of the respondents were written on the questionnaire.

Procedure

Phase 1 trial individual : The researcher used the Computer-Mediated Lesson to test with 1 the third-year nursing student by the student sit at the computer then the researcher explained the process and how the teaching of the CML to the learner. After that, Samples do the measurement to measure the level of knowledge that appears in the CML in 10 items. After that, the students study the following content to the end. Then they do the measurement to measure the level of knowledge that appears in the CML in 10 items similarly. After that, the researcher used the scores from the two tests times for evaluated the effectiveness of CML (E1/E2) (E1 refers to the efficiency of processes, E2 refers to the effectiveness of the results.), which in the first Test, the effectiveness of CML is the 70/70. There is also a suggestion from the samples taken were analyzed for the various defects to further improvement.

Phase 2 trials in small groups, the researcher used the CML to evaluate in 1 the third-year nursing student by the student sit at the computer then the researcher explained the process and how the teaching of the CML to the learner. After that, Samples do the measurement to measure the level of knowledge that appears in the CML in 10 items. After that, the students study the following content to the end. Then they do the measurement to measure the level of knowledge that appears in the CML in 10 items similarly. After that, the researcher used the scores from the two tests times for evaluated the effectiveness of CML (E1/E2) (E1 refers to the efficiency of processes, E2 refers to the effectiveness of the results.), which in the first Test, the effectiveness of CML is the 80/80. There is also a suggestion from the samples taken were analyzed for the various defects to further improvement.

Phase 3 field trials, the researcher used this created CML with 30 the third-year nursing student by the student sit at the computer then the researcher explained the process and how the teaching of the CML to the learner. After that, Samples do the measurement to measure the level of knowledge that appears in the CML in 10 items. After that, the students study the following content to the end. Then they do the measurement to measure the level of knowledge that appears in the CML in 10 items similarly.

Instruments used in data collection consists of a quiz about rehabilitation after laminectomy procedure is a question about spine surgery (laminectomy), indication for surgery, how to rehabilitation after spinal surgery, 10 questions, which the multiple-choice. Respondents were given 1 point and 0 points for wrong answers.

Research Findings

This development Computer-Mediated Lesson entitles principle and method of rehabilitation for patient undergoing laminectomy for nursing students consist of four main topics including: spine surgery, surgical indications, principles, practices, accurate and rehabilitation after surgery. Lessons are two forms consist of content which presents content knowledge as text, a simulation, image, video shows the steps to perform daily activities and rehabilitation was needed to help the students understand and exercises that include pre-test and post-test. The tests with a set of questions that sent the explanation of the correct answer, give feedback and reinforcement encourages the students to greater understanding. In addition, Students can choose classes according to their own needs and the learner can return to the main menu without having to wait to finish the lesson, then, can be traced back to the content is still not understood. This Computer-Mediated Lesson divided into 42 frame by frame content development, instructional design based on the concept of Alessi & Trollip [7] in 7 steps. The screen design to deliver content with the screen elements, use of graphics, video, video, sounds, colors and characters associated with the content. Screen design with colors that appeal to the students to encourage and motivate the students to want to learn. Development of Computer-Mediated Lesson is created using the straight-line tutorials, a branch and a separate framework presented is not a major topic for the students to choose a topic. Students can choose courses according to their own ability and can go back and review the content is not understood. After creating the lesson finished, the researchers have applied the lessons to education expert to examine the validity of the model of the arrangement of content, how the content of the lessons and quizzes CML built. Researchers improve upon the recommendation of the experts. Then evaluate the effectiveness of computer-assisted instruction to test in a single person, a group of 6 people and a field of 30, after which the researchers used scores from the test to evaluate the effectiveness of Computer-Mediated Lesson (E1/E2) that it was found that the efficiency of the computer assisted instruction was 85/87. The findings of this study revealed that the achievement scores after the computer assisted instruction lessons of the sample were significantly higher than those before at the 0.01. In addition, most students have a comment about the CML is inside the content and presentation was good with an average of 4.42 (SD = .56). Opinions on the topic Computer-Mediated Lesson in the other side such as: 1) image, audio and language was good with an average of 4.07 (SD = .65) 2) the design of the monitor is at a good level with an average of 4.21 (SD = .49. 3)), the sequence and steps in a good level averaged 4.37 (SD = .54), and 4) Comments satisfaction in learning a lesson in what is a very average. 4.37 (SD = .54)

Discussion

Researchers develop computer-assisted instruction program by offering content in the text, still images, movies and audio, students can study the contents and determine progress in their learning abilities. Appropriated Classes for using Computer-Mediated Lesson must be the learners who are students with basic nursing knowledge because the content is complex. As a sample of the opinion that the content of the lessons covered in the patients who received spinal surgery, especially presented to illustrate how to care and give advice on how to do various daily activities and can be implemented more accurate. Samples can take the time to learn the Computer-

Mediated Lesson (CML.) by the ability and needs of the individual. The study found that the students take to the unequal class is from 50 minutes to 65 minutes. Computer skills and proficiency in the use of the individual may make use of the time in different classes. In addition, the opinion of samples that the presentation of content in Computer-Mediated Lesson is easy to understand and easy to find topics / content because Computer-Mediated Lesson has created a main menu with the subject content four main topics that the students can study and choose to review the content they want to make the majority opinion and the satisfaction of learning is very good with Computer-Mediated Lesson averaged 4.37 (SD = .54). The findings of this study revealed that the achievement scores after the computer assisted instruction lessons of the experimental group were significantly higher than those before the Computer-Mediated Lesson lessons at the 0.01 level. Additionally, Computer-Mediated Lesson also multimedia that contain text, pictures, animations file, videos file, visual and sound effects that stimulate the learner's interest and willingness to enrol in lessons, making the recognition and behavioural knowledge to correspond to the objectives set.

Computer-Mediated Lesson also has the appearance of quizzes to improve students' knowledge and practice skills and could interact with lessons. This creates an incentive for students to teaching and learning which is based on principles that are aimed at specific individuals and the students-centred corresponding with the previous study. The effectiveness of Computer-Mediated Lesson (E1/E2) was 85/87 that mean it is a good education media [2] as well as CML over the past [11-14], so it is considered Computer-Mediated Lesson can serve as a lesson to help the students with the knowledge to care for patient undergoing laminectomy has been increased and the sample commented that they gained knowledge about the care of patient undergoing laminectomy and much more in the end. The samples show that they can apply their knowledge to practical use, more accurate, and the importance of caring for the patients who received spinal surgery. Samples have suggested that we should include in this CML entitle principle and method of rehabilitation for patient undergone laminectomy in units of the hospital utilization. This program is very useful to use in nursing education which corresponds with the results of computer assisted instruction [15,16] found that the students' satisfaction in learning and thinking how useful can used in clinical practice as well.

Conclusion and Suggestions

This process of applying new technology in nursing education is a challenge every nursing lecturer will have to face. Applying Computer-Mediated Lesson to teaching has become a new trend to the advanced countries in the current world. Meanwhile, information technology and multimedia teaching will be a direction that the government advocates in our educational policy. Whether there is integration between technology and nursing teaching efficiently and successfully depends on the lecturers' efforts and professional abilities. More importantly, the government and education authorities concerned should put emphasis on the need of information technology in schools, fostering the coordination of policy and resources. Although the integration of technology into nursing is difficult and complicated, it is suggested that lecturers can build up confidence, and consult with the other professional teachers or education expert to continue innovation. The most important, Computer-Mediated Lesson or

Computer-Assisted Instruction can never replace lecturers but it compliments them and helps in easier, faster and effective learning of content.

References

[1] Kara, I. (2007). The effect on retention of computer-assisted instruction in science education. *Journal of instructional Psychology*, 35(4):357–364

[2] Schwarz, G. (2000). *Renewing teaching through media literacy*. Phi Delta Kappan, 37, 8-12.

[3] Mamom, J. (2014). Computer Assisted Instruction (CAI): Educational Technology to Develop the Knowledge and Skills of Nursing Students. *Journal of Science and Technology*, 22(2):286-293.

[4] Carreon LY, Puno RM, Dimar JR, et al. (2003). Perioperative complications of posterior lumbar decompression and arthrodesis in older adults.*J Bone Joint Surg Am*; 85:2089–92.

[5] Ploumis A, Transfledt EE, Denis F. (2007). Degenerative lumbar scoliosis associated with spinal stenosis. *Spine*; 7:428–36.

[6] Cho KJ, Suk SI, Park SR, et al. (2007). Complications in posterior fusion and instrumentation for degenerative lumbar scoliosis. *Spine; 32:2232*–7.

[7] Alessi, S. M., & Trollip, S. R. (2001). *Multimedia for learning: Methods and development.* Massachusetts: A Pearson Education.

[8] Somchai, B. (2009). *Creating computer assisted instruction* .Med-Shine Printing.(in Thai)

[9] Miller, D. G. (1986). *The integration of computer simulation into the communi~ college general biology laboratory*. Dissertation Abstracts International, 47, 2106A (University Microfilms No. 86-I 9, 579).

[10] Roblyer, M. D., & Knezek, G. (2003). New millennium research for educational technology: A call for a national research agenda. *Journal of Research on Technology in Education*, 36(1), 60-71.

[11] Barot, H. (2009). *Development and Effectiveness of CAI in Sanskrit for Standard IX students*. Unpublished Ph. D. Thesis. The Maharaja Sayajirao University of Baroda, Vadodara.

[12] Kara,Y., and Yesilyurt, S. (2007). Assessing the effects of Students' achievements, misconceptions and attitudes towards Biology. *Asia-Pacific Forum on Science learning and teaching*, 8(2), 1-22.

[13] Mamom, J. (2012). Outcomes of Computer-Mediated Review Lesson on Pressure-Sore Dressing as Observed in Second-Year Nursing Students' Knowledge, Practical Skills and Opinions. *Thai Journal of Nursing Council*; 27(3) 63-76.

[14] Mamom, J. (2012). Impacts of a Computer-Mediated Lesson on Nursing Students' Knowledge and Skills in Giving Post-Operational Care to Spine Surgery Patients. *Thai Journal of Nursing Council*; 27(special issue): 90-101.

iafor

Multivariate Gradient Analysis for Evaluating and Visualizing a Learning System Platform for Computer Programming

Richard Mather, Buckinghamshire New University, United Kingdom

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

Abstract

This paper explores the application of canonical gradient analysis to evaluate and visualize student performance and acceptance of a learning system platform. The subject of evaluation is a first year BSc module for computer programming. This uses 'Ceebot', an animated and immersive game-like development environment. Multivariate ordination approaches are widely used in ecology to explore species distribution along environmental gradients. Environmental factors are represented here by three 'assessment' gradients; one for the overall module mark and two independent tests of programming knowledge and skill. Response data included Lickert expressions for behavioural, acceptance and opinion traits. Behavioural characteristics (such as attendance, collaboration and independent study) were regarded to be indicative of learning activity. Acceptance and opinion factors (such as perceived enjoyment and effectiveness of Ceebot) were treated as expressions of motivation to engage with the learning environment. Ordination diagrams and summary statistics for canonical analyses suggested that logbook grades (the basis for module assessment) and code understanding were weakly correlated. Thus strong module performance was not a reliable predictor of programming ability. The three assessment indices were correlated with behaviours of independent study and peer collaboration, but were only weakly associated with attendance. Results were useful for informing teaching practice and suggested: (1) realigning assessments to more fully capture code-level skills (important in the workplace); (2) re-evaluating attendance-based elements of module design; and (3) the overall merit of multivariate canonical gradient approaches for evaluating and visualizing the effectiveness of a learning system platform.

iafor
The International Academic Forum
www.iafor.org

1 Introduction

The two aspects of the study reported below concern: (1) the educational context, in this case an investigation of an approach for learning and teaching computer programming; and (2) the primary objective, an evaluation of a novel means for exploring complex data that commonly arise from such multivariate studies.

Regarding the first aspect (the approach taken for introducing programming), it is widely accepted that students find that learning to programming is challenging and an obstacle to progression to later stages of higher education. The paper "Learning and Teaching Programming: A Review and Discussion" by Robins and co-workers (2003) at Otago University, clearly summarises that "Novice programmers suffer from a wide range of difficulties and deficits. Programming courses are generally regarded as difficult, and often have the highest dropout rates".

Experiences at Buckinghamshire New University, where modules in programming underpin computing courses, reflect the findings of Robins *et al*. (*ibid.)* and of others reporting student difficulties in understanding both introductory and higher level programming concepts (for example Milne and Rowe, 2002).

Many learning and teaching applications therefore endeavour to make the subject less intimidating and more accessible to novice programmers through creative use of graphical and interactive development environments or immersive game-like interfaces. Widely used examples of such learning environments include: Alice (Cooper *et al.*, 2000); Lego Mindstorms (Barnes, 2002); BlueJ (Kölling *et al.*, 2003), Greenfoot (Henriksen & Kölling, 2004) and Scratch (Resnick *et al*., 2009).

In this study, students use the Ceebot application, designed for learning industry-standard C-language syntax and object-oriented principles (Huber, 2008; Maragos & Grigoriadou, 2005). Ceebot employs a dynamic landscape populated with robotic devices that may be programmed to interact with each other, 'alien' life and to perform tasks on inanimate objects (see Figure 1).

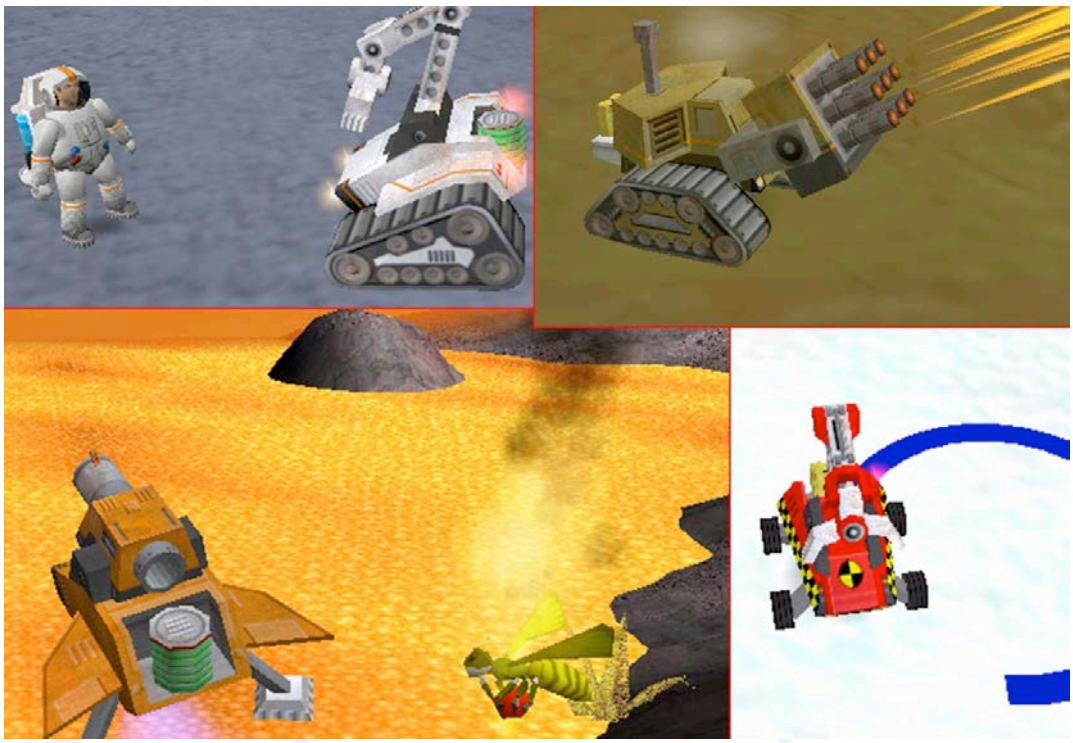

Figure 1 Screen capture from Ceebot showing a small section of 'bots' that may be programmed to move, pick up objects, shoot, fly (bottom left) and draw (bottom right).

Concerning the second aspect of research interest (the means of data analysis), the nature and type of data available is normally determined by the intention of research, the context, the research style and strategy for data collection and analysis (Cohen, Manion and Morrison, 2011). As with many exploratory investigations surrounding the efficacy and acceptance of educational environments, data sets are often unavoidably complex and multivariate as a consequence of response behaviours, potential explanatory variables and interaction effects. Moreover, in exploratory analyses involving questionnaire data, it may be desirable to first screen or filter variables for explanatory power and for collinearity or other redundancy (Cohen, Manion and Morrison, *ibid.)*.

Common exploratory approaches include correlation analysis (Pearson's Product Moment Correlation coefficient and Spearman's Rank Order Correlation coefficient). Although strictly concerned with bivariate relationships both are often used in matrices to explore patterns in multivariate data (Sokal and Rohlf, 1995).

Among gradient-type tools, Principle Component Analysis (PCA) is a true multivariate tool that is widely used for exploratory purposes. Although a useful means for investigating multivariate relationships, the ordination axes describing variation only represent orthogonal directions in the entire data set and are not directly related to explanatory data (Sokal and Rohlf, *ibid.)*.

Similar to PCA, the alternative approach of Canonical Correspondence Analysis (CCA) has the advantage that response scores are regressed on explanatory data, so ordination axes are constrained to explanatory variables. Canonical gradient analysis

techniques are widely used by the ecology scientific community. Correspondence analysis (CA) was pioneered by ecologists from the 1970s and found to be well suited to describing unimodal species distributions. Canonical Correspondence Analysis (CCA) was developed by ter Braak for ecological sciences (ter Braak, 1986) and is highly regarded by community ecologists for investigating the distribution and abundance of species along environmental gradients (Šmilauer and Lepš, 2014).

However, CCA assumes unimodal distribution of response variables and is insensitive to direction of relationship. Thus this study evaluates Redundancy Analysis (RDA), first publicised by van den Wollenberg in 1977. RDA possesses two advantages that ordination axes are constrained to explanatory variables and, through applying a linear ordination, does not rely on assumptions of unimodality. It is, in effect, the canonical equivalent of PCA (ter Braak, 1987). Like CCA, RDA is a valued tool among ecologists and environmental scientists. CCA and RDA may also be used in a 'partial' form to filter effects of background variables so that residual variation may be analysed against explanatory factors of interest. One example of this being a study of forest condition in which relationships with atmospheric pollution were analysed after first 'removing' variation in data sets attributable to meteorological effects (Mather *et al.*, 1995).

2 Aim and objectives

The primary intention of this investigation is to evaluate a Redundancy Analysis as a multivariate statistical tool for exploring student engagement and performance in a learning environment. As a consequence, this fulfilled a secondary aim of revealing interrelationships between student behaviours, preferences and achievement using the Ceebot environment for learning computer programming.

3 Method

First year degree students enrolled on courses in computing, games development and software engineering and attending a module on introductory computer programming were invited to participate in this study. Of a possible eighty students thirty five made fully valid returns (no missing data) for a questionnaire with a combined test and also completed the final module assessment.

The combined test and questionnaire comprised: (1) a self-evaluation of perceived difficulty; (2) tests of commonly used terms/definitions and of code skill and understanding; and (3) twenty questions with Likert scale responses (see Table 1) designed to gauge individual acceptance of the Ceebot environment, preferences, behaviours and approaches to completing work. Likert scales intentionally allowed neutral responses.

Two further variables for module mark and attendance (both as percentages) were included for each student record.

Measures were taken to ensure that participants were willing and consented to recordings. The reasons for study, the ownership, protection and the distribution of information were clearly explained. All findings are published anonymously.

Questionnaire returns were subjected to checks for completeness, accuracy and uniformity, following established recommendations of Moser and Kalton (1977). Data were collated in spreadsheets and, for purposes of canonical analyses with the Canoco 5 application (ter Braak and Šmilauer, 2012), divided into response and explanatory data. Although other statistical packages allow canonical analysis, Canoco 5 was selected for reasons of a dedicated canonical specification that is subject to ongoing research and development. It also offers powerful graphing tools for visualising ordinations (Šmilauer and Lepš, *op. cit.*).

Although a conventional approach might perhaps be to regard that module grades and test scores were 'responses' to predisposing explanatory variables (e.g. motivation, attendance, collaborative inclination, as indicated by questionnaire data), in initial analyses RDA axes were constrained to the key learning performance indices of interest. In other words module grades and test scores were initially reversed to become explanatory variables and questionnaire data became response variables.

Reasons for adopting this 'switched' perspective included that module grades and test results were more representative of true gradients than the limited range of Likert categories. There were also a relatively large number of questionnaire variables for which, in the context of this exploratory study, it was highly probable that many would be unrelated to the learning performance variation of interest. In addition to potentially weak explanatory power, there was also a strong likelihood that much questionnaire variation was intercorrelated and collinear.

Given the landscape ecology origins of canonical and redundancy analysis (in which species and other biological variation is commonly investigated against explanatory environmental gradients, there was also conceptual consistency in this converse view. Thus learning achievements (as indicated by grade and test results) represented positions along gradients in a learning landscape; these positions being in part determined by behaviours, preference, acceptance characteristics.

4. Results and Discussion

4.1 Central tendency in questionnaire responses.

Initial screening for central tendency in questionnaires (Table 1) revealed only one item in which the overall response pattern was entirely symmetrically distributed around a neutral mode (Question 18 in Table 1). For all other questions Likert distributions were clearly skewed towards either agreeing or disagreeing to the assertion made. Overall consistent 'polarities' between similar but alternative viewpoints concerning acceptance of Ceebot (e.g. questions 3, 5, 6, 9, 11 and 13) and motivation (e.g. questions 10, 12, 16, 17, 19 and 20), suggested that questionnaires had been completed accurately and diligently.

Table 1 Summary of frequency of Likert category against questionnaire returns.

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. It is very helpful to discuss Ceebot problems with friends.	**21**	13	0	1	0
2. It is always possible to find information to complete exercises.	3	11	**14**	4	3
3. Ceebot animated environment aids understanding.	10	**16**	7	2	0
4. I find it useful to draft designs and algorithms on paper.	1	12	**13**	4	5
5. Ceebot does not help me remember fundamental concepts.	0	7	3	**19**	6
6. Ceebot is enjoyable.	6	**20**	8	1	0
7. No formal lectures are required – just Ceebot notes.	2	7	6	**18**	2
8. Like this module to be commercially recognised qualification.	5	**18**	8	4	0
9. Ceebot graphics are distracting.	2	2	7	**19**	5
10. Un-assessed multiple-choice tests would help with learning.	3	**19**	10	3	0
11. It would be quicker to learn to program without Ceebot.	2	8	10	**11**	4
12. Easiest way to complete logbooks is to cut and paste code.	5	**14**	11	3	2
13. Ceebot is good for learning C-programming for employment.	7	**22**	6	0	0
14. Other websites are helpful for completing exercises.	0	4	6	**18**	7
15. I'm worried that Ceebot may not help me get a job.	2	6	**12**	10	5
16. I only work on Ceebot exercises in practical sessions.	1	2	4	**21**	7
17. 2+ hours extra work is needed to complete the week's tasks.	7	**22**	1	5	0
18. More exercises than needed to understand concepts covered.	1	9	**15**	9	1
19.I work on Ceebot exercises at home.	14	**17**	2	2	0
20. I'd like an e-forum to discuss Ceebot problems.	14	**15**	4	2	0

Table 1 Notes: (1) mode category is bold and underlined; (2) questions are abbreviated from full questionnaire form for the purposes and convenience of tabular display.

4.2 The interpretation of redundancy analyses and ordination diagrams.

The ordination diagrams presented in Figures 2 and 3 are correlation biplots in which axes are scaled to unit length and increment (ter Braak, 1992; Šmilauer and Lepš, *op. cit.*). Response variables are represented by blue arrows (or vectors) and explanatory variables are represented by red arrows. The length of arrows is proportional to their standard deviations and the cosines of their angular separations between each other and the axes (regardless of whether explanatory or response variables) corresponds to their correlation coefficients, i.e. $r \approx \cos \theta$ (Corsten and Gabriel, 1976; ter Braak, 1987; Šmilauer and Lepš, *op. cit.*). Thus perpendicular relationships between response and explanatory arrows and axes (i.e. approximating to cosine 90^0) indicate near zero correlation ($r \approx 0$) while parallel relationships (whether in same or opposing directions) represent correlations approaching unity (cos 0^0 or 180^0 corresponding to $r=1$ or -1 respectively).

Summarising, the heads of arrows indicate the direction of maximum variation in the value of corresponding variable. The longer an arrow the greater the importance of the variable effect in the model and also the greater the confidence in the inferred correlation (ter Braak, 1987; ter Braak and Prentice, 1988). Variable arrows and

ordination axes in the same direction are positively correlated, perpendicular vectors are not correlated and those pointing in opposing directions are negatively correlated.

It is important to note that a 180^0 shift in correlation polarity may simply reflect that a questionnaire item is expressed with a negative rather than a positive assertion.

In tables of summary statistics (Tables 2 and 3) entries are only made for the first two axes because these describe the great majority of explainable variation in response data. The first row states eigenvalues. These express the proportion of all variation (unity) explained by an axis; hence their equivalence to percentage expressions for cumulative variation on the second row. The pseudo-canonical correlations on the third row express the correlation between response based and explanatory-variable based axes (Šmilauer and Lepš, *op. cit.*). The final entries for explained fitted variation are only concerned with variation described by the model and express the proportion explained by the axis concerned.

Notes following summary statistic tables describe: (1) the total response variation explained by explanatory variables and an adjusted figure to compensate for inflatory bias due to small sample sizes (Šmilauer and Lepš, *ibid.)*; and (2) a pseudo-*F* statistic is derived and may be interpreted in the same way as in ANOVA of the regression model (Šmilauer and Lepš, *ibid.)*. The probability *P* is derived from a Monte Carlo permutation test. This involves random permutation of response data with respect to explanatory variables. Thus, if after 999 permutations, 43 random permutations produced eigenvalues greater than that for the original data, *P* would be (43+1) / (999+1) = 0.044.

4.3 Findings from Exploratory Redundancy Analyses.

The result of redundancy analysis of all data (using the 'converse' view that grade and test achievement variables represented gradients that explained distributions of behaviours, preference, acceptance responses) is represented by the ordination of Figure 2, with summary statistics presented in Table 2.

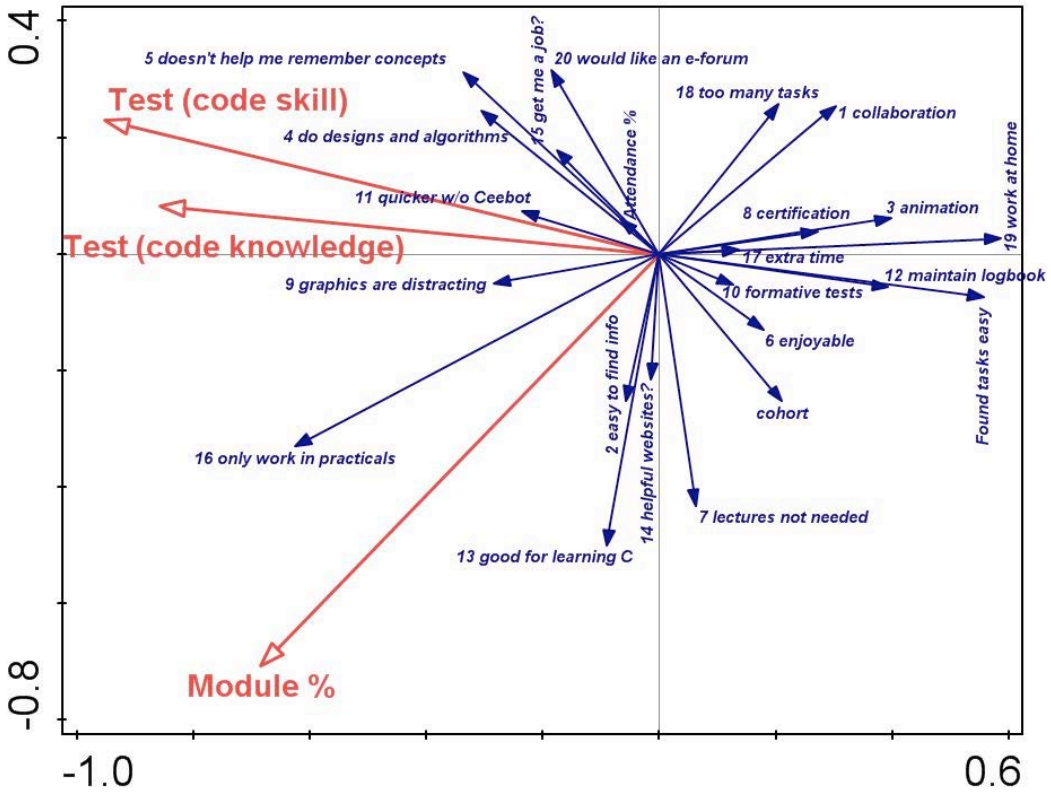

Figure 2. Ordination Biplot for the Redundancy Analysis of student behaviours, preference, acceptance responses (as indicated by blue arrows representing questionnaire returns and class attendance) against positions along learning performance gradients (as indicated by red arrows indicating module grade and tests of programming knowledge and coding skill).

The first (horizontal) axis describes most variation in response variables at approximately 9% (Table 2 eigenvalue 0.0915 and cumulative percentage 9.15%). The direction and length of the two "Test (code ...)" vectors indicate their overall influence on the first axis and relative effectiveness in describing the greater proportion of explainable response variation. The second axis is uncorrelated to the first axis, apparently most strongly influenced by Module % but weakly related to the two "Test (code skill/knowledge)" vectors. This axis describes a further 5% of variation in response data. Table 2 coefficients ~0.85 and ~0.70 express that the correlation between response based and explanatory-variable based axes are highly significant. The Monte Carlo permutation test confirms the overall significance of the model (p=0.044).

It is clearly evident that the two "Test (...)" items explain most variation in response (behaviour) data, although the overall module grade (Module %) is also strongly related to response variation in both first axis and the orthogonal second axis**.** Those response variables most strongly related to explanatory variation of interest included behaviours of independent study and homework (16 - only work in practical sessions; 19 - work at home) and peer collaboration (1), but surprisingly weakly associated with 'Attendance'. The latter is the shortest and least significant vector in the entire model. Further investigation revealed that this apparent anomaly may be partly attributed to a

small group of students with advanced subject knowledge who did not attend regularly.

Table 2 Summary statistics for Redundancy Analysis and Ordination presented in Figure 2.

Statistic	*Axis 1*	*Axis 2*
Eigenvalues	0.0915	0.0516
Explained all variation (cumulative %)	9.15	14.31
Pseudo-canonical correlation	0.8523	0.6975
Explained fitted variation (cumulative %)	54.04	84.52

Table 2 Notes: (1) Explanatory variables account for 16.9% all variation (adjusted explained variation is 4.5%); (2) Permutation Test Results (on all axes): pseudo-F=1.4; P=0.044.

Explanatory variables (red in Figure 2) were clearly effective in describing response variation. However, the orthogonal relationship between the key element of assessment (Module %) and the un-assessed tests on code understanding and skill, unexpectedly suggested that strong module performance was not necessarily a reliable predictor of programming ability. This finding was clearly of pedagogic concern. A simple correlation check (Pearson product-moment) also suggested that although "Test (code understanding)" was significantly correlated with "Module %" (r=0.56, p<0.001), "Test (code skill)", was not correlated with overall assessment grade (r=0.27, p<0.117).

There were strong correlations between "commitment" indicators (16 "only work in practical - disagree", 19 "work at home – agree" and 12 "maintaining logbook - agree").

Among other exploratory patterns of interest was the correlation between response 13 ("good for learning C type languages") and the second axis, as well as a strong relationship to overall "Module %" and the evident orthogonal relationship with "Test (code skill)". This indicated that appreciation of Ceebot may not have been so strongly expressed by more adept programmers. Similarly, the strong negative correlation between the indicator for collaboration (stated as "It is very helpful to discuss Ceebot problems with friends" in the questionnaire and labelled "1 collaboration" in Figure 2) and "Module %" suggested that such behaviour was more greatly valued by those achieving high overall module grades than those who were 'purely' proficient at programming.

Although there are other correlations and patterns deserving of pedagogic attention, the aforementioned represent the most significant and, with respect to this analysis, are perhaps within limits of model interpretation.

The proportion of overall variation explained by learning performance indicators may appear low. However, this is not surprising given the exploratory nature of questionnaire items and the fact that some questions will unavoidably introduce variation that is unrelated to learning performance.

Among objective measures used to filter such extraneous variation was stepwise forward selection of factors explaining most variation in learning performance. To do this it was necessary to adopt a conventional view that the learning performance indicators "Module %", "Test (code skill)" and "Test (code understanding)" were responses to explanatory characteristics (behaviours, preference and acceptance characteristics) expressed in the questionnaire.

The following analysis therefore uses forward selection and also excludes variables that contribute little to the overall model, such as "Attendance", or are redundant through collinear/inter-correlation with other variables, for example "Test (code understanding)". It also observes Canoco's over-fitting alert, based on termination criterion of Blanchet *et al*. (2008). This suggests when further stepwise inclusion is unadvisable on the grounds that adding another predictor would increase the R^2 (adjusted) to a value greater than that would be otherwise obtained by fitting the full model with all predictors.

After removing obvious sources of collinearity, stepwise selection observing termination criterion resulted in a simpler model (Figure 3) with only six questionnaire items. A reduction in 'unexplainable' variation is partially responsible for increased eigenvalues and overall variation explained by the model (Table 3 indicates the first axis accounts for approximately 35% of overall variation and the second axis accounts for some further 13%). However, a direct comparison should not be made with the earlier RDA due to the changed focus of analysis. The overall model is highly significant (Table 3 notes: pseudo-F=15.7; P=0.002).

The alignment of item 19 (full form, "I work on Ceebot exercises at home") with the first axis and the two indicators of learning achievement, and the overall length of vector suggests that this is the most important item describing variation in learning performance. This is confirmed by the statistics for stepwise regression (Table 4) that indicate item 19 alone accounts for more than 33% of the explainable variation and that its contribution is also highly significant (pseudo-F 6.5, P=0.004).

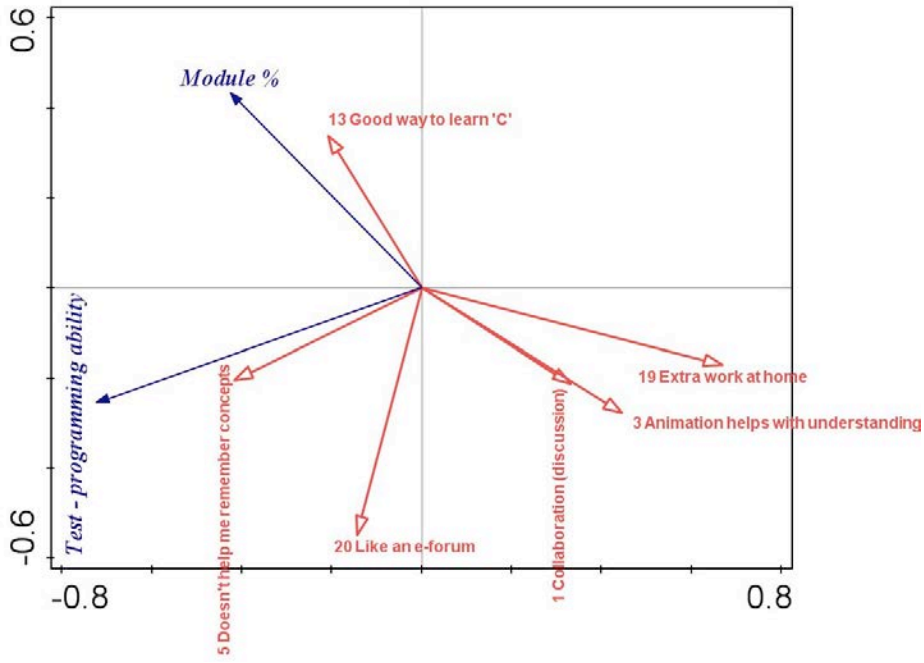

Figure 3 Ordination Biplot for Redundancy Analysis of learning performance responses (blue vectors) against step-wise selections of behaviours, preference and acceptance (red arrows). Notes: (1) response and explanatory variables are 'switched' in relation to the earlier analysis so that learning performance are responses and questionnaire variables are explanatory, thereby allowing stepwise inclusion of key variables and elimination of collinear or otherwise redundant terms; and (2) stepwise selection is terminated on according to Canoco 5's internal over-fitting warning based on criterion of Blanchet *et al*. (2008).

Of items remaining after stepwise selection, 13 "Ceebot is good for learning C ...", 20 "I'd like an e-forum ...", 5 "Ceebot doesn't help me remember concepts ..." and "3 Ceebot environment aids understanding ..." each account for some 14-15% of explainable model variation (Table 4.). The last item included in stepwise selection, "1 Collaboration (discussion)" in Figure 3, accounts for a smaller proportion of model variation.

The alignment of Ceebot acceptance indicators (item 5, disagreeing that Ceebot doesn't help with remembering concepts and the test of programming ability; item 3 agreeing that Ceebot animation assists understanding and a balanced alignment between both indicators of learning performance) suggests overall appreciation in Ceebot as a learning platform.

Table 3 Summary statistics for Redundancy Analysis and Ordination presented in Figure 3.

Statistic	*Axis 1*	*Axis 2*
Eigenvalues	0.3517	0.1260
Explained all variation (cumulative %)	35.17	47.77
Pseudo-canonical correlation	0.7494	0.5806
Explained fitted variation (cumulative %)	73.63	100.00

Table 3 Notes: (1) Explanatory variables account for 47.8% all variation (adjusted explained variation is 37.0%); (2) Permutation Test Results (on all axes): pseudo-F=15.7; P=0.002.

Two items suggest the value of measures for peer communication and collaborative working (20 "I'd like an e-forum ..."; 1 "Helpful to discuss Ceebot tasks with friends ..."). Item 13 is somewhat anomalous in that no one disagreed that Ceebot is good for learning C (i.e. the entire range of Likert responses were only in categories 1, 2 and 3), thus its alignment with Module % suggests that respondents generally agreed or were neutral but didn't 'strongly agree' with this assertion.

Table 4 Summary statistics for Predictors included in Stepwise Forward Selection in the Redundancy Analysis and Ordination presented in Figure 3.

Variable	*Variation Explained %*	*Model Contribution %*	*Pseudo-F*	*P*
19 I work on Ceebot exercises at home	16.1	33.6	6.5	0.004
13 Ceebot is good for learning C ...	6.7	14.0	2.8	0.084
20 I'd like an e-forum ...	6.9	14.5	3.1	0.064
5 Ceebot doesn't help me remember concepts ...	7.6	15.8	3.7	0.028
3 Ceebot environment aids understanding ...	6.8	14.2	3.6	0.018
1 Helpful to discuss Ceebot tasks with friends ...	3.8	7.9	2.1	0.128

5. Conclusions and Recommendations

With respect to the primary aim, "to evaluate a Redundancy Analysis as a multivariate statistical tool for exploring student engagement and performance in a learning environment", findings indicate that RDA was appropriate and useful for describing patterns of student behaviour and preferences associated with measures of 'success'. The canonical facility to directly focus or constrain analysis to gradients of interest, combined with powerful biplot visualisation of variable influence, vector association and collinear effects provide the researcher with a robust method for identifying pedagogically meaningful influences. In this study, centred on the Ceebot learning environment, RDA was found to be effective in screening indicators and behaviours that may be predictors of learning performance and of acceptance of the environment.

The secondary aim, "of revealing interrelationships between student behaviours, preferences and achievement using the Ceebot environment for learning computer programming", was only achievable because both conditions were satisfied that: (1) RDA was demonstrated to be an appropriate form of analysis; and (2) that most questionnaire items were, to greater or lesser extents, valid predictors for the measures of learning performance.

Although a number of patterns of pedagogical interest were noted, key and significant findings were: (1) the weak association between overall module assessment and the computer programming skill ability; and (2) the three indices of learning performance were correlated with behaviours of independent study and peer collaboration but not with attendance. From a perspective of teaching practice, results indicated that logbook based assessments may need to be revised to more closely align with programming skills valued in the workplace. There was also some evidence that requirements for attendance may be reconsidered, perhaps relaxed for experienced computer-programmers able to demonstrate prior learning. Additionally, opportunities for collaborative learning (discussion) were valued and positively associated with learning performance. From a learner perspective RDA revealed that the key predictor of success was commitment to continue module work outside timetabled sessions.

Regarding ongoing work and recommendations for readers interested in using canonical tools, the canonical viewpoint of learner behaviours determining positions along landscape gradients of performance is novel perspective. This, however, requires further investigation to determine whether such a paradigm may aid in detecting and encouraging behavioural transformations that 'predict' success. It is anticipated that research will continue to use RDA to monitor effects of modifications to teaching practice. One such planned modification is the inclusion of formative tests to develop code-skills.

6. Acknowledgements

This study was made possible through the generous and diligent participation of colleagues and students delivering and attending BSc modules in "Programming Concepts" and "Application Programming" at Bucks New University. The research was funded by Bucks New University.

7. References

Barnes, D.J. (2002) Teaching introductory Java through Lego Mindstorms models. *Proceedings of the 33rd SIGCSE technical symposium on computer science education*, 147-151.

Blanchet, F.G., Legendre, P. & Borcard, D. (2008) Forward selection of explanatory variables. *Ecology 89* (9), 2623-2632.

Cohen, L., Manion, L. & Morrison, K. (2011) *Research Methods in Education* (seventh edition). Routledge, UK.

Cooper, S., Dann, W. & Pausch, R. (2000) Alice: a 3-D tool for introductory programming concepts. *Proceedings of the 5th Annual CCSC Northeastern Conference*, Mahwah, NJ, 107-116.

Corsten, L.C.A. & Gabriel, K.R. (1976). Graphical exploration in comparing variance matrices. *Biometrics 39*, 159-168.

Henriksen, P. & Kölling, M. (2004) Greenfoot: combining object visualisation with interaction. *ACM Conf. on Object Oriented Prog. Systems Languages and Applications*, 73-82. DOI=http://doi.acm.org/10.1145/1028664.1028701.

Huber, M. (2008) *Bemerkungen für Lehrpersonen* (Notes for teachers). [PDF file]. Retrieved February 21, 2014, from http://www.ceebot.org/index.php?option=com_remository&Itemid=53&func=fileinfo&id=6.

Kölling, M., Quig, B., Patterson, A. & Rosenberg, J. (2003) The BlueJ System and its Pedagogy. *Computer Science Education, 13* (4), 249-268.

Maragos, K. & Grigoriadou, M. (2005) Towards the design of Intelligent Educational Gaming Systems. *Proceedings of the AIED 05 WORKSHOP 5*, 35-38.

Mather, R.A., Freer-Smith, P. & Savill, P. (1995) Analysis of the changes in forest condition in Britain 1989 to 1992. *Forestry Commission Bulletin 116*. HMSO, London.

Milne, I. & Rowe, G. (2002) Difficulties in Learning and Teaching Programming – Views of Students and Teachers. *Education and Information Technologies 7* (1), 55-66.

Moser, C. & Kalton, G. (1977) *Survey Methods in Social Investigation* (second edition). Heinemann, London.

Resnick, M., Maloney, J., Monroy-Hernandez, A., Rusk, N., Eastmond, E., Brennan, K., Millner, A., Rosenbaum, E., Silver, J., Silverman, B. & Kafai, Y. (2009) Scratch: Programming for all. Comm. *ACM 52* (11), 60–67.

Robins, A., Rountree, J. & Rountree, N. (2003) Learning and Teaching Programming: A Review and Discussion. *Computer Science Education 13* (2), 137-172.

Šmilauer, P. & Lepš, J. (2014) *Multivariate Analysis of Ecological Data using CANOCO 5*. Cambridge University Press.

Sokal, R.R. & Rohlf, F.J. (1995) *Biometry: The Principles and Practices of Statistics in Biological Research* (third edition). WH Freeman and Co., New York.

ter Braak, C.J.F. (1986) Canonical correspondence analysis: a new eigenvector technique for multivariate direct gradient analysis. *Ecology 67* (5), 1167-1179.

ter Braak, C.J.F. (1987) Ordination. In Jongman, R.H., C.J.F. ter Braak and O.F.R. van Tongeren, editors. *Data Analysis in Community Ecology*. Pudoc, Wageningen, The Netherlands.

ter Braak, C.J.F. (1992) *CANOCO - a FORTRAN program for Canonical Community Ordination*. Microcomputer Power. lthaca. New York.

ter Braak, C.J.F. & Prentice, I.C. (1988) A theory of gradient analysis. *Advances in Ecological Research 18*, 271-317.

ter Braak, C.J.F. & Šmilauer, P. (2012) *Canoco Reference Manual and User's Guide: Software for Ordination (Version 5.0)* Microcomputer Power www.canoco.com.

van den Wollenberg, A.L. (1977) Redundancy analysis. An alternative for canonical correlation analysis. *Psychometrika 42*, 207-219.

iafor

Social Media in the Classroom: Facebook vs. Whatsapp

Joy He, The Hong Kong Polytechnic University, Hong Kong
Xin Xu, The Hong Kong Polytechnic University, Hong Kong
K.M. Chan, The Hong Kong Polytechnic University, Hong Kong

The European Conference on Technology in the Classroom
Official Conference Proceedings 2014

Abstract
The increasing popularity and influence of social media provide opportunities for instructors to leverage the power of new technologies, applications and platforms to improve teaching and student performance. In particular, students are increasingly relying on social media to facilitate their communication and collaboration for teamwork, especially complex team tasks. Social media as collaborative tools not only allow team members from diverse locations to work together, but also facilitate communication and knowledge sharing among them. Given this backdrop, this paper investigates the role of social media in team communication and team outcomes in the context of university teaching. In particular, the current study operationalizes the measurement of the social media capabilities construct based on the Media Synchronicity Theory (Dennis et al. 2008) and empirically tests the impacts of social media capabilities on three important aspects of student teamwork—namely administrative efficiency, knowledge sharing, and quality feedback on individual member's work. A survey was conducted to collect the evaluation of five capabilities of social media by a convenient sampling of 109 undergraduate students from universities in Hong Kong and their use of social media in team project assignments. The data collected was analyzed using SmartPLS to empirically test the hypotheses. Social media capabilities are found to have differential predicting power for teamwork outcomes—i.e., administrative efficiency, knowledge sharing, and quality feedback. Implications are provided and discussed based on the results of the empirical study.

Keywords: Social media, media capabilities, teamwork

Introduction

Undoubtedly, social media have been revolutionizing people's ways of communicating and interacting with others (Aral et al. 2013). Till June 2013, the largest social networking site - Facebook has 1.11 billion users and 665 million daily active users; LinkedIn has 255 million users; WhatsApp has 200 million users; Skype has 280 million users; Youtube has 1 billion users and 4 billion views per day; Instagram has 100 million users and 4 billion photos; and Dropbox has over 100 million users and 1 billion files uploaded daily (Smith 2013). And we can reasonably expect that social media continue to expand and grow in various forms.

The increasing popularity and influence of social media provide a new set of opportunities for firms to leverage the power of new technologies, applications and platforms. Though the impacts of social media on firm's marketing performance have gained relatively great research interests among scholars (Aral et al. 2013), it yet is an untouched question that how virtual teams can benefit from social media. Contemporary firms are increasingly relying on virtual teams, whose members communicate and collaborate virtually, to accomplish complex tasks (Kanawattanachai and Yoo 2007). The advancement of information and communication technology (ICT) allows team members from diverse locations to work together for shared team tasks. Concerning the increasing adoption of social media within teams as collaborative tools to facilitate communication and knowledge sharing, among young people and virtual teams in particular, this paper starts from operationalization of media capabilities (based on the Media Synchronicity Theory, Dennis et al. 2008) and empirically tests the impact of social media capabilities on three important aspects of teamwork: administrative efficiency, knowledge sharing, and quality feedback on individual member's work.

Literature Review

The capabilities of media were firstly documented by the Media Richness Theory (MRT), which argues that media differ in richness: the ability to process many different amounts of and types of information that changes understanding within a time period (Daft and Lengel 1986). According to Daft and Lengel (1986), the richness (or the information carrying capacity) of a medium is increased by the extent to which the medium meets four criteria: 1) the ability to facilitate immediate feedback, 2) the ability to support simultaneous transmissions of multiple cues (both verbal and nonverbal cues), 3) the ability to convey a message in multiple language types (in written, verbally or visually), and 4) the ability to convey personal feelings and emotions. Face-to-face (F2F) communication is the richest medium, while social media, as a form of computer-mediated communication (CMC), capable of providing slower responses (specific comments or information may be ignored completely or not be responded in a timely manner) and supporting fewer cues (e.g., no physical cues) are leaner.

Based on MRT, Dennis et al. (2008) proposed the Media Synchronicity Theory (MST) and further identified five capabilities of media (transmission velocity, parallelism, symbol sets, rehearsability, and reprocessability) that may affect information transmission and processing. Transmission velocity is the speed at which a medium can transmit a message to recipients. Media high in transmission velocity

enable messages to reach recipients as soon as they are sent, thereby allowing fast responses (Dennis et al. 2008). Parallelism is the number of concurrent transmissions that can effectively take place over the medium. High-parallelism media allow simultaneous sending and receipt of messages to and from multiple parties (multidirectional communication and multiparty transmissions) and increase the number of concurrent conversations (Dennis et al. 2008). Symbol sets are the number of ways in which a medium can support to encode information for communication. Media that are low in symbol sets are considered to be low in social presence (Short et al. 1976). Low social presence may reduce satisfaction of the communication and interactivity, limiting the sharing of knowledge and experience among colleagues. Rehearsability is the extent to which senders can rehearse and fine tune messages before sending. Media that support rehearsability allow messages to be better crafted and reasoned (Maruping and Agarwal 2004), therefore ensure the intended meanings are expressed precisely (Dennis et al. 2008). Reprocessability is the extent to which participants can reexamine or reprocess previously sent content either within the communication event or at a later time. Media that support rehearsability allow recipients to spend more time on decoding messages by revisiting prior messages for better understanding and additional consideration, as well as provide a memory that can remind participants on their early discussion contents and help new participants to understand past activities (Dennis et al. 2008).

Research Hypotheses

Social Media Capabilities and Administrative Efficiency

Teamwork involves miscellaneous administrative communication such as arranging meetings or announcing. Extensive team communication and coordination for performing a task consume the team members considerable time and efforts and cognitive resources. Administrative efficiency refers to the ability to support easy, convenient and efficient handling of administrative issues. Administrative issues can be communicated to all via social media quickly (fast transmission velocity) and in parallel (high parallelism). Thus, all recipients can respond immediately. Concerning their fast transmission velocity and high parallelism, and relative lean in media richness, social media are suitable for efficient handling of administrative issues (non-equivocal, analyzable, task-oriented tasks) which involve interchanging of clear messages and discussion over simple topics. Therefore,

Hypothesis 1a (H1a): Using social media high in transmission velocity has a positive impact on administrative efficiency.

Hypothesis 1b (H1b): Using social media high in parallelism has a positive impact on administrative efficiency.

Social Media Capabilities and Knowledge Sharing

Teamwork frequently demands its members sharing task-related information and knowledge. Social media have been proven to be superefficient in disseminating information (Jue et al. 2010). Knowledge sharing has two forms: knowledge donating and knowledge collecting. Knowledge donating is a process of actively communicating to others what an individual knows, while knowledge collecting is a

process of actively consulting others to learn what they know (Hooff and Weenen 2004). Social media, as ICTs, offer unique opportunities for virtual teams to overcome time and space barriers by allowing dispersed team members to communicate and collaborate online, and improve access to information. The value of ICTs for knowledge sharing, however, is generally considered limited because it does not give attention to when and how quality of knowledge sharing will be enhanced (Hendriks 1999). Social media users cannot communicate in physical ways (e.g., a handshake or a gentle touch), and can only use limited visual (limited set of emoticons) and verbal cues. They usually communicate using written, digital symbols like words, images and videos. Also, social media can hardly support simultaneous transmissions of multiple cues. Being low in symbol sets, social media are low in social presence (Short et al. 1976). We argue that low social presence may discourage participation and conversation, thereby discouraging group members to share their knowledge with others to collectively contribute to the group knowledge construction. Therefore,

Hypothesis 2a (H2a): Using social media low in symbol sets has a negative impact on knowledge sharing.

Social media's high parallelism facilitates knowledge sharing by extending people's reach to a wider network for knowledge sharing (Jue et al. 2010). Previously, people who were not close to a project may not have been aware that they could contribute. Social media such as social networking sites, forums and wikis enable these individuals to offer their ideas and experiences (knowledge donating) when the project team signals the need for assistance. High parallelism enables signaling for assistance (knowledge collecting) to a wide pool of knowledge community in parallel. Therefore,

Hypothesis 2b (H2b): Using social media high in parallelism has a positive impact on knowledge sharing.

Social Media Capabilities and Quality Feedback

Quality feedback refers to consistent, informative and useful feedback that helps recipients to improve performance (Steelman et al. 2004; Watts 2007). In social media where communication is not necessarily in real time, the chance to contemplate or edit a message prior to sending it is high. Social media also maintain a record of all communications for reference. Social media's high rehearsability and reprocessability facilitate quality feedback. High rehearsability enables the sender to ensure that the intended meaning of the message is expressed precisely, thereby improving the subsequent decoding and information processing of the recipient (Dennis et al. 2008). High reprocessability provides the recipient opportunities for offline deliberation and reflection after the interaction (Maruping and Agarwal 2004) in order to develop better understanding and for additional consideration (Dennis et al. 2008). Since social media possess the capabilities that make the messages more rigorously deliberated and better crafted, users are more likely to receive consistent, informative and useful feedback on this platform. Therefore,

Hypothesis 3a (H3a): Using social media high in rehearsability has a positive impact on quality feedback.

Hypothesis 3b (H3b): Using social media high in reprocessability has a positive impact on quality feedback.

Methodology

A survey was conducted to collect the evaluation of five capabilities of social media by university students and their use of social media in doing group assignments. A convenient sampling of total 109 undergraduate students and fresh graduates (50 females and 59 males) from 7 universities in Hong Kong completed the questionnaire. Data collected from the survey was then analyzed to empirically test the hypotheses using SPSS.

The items measuring five media capabilities were self-developed based on the conceptual definitions and arguments by Dennis et al. (2008). The card sorting technique (Moore and Benbasat, 1991) was employed to develop the measurement instrument in a scientific way. Since there is no available measure capturing administrative efficiency, we self-developed a set of 5-item instrument following the same procedure. Validated survey items from prior studies were adopted to measure knowledge sharing (Hooff and Weenen 2004) and quality feedback (Watts 2007). Besides the common demographic factors, i.e., age, gender, year of study, faculty, we also controlled the frequency of using social media for teamwork (Cao et al. 2012), perceived level of familiarity with teammates (Janssen et al. 2009), task interdependence (Kirkman et al. 2004), and online communication self-efficacy (Lin and Overbaugh 2009). A full list of survey items are reported in Appendix A. All questions were rated using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

Results

The self-developed constructs showed satisfactory reliability in terms of Cronbach's alpha: transmission velocity (.832), parallelism (.864), symbol sets (.894), rehearsability (.873), and reprocessability (.863), and administrative efficiency (.833).

In the questionnaire, we asked the respondents to indicate a certain type of medium that they most frequently used for teamwork and to answer following questions regarding that particular medium. That created a chance for us to further understand whether different social media tools differ in their capabilities. Facebook (frequency = 39; 35.8%) and WhatsApp (frequency = 56; 51.4%) were the two major social media tools that the study population frequently used for doing their group assignments. As a result, we analyzed the data using three sub-sets: overall social media use (1), Facebook users (2), and WhatsApp (3). Table 1 presents the mean values of the five media capabilities of the three sub-sets. Results of the t-test showed that Facebook possessed significantly lower level of symbol sets (Sig. < .05) and higher level of rehearsability (Sig. < .05) than Whatsapp's. Table 2 summarizes the results of linear regression tests to check for significant relationships of media capabilities on work-related outcomes.

Frequency of using social media is positively associated with administrative efficiency for the general sample (B=.200) and Facebook users (B=.282), but not for WhatsApp group. Task interdependence is also positively associated with

administrative efficiency for Facebook users (B=.288). Self-efficacy for online communication is positively associated with administrative efficiency for the general sample (B=.209) and WhatsApp group (B=.290), but not for Facebook users. Self-efficacy is also positively associated with knowledge sharing and quality feedback for the general sample (B=.293 and .366 respectively), Facebook users (B=.364 and .447 respectively) and WhatsApp group (B=.270 and .322 respectively).

Table 1. Mean values of the five media capabilities

Sample Set	N	Transmission Velocity	Parallelism	Symbol Sets	Rehearsability	Reprocessability
1.Social media	109	4.1216	4.4541	2.8647	3.7110	4.0206
2.Facebook	39	4.0385	4.4103	**2.6538**	**3.8910**	4.0256
3.WhatsApp	56	4.2009	4.5089	**3.1205**	**3.5580**	4.0000

Table 2. Summary of hypothesis testing results

Sample Set		Social media		Facebook		WhatsApp	
Independent variables	Dependable variables	R^2	Significance	R^2	Significance	R^2	Significance
H1a:Transmission Velocity	Administrative Efficiency	.390	–	.632	–	.307	–
H1b: Parallelism			.208**		.412**		–
H2a: Symbol Sets	Knowledge Sharing	.413	–	.599	–	.405	.126, p<.1
H2b: Parallelism			.200***		.259*		–
H3a: Rehearsability	Quality Feedback	.340	–	.480	–.247*	.375	–
H3b: Reprocessability			.222**		.306*		.205*

***p<.001. **p<.01. *p<.05.

Discussions

The results showed that transmission velocity did not influence administrative efficiency (H1a unsupported), while parallelism was found to have a positive effect on administrative efficiency (H1b supported). Despite of its high transmission velocity capability, social media do not guarantee immediate responses from the recipients because users may intentionally (e.g., to take time for deliberation or being uncooperative) or unintentionally (e.g., being unaware of the requests to respond because they are temporarily absorbed in other tasks or disconnected from internet access) respond later. These may explain why social media's high transmission velocity did not contribute to administrative efficiency.

Parallelism was positively associated with administrative efficiency (H1b supported). Results obtained from WhatsApp subset, however, did not support. This may be explained by the physical limitation of smart phones (WhatsApp is run on smart phones). Despite of possessing similar high level of parallelism as of Facebook, the smaller screen size of smart phones limited WhatsApp users to open multiple conversation windows concurrently. By contrast, Facebook, can be and is often accessed using computers with larger displays, enables users to open multiple conversation windows simultaneously and communicate with multiple parties concurrently without switching back and forth between conversations.

The results indicated that symbol sets did not influence knowledge sharing (H2a unsupported), while parallelism was found to have a positive effect on knowledge sharing (H2b supported). Prior studies argue that social media are objectively lower in social presence (Short et al.1976), thereby reducing the level of interactions and the number of contributions and discouraging group members to share their knowledge

with others to collectively contribute to group knowledge construction (the "why care" or "why bother" problems due to perceived low social presence by virtual teams). Results obtained in this study, however, revealed that social media were not always perceived as low in social presence, and thus, supporting the arguments of another stream of researches: subjective qualities of social presence are influential to actual experience of social presence (Swan and Shih 2005). The sample of this survey was university students who were familiar with ICT and experienced in online communication. Their interactions through social media were often loaded with social interchange. Also, social media support exchanging of multiple cues by providing a variety of emoticons for users to express facial expressions and supporting transmission of multimedia files to convey verbal and visual cues. Social media are not perceived as low in social presence when taking these subjective characteristics of social media into consideration. These may explain despite of its objectively low in social presence, social media did not discourage knowledge sharing.

The results supported that parallelism was positively associated with knowledge sharing (H2b). This demonstrates that social media's high parallelism extends people's reach to a wider knowledge community for knowledge sharing. Results obtained from sample set on WhatsApp, however, did not support - parallelism did not influence knowledge sharing. This may be explained by the limited actual experience of parallelism on WhatsApp (similar to hypothesis 1b). Since there was no relationship between parallelism and knowledge sharing on WhatsApp samples, knowledge sharing had to rely on another capability - symbol sets (H2a). Also, WhatsApp possessed markedly higher level of symbol sets (mean value of 3.12) than that of Facebook (mean value of 2.65) as users generally use it more often for daily social interactions and it offers a wider variety of emoticons. WhatsApp, therefore, enjoys higher level of social presence which increases the level of interactions and encourages group members to share their ideas and collaborate with others to contribute to group knowledge construction. Therefore, symbol sets was found to be contributive to knowledge sharing.

The results showed that rehearsability did not influence quality feedback (H3a unsupported), while reprocessability was found to have a positive effect on knowledge sharing (H3b supported). Although social media allow users to rehearse and perfect messages before sending them, social media users may decide not to do so. The decision to rehearse and fine tune messages or not depends on the recipients, both in terms of size and formality of the group. If the group is large in size and/or the group context is more formal, people tend to carefully rehearse and fine tune messages before sending them to ensure that messages are complete, grammar- and syntax-free and precise. People have a tendency to better behave when interacting with a large group of people and/ or in formal contexts. If the recipients are small, informal group, people tend to be less careful in crafting and fine tuning messages before transmission because the main goal is to respond quickly. Even the messages may be incomplete or with minor errors, as long as they can convey the intended meanings, they are considered to have fulfilled the communication needs. These may explain despite of its high rehearsability capability, social media did not contribute to quality feedback.

Paradoxically, rehearsability was found to have a negative effect on quality feedback on Facebook samples, rejecting hypothesis 3a. This may be explained by the fact that

people may tend to hide their true and immediate responses after rehearsal and consideration (groupthink). Since Facebook maintains a digital record of all conversations, participants may feel inhibited to voice unusual or conflicting ideas because of higher opportunities for retribution from other team members (Valacich et al. 1994). Groupthink is the "phenomenon in which the norm for consensus overrides the realistic appraisal of alternative courses of action" (Robbins and Judge 2010, p. 331). "Group pressures for conformity deter the group from critically appraising unusual, minority, or unpopular views (Robbins and Judge 2010, p. 330)." Thus, rehearsal may deter group members to voice unusual or unpopular ideas which could be valuable and contributive to better group performance. These may explain despite of its high rehearsability capability, Facebook did not contribute to quality feedback.

The results showed that reprocessability was positively associated with quality feedback (H3b supported). This demonstrates that social media's capability of maintaining a digital record of conversations enables users to revisit previously interactions to spend more time on decoding messages for deliberation, and helps to remind users on previously discussed content, thus, contributing to quality feedback.

The results also indicated that self-efficacy was significant for nearly all hypotheses, except for hypotheses 1a and 1b on Facebook samples. Not surprisingly, respondent's self-efficacy for online communication was important to favorable group outcomes because social media users have to be knowledgeable about the capabilities of social media and be confident that they can make good use of these capabilities to assist them for effective and efficient communication and collaboration within virtual groups. Knowledge of such capabilities is therefore crucial in determining the impact of using social media on teamwork. Competent users can make good use of the capabilities of social media to improve team level information sharing and work-related outcomes. Thus, self-efficacy for online communication is justified for administrative efficiency, knowledge sharing and quality feedback. At the same time, frequency of using social media for teamwork was found to have a positive effect on administrative efficiency. Prior studies suggest that knowledge of the social media tools (self-efficacy) may be the results of prior usage of these tools (frequency) (Majumdar and Krishna, 2011). Therefore, frequency and self-efficacy were interrelated to contribute to administrative efficiency.

Task interdependence was also found to have a positive effect on administrative efficiency for Facebook users. This may be explained by different usages of different social media tools on teamwork for. Students often use WhatsApps to communicate administrative issues, whereas for Facebook, apart from administrative coordination, students more often use it to share resources and exchange documents with team members. This is because Facebook allows users to attach files to messages. This justified the significant task interdependence association with administrative efficiency on Facebook samples.

Limitations and Future Research

The major limitation of this study is the sample size of the survey, especially on the investigation of difference(s) in capabilities of different social media tools. There were only 56 and 39 responses on WhatsApp and Facebook respectively which were

insufficient to provide a representative overview of how media capabilities differ across different social media tools.

The results revealed that transmission velocity did not contribute to administrative efficiency. Also, the associations of symbol sets on knowledge sharing (only supported by WhatsApp sub-sample) and rehearsability on quality feedback (only supported by Facebook sub-sample) are considered to be weak. Therefore, future research could investigate other aspects of team level information sharing and work-related outcomes that transmission velocity may have impact on. Future empirical studies might also further test the associations of symbol sets on knowledge sharing and rehearsability on quality feedback in order to further comprehend the phenomenon. Future research could also investigate the relationship between capabilities of social media and other meaningful outcome variables such as group satisfaction, group well-being, group cohesiveness and so on.

This study investigated the impact of social media capabilities on teamwork using student sample, leaving a need to empirically examine its impact in work contexts in real-world organizations. Also, since it was a self-report study, future research could also collect real data, for example, with the access to the archival history of a group chat from the respondents, future research is able to give objective examination of the link between perception of media capabilities and consequent behaviors.

Conclusion

Based on MST, this study proposed a hypothesized model to investigate which capability (-ies) of social media may impact the team interaction and outcomes. It thus makes several contributions. First, this study developed a set of reliable scales to measures media capabilities. It is the first study, to our knowledge, that empirically evaluates the five capabilities. Our study thus provided a nice ground for future research on social media or other media's impact on various outcomes. Second, this study empirically validated that parallelism of social media had positive impact on both administrative efficiency and knowledge sharing, and reprocessability positively impact quality feedback users can get from social media. These findings serve as a preliminary exploration of social media's influence on teamwork in workplace, thus moving forward the body of knowledge on social media beyond the individual- and firm-level. Third, this study proposed administrative efficiency as one of the important team process variables. It is a new concept emerged from qualitative interviews of sample users of social media. Our results proved that the use of social media can largely improve the efficiency of team coordination. It thus sheds a light on more potential aspects of group work research.

References

Aral, S., Dellarocas, C., & Godes, D. (2013). Introduction to the special issue-social media and business transformation: A framework for research. *Information Systems Research*, *24*(1), 3-13.

Cao, X., Vogel, D. R., Guo, X., Liu, H., & Gu, J. (2012, January). Understanding the influence of social media in the workplace: an integration of media synchronicity and social capital theories. In *System Science (HICSS), 2012 45th Hawaii International Conference on* (pp. 3938-3947). IEEE.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management science*, *32*(5), 554-571.

Dennis, A. R., Fuller, R. M., & Valacich, J. S. (2008). Media, tasks, and communication processes: A theory of media synchronicity. *MIS quarterly*,*32*(3), 575-600.

Hendriks, P. (1999). Why share knowledge? The influence of ICT on the motivation for knowledge sharing. *Knowledge and process management*, *6*(2), 91-100.

Janssen, J., Erkens, G., Kirschner, P. A., & Kanselaar, G. (2009). Influence of group member familiarity on online collaborative learning. *Computers in Human Behavior*, *25*(1), 161-170.

Jue, A.L., Marr, J.A., and Kassotakis, M.E. (2010). *Social Media at Work: How Networking Tools Propel Organizational Performance*. San Francisco, CA: Jossey-Bass.

Kirkman, B. L., Rosen, B., Tesluk, P. E., & Gibson, C. B. (2004). The impact of team empowerment on virtual team performance: The moderating role of face-to-face interaction. *Academy of Management Journal*, *47*(2), 175-192.

Lin, S., & Overbaugh, R. C. (2009). Computer-mediated discussion, self-efficacy and gender. *British Journal of Educational Technology*, *40*(6), 999-1013.

Majumdar, A., & Krishna, S. (2011, October). Social computing implications for technology usage and team interactions in virtual teams. In *Collaborative Computing: Networking, Applications and Worksharing (CollaborateCom), 2011 7th International Conference on* (pp. 443-450). IEEE.

Maruping, L. M., & Agarwal, R. (2004). Managing team interpersonal processes through technology: a task-technology fit perspective. *Journal of Applied Psychology*, *89*(6), 975-990.

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research*, *2*(3), 192-222.

Rice, R. E. (1992). Task analyzability, use of new media, and effectiveness: A multi-site exploration of media richness. *Organization science*, *3*(4), 475-500.

Robbins, S.P., & Judge, T.A. (2010). *Organizational Behavior, 14th ed*. Upper Saddle River, NJ: Prentice Hall.

Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications.* UK: John Wiley.

Smith, C. (2013). How many people use the top social media, apps & services? Retrieved August 20, 2014, from http://expandedramblings.com/index.php/resource-how-many-people-use-the-top-social-media/

Steelman, L. A., Levy, P. E., & Snell, A. F. (2004). The feedback environment scale: Construct definition, measurement, and validation. *Educational and Psychological Measurement*, *64*(1), 165-184.

Swan, K., & Shih, L. F. (2005). On the nature and development of social presence in online course discussions. *Journal of Asynchronous Learning Networks*, *9*(3), 115-136.

Valacich, J. S., George, J. F., Nunamaker, J. F., & Vogel, D. R. (1994). Physical proximity effects on computer-mediated group idea generation. *Small Group Research*, *25*(1), 83-104.

van den Hooff, B., & de Leeuw van Weenen, F. (2004). Committed to share: commitment and CMC use as antecedents of knowledge sharing. *Knowledge and Process Management*, *11*(1), 13-24.

Watts, S. A. (2007). Evaluative feedback: Perspectives on media effects. *Journal of Computer-Mediated Communication*, *12*(2), 384-411.

iafor

Active Learning Spaces In Schools And Higher Education

A. Torres, Mariano Galvez University, Guatemala
P. Castro, Mariano Galvez University, Guatemala

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

Abstract
In today's world, globalization, technological and demographic changes make necessary and essential lifelong learning, while it is cooperative, global and universal. To achieve this challenge, is strongly required that schools and universities radically transform their educational systems and meet the demands to acquire the twenty-first century competencies. However, this can not be achieved without the necessary facilities (both, physical and virtual), the inclusion of the appropriate Pedagogy and technology, recognizing that people learn in different ways, motivating the students and accepting that learning is an inherent part of the daily life, therefore, permanent. This paper describes the importance of implementing Active Learning Spaces (formal and informal) in schools and Higher Education Institutions, which is justified through the collaborative Pedagogy, the needs and requirements of today's students, the involvement of educational technology and the use of Internet as a platform. Besides, it also presents the inclusion and adoption of these Active Learning Spaces by the schools of Mariano Galvez University (UMG), and its use by teachers and students.

Keywords: Active Learning Spaces (ALS), Collaborative Learning, Educational Technology, Pedagogy, Physical Space.

iafor
The International Academic Forum
www.iafor.org

Introduction

In the past two centuries, the world's population has grown considerably. As a result, global economies have experienced major changes. This, combined with other factors such as rapid technological development, the interdependence of modern societies and globalization make necessary for people to develop specific skills and expertise enabling them to enter in a social environment without training deficiencies. According to UNESCO countries whose populations acquire processing skills and knowledge construction applying them to work and daily life situations, may generate greater economic advantages over those countries that don't (UNESCO, 2002).

It is important to note that there are fundamental reasons to believe that to promote progress, development and modernization in societies, it is essential for people to have the abilities to build knowledge and the best form of use of this information. To achieve this, schools, universities and research institutions should be more involved in production processes, distribution and orientation of the use of this knowledge.

On the other hand, technological changes and the fact that modern societies should collaborate with each other, innovation and learning become essential (Chambers, 2010). According to this, it's necessary to change the traditional way of teaching, focusing in the learning process. However, classrooms are still relevant places where the teaching and learning process takes place. But learning occurs everywhere and at any time. Additionally, in the modern world, students are immersed in technology, computers and mobile devices, digital means and wireless communications, enabling them to create knowledge and share it with others no matter where they are. Nevertheless, the current educational system still uses classrooms in the traditional way. This is a contradiction when compared with the needs of the educational system that today's students require.

Methodology

Due to these reasons, Mariano Galvez University has considered three important aspects for their new Formal Active Learning Spaces: Technology and Physical Space to support Pedagogy, which integrated make up the framework used in the design of these new environments as well as a platform inside the classrooms to allow the teachers to develop in their students the skills, abilities and competencies that is required in today's society in any discipline.

Several experts and organizations worldwide have suggested many initiatives and frameworks in Learning Spaces Design. However, UMG is using the Pedagogy-Space-Technology Active Learning Eco-system (Corcorran & Scott-Webber, 2011).

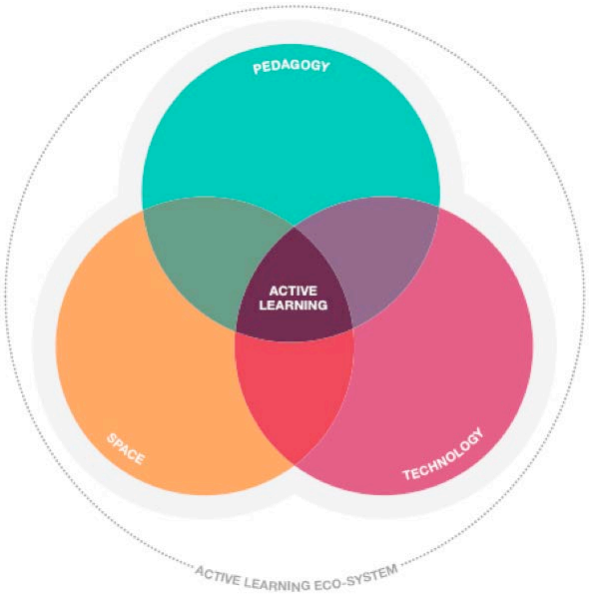

Figure 1: Active Learning Eco-System

It is important to note that Pedagogy always occupies the top position in this framework and should not change, since space and technology are the foundation on which Pedagogy is supported. In this model the Active Learning occurs in the intersection of the three areas.

The first important issue that UMG considered in the design of their Active Learning Spaces was the technology to support Pedagogy, as it plays a major role in the learning process of students of the modern world. The technological aspect has been so significant that some researchers have claimed that the thinking patterns of modern students have changed. They think and process information in a different way from past students (Prensky, 2001). With this in mind, UMG has been installing technological tools to support modern pedagogical strategies in every formal learning space. These tools are:

- An ultra-short throw projector that converts any plain surface into an interactive whiteboard.
- A document camera (digital presenter) to present any document in a digital way with videoconferencing and recording classes capabilities.
- A personal computer.
- Interactive software that makes possible to record what is written on the blackboard and to upload these educational files to the Learning Management System (LMS) to have a register of each class.
- Internet Access for everyone
- Sound
- An Audio and Video (AV) plate that permits to connect other mobile digital devices to the projection system such as tablets, iPads, netbooks, etc.

- An automation plate managed over the network that integrates all these resources. Besides, with these automation plates it is possible to control the projectors and to administrate all these equipment.
- A Learning Management System to support face-to-face classes.

Another aspect UMG has considered was the replacement of the old and traditional school desks by new flexible, confortable and ergonomic furniture that could be used in different ways. These attributes were appreciated using the "Node Chairs" that promote sharing information between peers in a very easy way and can be used in any pedagogical style. This flexibility is crucial since the change from a transmissive approach to the collaborative method, which cannot be completed from one day to the next, but can be done through time.

The University also needs security for the hardware installed in every environment. So, in every Active Learning Space there was placed a lectern or an IT table with adjustable LCD arms which hides away the PC monitor when not in use.

Besides the two preceding issues, UMG considered the 21st Century Pedagogy for today's students. At the present time, learning is based on understanding and development of new skills necessary for critical thinking and solving complex problems. Additionally, Pedagogy has evolved from a transmissive to a collaborative model, framed by constructivist theory, which holds that each student constructs his own understanding of knowledge adding new information to his current knowledge. This theory also dictates that learning is best when it is contextual, active and social, i.e., student´s understanding and engaging them in activities that use analysis and review through group discussions with partners and possible interventions with experts.

With this in mind, it is necessary to consider several pedagogical features in this modern educational world:

- Today's students are social. They like to get in touch with peers and therefore have preference to do group activities.
- Students are inclined to discover, explore, experiment and analyze critically.
- Modern learners are inclined more to "do" than to "listen".
- Learning must be student centered.
- Work must be interdisciplinary and project-based.
- Learning must be linked with reality.
- There are multiple intelligences and different learning styles.
- Learning should be comprehensive, permanent and meaningful.

All the technology and furnishing installed would be incomplete without the proper faculty training. With this in mind, UMG decided to design, develop and deliver continuously training for teachers. These courses were designed with three major pillars in mind (Brown & Long, 2006):

a) Active and social learning strategies
b) An emphasis in human-centered design
c) Technology that enrich learning

Taking this into account, each course has four units:

- Concepts of Active Learning Spaces and the use of the technology installed in every classroom
- Concepts of Pedagogy and Collaborative Learning
- How to use the learning management system as a support to face-to-face classes
- Web 2.0 tools.

To implement this project, Mariano Galvez University didn't hire external companies. Instead, the University used six teams from its Department of Innovation, Information and Technology. These teams are:

Technical Support: They are responsible for installing the pipelines, the data network and audio and video wiring. It is also a function of this team the installation, configuration and maintenance of the hardware.
Electrical Installation: For security reasons it was decided to make a new electrical wiring, thus this team has the responsibility to install the electrical pipelines and its respective wiring. They also made the electrical panels with the proper groundings.
Telecommunication: These are the people responsible for network configuration.
Infrastructure: For security and cosmetic reasons, it is required that the pipes and wiring should not be visible, so there is a team responsible for the installation of dry walls and finishing touches.
Development: Their function is to create web interfaces to use the Learning Management System and to keep the system working.
Center for Innovation in Learning: This unit is responsible to design and develop faculty-training courses.

In this way, Mariano Galvez University has transformed over 450 traditional classrooms into real Formal Active Learning Spaces to enhance student's learning, to facilitate a real commitment among students and teachers, students and peers, collaborative work in pairs and small groups, development of team projects, presentations by students to their peers, content creation and evaluation through problem-based curriculum. These new environments are used not only by the University but also by the schools that are part of UMG.

As mentioned before learning occurs anywhere, it means, learning not only happen in formal learning spaces, but also occurs in places where students gather to work in groups and share information. One of these places is the computer lab.

Although there is currently a tendency to reduce the use of computer laboratories, these are required, among other reasons, it is in these places where students have access to specialized software and which generally have an acquisition cost that is very high. Moreover, these informatic tools require very large features in the configuration of the computer equipment, making them too hard to come because of its high cost for the students. However, most of these laboratories are installed as traditional classrooms, made up of rows and columns of small desks equipped with computers arranged in a rectangular format and designed for the transmission of knowledge. This makes it very difficult to work in groups and collaboratively, as is required in the modern educational approach.

That is why Mariano Galvez University is implementing technological projects that develop in today's students the skills and abilities that are required in the new millennium as well as transform the way they learn. One of these highlighted projects is to implement multimedia in classrooms and laboratories in collaborative format which can be used for different functions, for example, computer-aided drawing classrooms. These classrooms and laboratories use a framework that promotes and develops learning in pairs, which integrates the concepts of teamwork, communication and co-creation, which revolve around collaboration supported by technology.

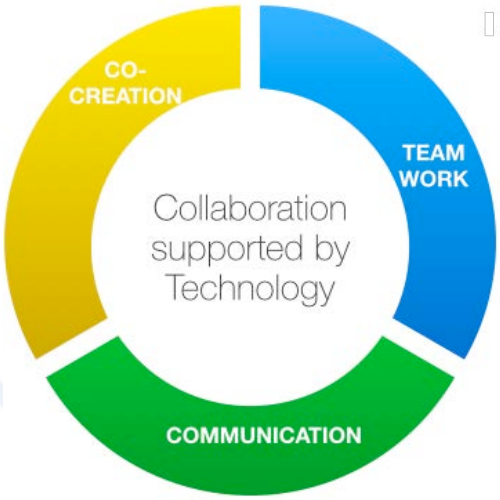

Figure 2: Computer Lab Framework

It should be noted that these new environments foster the transition from a transmissive to a collaborative teaching model, which can be used for formal or informal learning spaces, as well for individual work or for teamwork.

Nevertheless, students also need flexible spaces to accomplish their group activities. They use various areas across campus, such as corridors, libraries, gardens, cafes and areas room; it is in these places where the informal learning is done. That is why it is

necessary to provide in these areas, spaces with technology and furnishings that enable them to develop their activities according to their requirements.

For the design and implementation of these new spaces, the UMG also used a model (framework) in which the concepts of collaboration, socialization, and flexibility, supported by modern technological means, helps with the informal learning.

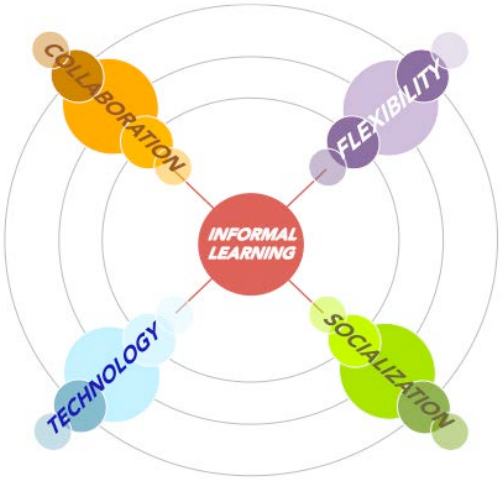

Figure 3: Informal Active Learning Spaces Framework

Results and Discussion

To evaluate these facilities about their use, two Web-based surveys were designed, one for teachers from high school and one for high school and University students. These questions are about their satisfaction and use of the new educational environments. Replies were received from 729 students and 37 teachers from high school. When asked the students about their satisfaction with the inclusion of these new environments, 84% of the students rated the new spaces between the ranges of "good" to "excellent". Additionally, 98% agreed they would not like to recover the traditional classrooms.

85% of the students from high school surveyed indicated that the inclusion of these Formal Active Learning Spaces has substantially improved their learning, and 55% stated they have changed the way they receive their classes considerably. This parameter reveals that teachers are changing the way they teach. In other words, they are migrating from transmissive pedagogical method to the collaborative.

The results showed that the majority of students from high school are very satisfied with these new environments and they have taken advantage of them in a good way. They also feel them comfortable and attractive.

When teachers took this survey the results were: 92% qualified the new Active Learning Spaces from ranges of "good" to "excellent" and 100% would not like to

recover the traditional classrooms. 88% said that these new spaces have improved student's learning and have changed the way they teach.

Other web-based survey was given to approximately 22,000 students from Mariano Galvez University (main campus only). Replies were received from 4,143 students with the following results: 67% rated the new educational environments from ranges of "good" to "excellent". 23% qualified the environments as "regular" but they indicated that the reason was of the old desks still placed in the classes because only the technology tools had been installed but not the new "Node Chairs", yet. 69% stated that they had improved their level of learning with the use of these new Active Learning Spaces.

Conclusions

Both surveys showed very similar results in all the questions and indicate that the majority of students and teachers are highly satisfied with the new environments. Additionally, both evaluations indicate that the new Active Learning Spaces have improved student learning and increased their sense of belonging to their institutions. However, the evaluations also showed that it is necessary to train teachers continuously not only in the use of technological tools, but also in Pedagogy and in didactic aspects.

This study was conducted with the inclusion of Formal Active Learning Spaces. Nevertheless, it is recommended a similar research for Informal Learning Spaces, which are located in libraries, corridors, cafeterias and places where students get together to work collaboratively.

For future perspectives for research it is highly recommended to make studies on the impact of the inclusion of these new environments within specific disciplines.

Acknowledgements

First of all, UMG recognizes that God has helped us and has given us everything to implement this project. As a Christian University we believe that all that we accomplish is because of the Grace of God. We share our faith, by placing a biblical verse in all of our new Active Learning Spaces. Subsequently, the installation of the new Active Learning Spaces has involved a range of stakeholders and a number of people and departments of the University who have worked as a team to reach the goal. Finally, the authors would like to thank the teachers and the students who participated in the research as a group of participants who took the time to reply the web-based surveys.

References

Dede, C. (2005). Educating the Net Generation, Chapter 15. USA. Educause.

Prensky, M. (2001). Digital Natives, Digital Immigrants (Vol. 9 No. 5). USA. MCB University Press.

Emery, R. (2012). Priorities in the Classroom: Pegagogies for High Performance Learning Spaces in Informed Design of Educational Technologies in Higher Education: Enhanced Learning and Teaching. Berkeley, California. USA.

Poole, P., Wheal, A. (2011). Learning, Spaces and Technology Exploring the Concept. UK. Canterbury Christ Church University and JISC.

Radcliffe, D., Wilson, H., Powell D., Tibbetts, B. (2009). Learning Spaces in Higher Education: Positive Outcomes by Design. The University of Queensland and Australian Learning & Teaching Council. Australia.

Bransford, J. (2000). How People Learn Brain, Mind, Experience, and School. USA. National Academy Press.

Corcorran, S., Scott-Webber, L. (2011). Active Learning Spaces Insights, Applications & Solutions. USA. Pencils Down.

Moore, M., Tait A., Zaparovanny, Y. (2003). Aprendizaje Abierto y a Distancia –Consideraciones Sobre Tendencias, Políticas y Estrategias-. Uruguay. UNESCO.

Chambers, J. (2010). The Learning Society. USA. Cisco Systems, Inc.

Chambers, J. (2008). Executive Action Plan. USA. Cisco´s Global Education Group.

Brown, M., Long, P. (2006). Trends in Learning Space Design. In: Oblinger D. (Ed.). Learning Spaces. USA. Educause.

Contact email: atorres@umg.edu.gt

iafor

COOL Informatics: A New Approach To Computer Science and Cross-curricular Learning

Barbara Sabitzer, Alpen-Adria-Universität Klagenfurt, Austria
Stefan Paster, Alpen-Adria-Universität Klagenfurt, Austria

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

Abstract
Children grow up as "digital natives", but nevertheless, they don't know the concepts behind technology and they don't choose technical careers because of different reasons. In many countries there is a lack of experts, particularly females, in technology and computer science. Reasons for this situation may be missing interest or the belief that technology is (too) difficult and complex. Hence, it is necessary to arouse the interest in children and to reduce or avoid fears of technology. These are the main aims of COOL Informatics, a teaching approach developed at our university including the principles *discovery, cooperation, individuality* and *activity*. It was introduced on different levels of education and shows that informatics is "cool" in the sense of motivating, fun and "easy" by exploring its core concepts in a playful and illustrative way. It is partially based on approaches like CS unplugged, but it goes further: It uses informatics concepts like algorithms or modeling to support learning in other subjects from elementary education up to university level. The paper gives some examples for different school levels and reports on experiences of students and teachers as well as on empirical results of some pilot projects. Summarizing them, the following core messages can be made: we could enhance the understanding of complex informatics contents and increase the interest in computer science.

iafor
The International Academic Forum
www.iafor.org

Introduction

Today's society has changed. Hence, teaching and learning should change, too. This is all the more the case in Computer Science Education, Informatics and Technology. Today's children are sometimes called digital natives because they are growing up with computers and smartphones. But, growing up with technology and using it every day does not imply responsible and correct use. It doesn't imply either that today's children and adolescents learn more about the concepts behind technology, neither in informal nor in formal learning settings. Despite growing up with technology, only a few adolescents choose a technical career like computer science. Hence, increasing interest in technology and teaching it in a way that motivates students and supports their understanding and learning, is of central importance for meeting the current lack of qualified technical staff.

In Austrian schools computer science education is not organized uniformly. With the exception of some schools with a special IT-orientation, computer science only starts in the 9th grade, at the age of 14. This may be late for arousing interest in technology. Consequently, a central question of this thesis is: What can schools and teachers do to promote interest and enthusiasm for technology in children? Our personal answer is: We should show that informatics is "cool" by using it as a tool and integrating informatics concepts in all subjects and on all levels. This is why we introduced the COOL Informatics approach where COOL refers to the following three meanings:

1. "Cool" as motivating, interesting, fun and effective.
2. COOL as COoperative Open Learning refers to an Austrian teaching model based on the Dalton-Plan (Greimel-Fuhrmann, 2006; COOL Impulszentrum) that offers thematic, methodic and institutional openness as well as cooperation on different levels and between different subjects.
3. COOL as COmputer-supported Open learning refers to all forms of technology-supported learning, like CSCL (Computer-supported Collaborative Learning), E-Learning or Mobile Learning as well as eCOOL, the E-Learning variant of the COOL teaching model.

A playful, fun and "cool" approach to technology and informatics that is implemented during early childhood could do more than raise interest and lay a good foundation for logical and computational thinking. It may also mitigate fears or gender differences regarding interests and performance in technical subjects. An interdisciplinary and cross-curricular use of computer science concepts (NOT only computers) does not only offer more possibilities of practice for more sustainable learning. Besides showing a wide range of application areas of computer science, it can also foster creativity as well as cross-linked thinking and it can support teaching and learning in other subjects.

"COOL Informatics" is not simply a combination of these fields, but it goes further. On the one hand it extends the aspect of computer-supported learning to "computer science-supported" by implementing core concepts of informatics in other subjects (e.g. modeling or algorithmization in foreign languages). On the other hand, it offers a new framework for other subject specific didactics and shows how to put in practice what neurodidactics proposes for effective teaching and learning.

Corresponding to the different meanings, the theoretical background of the "COOL Informatics" approach includes numerous teaching concepts and methods as well as a wide range of related work. It would go beyond the scope of this paper to consider all these fields in depth. As a result, only the most relevant literature is cited in the context of each realm.

Concerning the first meaning of "cool", it can be seen from a teacher's or a student's perspective. "Cool" from a teacher's view means effective as summarized by Erlauer (2003):

> "Effective teachers are using multimodal strategies such as hands-on discovery, discussion, experimentation, high-level thinking and problem solving, activities involving all multiple intelligences, offering choices, authentic learning and assessment, tying learning to emotions, and collaborative learning for teaching and assessment." (Erlauer, 2003, p. 131)

This includes concepts and methods applied for centuries by good educators and teachers as the following statements of famous people show:

(1) "Tell me, and I will forget. Show me, and I may remember. Involve me, and I will understand." Confucius (551 – 479 B.C.)
(2) "You cannot teach anybody anything. You can only help them discover it within themselves." Galileo Galilei (1564 – 1642)
(3) "Help me to do it myself. The teacher thus becomes a director of the children's own spontaneous work. S/he is silent and passive." Maria Montessori (1870 – 1952)

These quotes (Brainyquote, 2011-2014) are part of progressive pedagogy and/or constructivist learning theories and most of them already anticipate the findings of neurodidactics (Sabitzer, 2011). They refer to teaching methods proved as effective in different empirical studies and summarized in a meta-study (Hattie, 2009). Hattie ranks the following methods as effective: *learning by doing* or *active learning*, *questioning*, *cooperative learning*, *small group learning*, *peer tutoring* and the use of *worked examples* (Hattie, 2009; Renkl & Atkinson, 2002).

From a student's view the adjective "cool" means fun, interesting and/or useful. This is one aim of neurodidactics and can be satisfied by using games in the classroom, not only by playing but also by designing them (Claypool, 2005). This is the context of research in game-based learning, educational games, serious games (Conolly et al., 2012) or learning by simulation (Bollin, 2012). Similar animation is offered in CS Unplugged (Bell et al., 2009) or Informatik erLeben (Mittermeir, Bischof & Hodnigg, 2010). These approaches teach informatics concepts in primary schools without using computers. The children slip into the role of hardware components or data and animate them. This is a very effective and sustainable form of learning as demonstrated in a variety of studies (Bell, Lambert & Marghitu, 2012; Bischof, 2011).

The second meaning of "COOL" (COoperative Open Learning) refers to an Austrian teaching model that has been developed by teachers in a vocational high school, in cooperation with a school in Denmark. It is based on the Dalton Plan of Helen Parkhurst and combines two approaches, *open learning* as well as c*ooperative* or *collaborative learning*. Up to now only a little research has been done concerning

COOL, but the few results confirm its effectiveness, e.g. (Greimel-Fuhrmann, 2006). A qualitative study, accomplished in a vocational school, shows a wide acceptance among teachers and students (Windbichler, Haslauer & Marschnig 2012).

Scientific research that is relevant in the context of COOL focuses only on one of its aspects. Many studies prove the efficiency of cooperative learning as already mentioned above (Hattie, 2009; Roseth, Johnson & Johnson, 2008, Porter et al., 2013). Regarding open learning, the results are fragmentary and not uniform. This is due to its varying definitions according to the different aspects and grades of openness (Peschel, 2006; Bohl & Kucharz, 2010).

"COOL" as Computer-supported Open Learning refers to all forms of technology use for learning and teaching, which includes E-Learning, Computer-supported Collaborative Learning (CSCL), Technology Enhanced Learning (TEL), Mobile Learning, One-to-One TEL as well as Web 2.0 or Learning 2.0 etc. Literature in this field is numerous for different subjects, especially for language learning. Contemporary aspects of computer-assisted language learning (CALL) and different CALL learning environments are described in (Thomas, Reinders & Warschauer, 2013). Their "Project Tomorrow" summarizes results of empirical studies in the USA concerning the benefits of online learning, personal access to mobile devices, needed ICT-skills, the role of parents and school infrastructure.
Mobile Learning, too, is more and more studied and regards different aspects like accessibility (Speak up, 2011), acceptance (Demouy, Eardley & Kukulska-Hulme, 2013), efficacy, mainly because of increased motivation (Sandberg, Maris & de Geus, 2011), and design (Wu et al., 2012).

COOL INFORMATICS

The COOL Informatics Approach

The teaching approach "COOL Informatics" is based on neurodidactical principles and contains four main principles. The following table (Sabitzer, 2014) shows the related teaching and learning methods as well as their neurodidactical basis.

"COOL Informatics" – Overview		
Principle	**Teaching and learning methods**	**Neurodidactical basis**
1. Discovery	Solution-based learning (worked examples) Step-by-step instructions + tasks Observational learning Video tutorials Hands-on, Minds-on Learning with all senses	Pattern recognition Mirror neurons Individual learning rhythm modality / multimedia effect
2. Cooperation	Team and group work Peer tutoring and -teaching Pair programming Cross-curricular learning Project-based learning	"A joy (=knowledge) shared is a joy (=knowledge) doubled." Recall = re-storage in long-term memory Integrating individual needs, talents and competences as well as practical relevance

3. Individuality	Competence-based learning Questioning Self-organized learning with compulsory and optional tasks	Connecting new information to previous knowledge, Considering individual interests, needs, tasks, methods and learning rhythm
4. Activity	Hands-on, Minds-on Learning by doing Learning by animation, simulation and playing Learning by playing and designing games (creative learning)	Knowledge must be newly created (constructed) by each learner (= constructivism) Learning is an active process (=progressive education)

Up to now, the COOL Informatics approach has been tested in some pilot projects in primary, secondary and higher education. These projects apply all COOL Informatics principles, but evaluate different main aspects. Table 2 shows an overview ordered by their main aspect (*Informatics – A Child's Play*, *COOL Informatics* and *Brain-based Teaching*).

Time	Project	Aims/Content	Target group & level
Brain-based Teaching			
2012- 14	Brain-based Programming	Increasing understanding and learning success in object-based programming	Bachelor students of Informatics, Economics, Math
COOL Informatics – cross-curricular			
2011/12	Informatics for Language	Cross-curricular learning and projects, applying informatics and computer-supported open learning in language lessons,	Students of a vocational high school for tourism and commerce
2013	COOL Informatics	Developing "cool" cross-curriular units and tasks	Master students in teacher education
Informatics – A Child's Play Raising interest and teaching Informatics concepts in a "cool" and playful way			
2012/13	Exploring and Discovering Informatics	Based on neurodidactics	Students of primary school, 3rd and 4th grade
2013/14	Young children learn from older	Applying learning by teaching	Students of primary and lower secondary school
2014	Informatics-Lab	Developing and testing teaching materials for different subjects	Children from five years on, primary and secondary school, all levels

The following section describes examples for applying COOL Informatics on different educational levels.

Exploring and discovering Informatics in Primary Education

The project "Exploring and discovering Informatics" ("Informatik erforschen und entdecken"), carried out in an Austrian primary school, is an example of "COOL" and brain-based teaching in a lower level of education (Elsenbaumer 2013; Sabitzer & Elsenbaumer 2013).

Students from a third and a fourth primary school class should learn the important informatics concepts and get curious about this area of science. The main aim was to

prepare the children for life, which includes many elements from informatics (Elsenbaumer 2013). The project was implemented from January to May 2013 in 14 days intervals in each class. Each unit lasted two hours and among others the following topics (in part based on Informatik erLeben (Mittermeir, Bischof and Hodnigg 2009)) were included (the numbers in brackets refer to the number of the applied principle of COOL Informatics in table 1):

Hardware unit: During the unit students slipped into the role of specific hardware components and simulated how they work together (2, 4). Also real hardware was shown and could be touched by the students (1). The creation of a memory game represented the conclusion of the first unit (3, 4).

Encryption unit: In this unit students should learn some simple mechanics from encryption. To make this content interesting for the students the unit started with an encrypted text (1), they could not understand. It was started with simple encryption algorithms like Caesar-cipher, which was decoded by using a wheel like in figure 1 (1, 4).

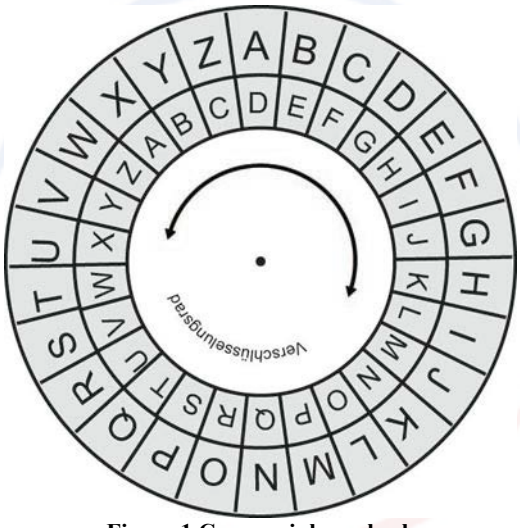

Figure 1 Caesar-cipher wheel.
From: http://qig.itp.uni-hannover.de/quanth/images/b/b9/A3_ceasar_rad_a_d.jpg

Flash drive and text editor unit: After the second unit the students should come in touch with working computers and standard software programs. For this purpose two units were planned. The first of them had the aim, that students learn how to use a USB memory stick correctly and how to store a text-document on them. In teams of three students (2) they had to plug in the USB memory sticks, open a text-document, which included the beginning of a story, with an appropriate editor, add some sentences to continue the story, store the text-file on the USB memory stick and safely remove the USB memory stick from the computer. Then they passed the stick to another group and got themselves a new stick, which contained a text-document with a different story. They had to repeat the process until each group has passed each stick (3, 4).

PowerPoint unit: In the second unit with standard software programs the students should learn how to handle the presentation software PowerPoint. Again the students created pairs or groups of three people (2). One of the students had to have previous knowledge in PowerPoint or at least in the handling of a computer. The task was to

independently work in these groups and to create an own presentation. On a USB memory stick they could find learning videos (1), which described the handling of PowerPoint step-by-step (Elsenbaumer 2013; Sabitzer & Elsenbaumer 2013).

Boolean algebra and logic unit: This unit should introduce logic operators, Boolean algebra and digital circuits to the students. It started with some questions about what the children think that logic and logical thinking mean and if there exists a relation with computers. During the next step a story about a birthday party where only guests with a costume AND a present get a piece of the cake was told. Together with the students the teacher showed how this story can result in a truth table (1). After that the students had to try it on their own (2, 4) and find out how the truth table works when the guests in the story have to wear a costume OR bring a present. The truth tables were filled with child-friendly symbols like smileys for the persons and cards with check marks (yes) or crosses (no) in order to indicate if the condition is true or false. In a further step the children had to write down their own stories containing an AND- or an OR-condition (3, 4).

COOL Informatics in Secondary Education

In a secondary school we focused on Mobile Learning as one aspect of COOL in the sense of Computer-supported Open Learning. As described in (Sabitzer & Pasterk 2014a) we implemented mobile learning in the author's secondary high school of tourism and commerce in three steps. First of all, we checked the equipment of the students and their usage habits concerning mobile phones and mobile learning. Then we offered workshops about mobile learning in language lessons and carried out a cross-curricular project on app programming in Applied Informatics and Spanish. In part the tasks were developed in the Master Course "COOL Informatics – Cross-currricular Concepts" at our university.

Brain-based Programming in Higher Education

"Brain-based Programming" is the name of a project that started with its pilot phase in winter 2012 at the author's university and is described in (Sabitzer & Strutzmann 2013). The main aims of the project were to create and evaluate a brain-based script for beginners in Java programming and to implement and evaluate brain-based teaching methods in an introductory programming course. Interesting for this paper are the structure and the methods, which were used during the experiment. Basic elements for the brain-based courses are especially for this purpose developed brain-based tasks and an adapted lesson structure called brain-based lessons. The exercises contained reading exercises, with for example complete pieces of Java program code and questions about this code or Step-by-step instructions (1, 3), competence-oriented tasks, with a big variety of different tasks to choose from following the student's interests (3), and programming tasks, with one big and complex Java project, which is worked out in small pieces during the semester.

During the lessons the students with good programming skills acted as peer-tutors or peer-teachers and helped their colleagues by answering their questions (2, 3.). The lesson structure was adapted and divided into a asking questions phase at the beginning, to give the students and peer-tutor the chance to work out answers to their questions (2), a discovering phase where the students discovered new content or to

recall topics they already knew with the help of reading exercises or short video clips (1, 2, 4), and finally a laboratory phase, to work on their exercises from the worksheets in teams of two people (2, 4) (Sabitzer & Strutzmann 2013).

EVALUATION AND RESULTS

For the evaluation of the "COOL Informatics" approach, qualitative and quantitative research methods depending on the main aspects are applied:

With questionnaires, informal feedback letters and open interviews with students and teachers in all projects studied the acceptance of COOL Informatics.

The learning outcomes in all projects are measured by immediate questions of the teachers, observation of the students' activities and, in the project Brain-based Programming, by two written exams.

The collected data of the pilot projects allow the following core statements:

- Students and teachers were satisfied with this approach.
- Learning and understanding of computer science concepts could be improved.

Acceptance of "COOL Informatics"

As COOL Informatics is a new approach that requires unusual teaching and learning methods, we were interested in the acceptance among teachers and students, their satisfaction, the preferred teaching methods and tasks as well as the practicability of different aspects of "COOL Informatics" in different schools and on different levels.

The qualitative evaluation of the "COOL Informatics" approach on three levels and different aspects shows the following main results:

(1) Brain-based Teaching

The following main results are taken from different non-standardized questionnaires (at the beginning, half and end of the semester), the official course feedback after the mid-term and the final exam, non-structured interviews with teachers and students as well as a SWOT-Analysis:

- Students and teachers liked the relaxed atmosphere in the courses.
- Students (learners and peer tutors) highly appreciate the possibility to get help anytime and from different people (colleagues, peer tutors, teacher).
- They like the possibility of free choice concerning tasks, topics and material.
- The most useful methods in the courses were discovery learning, peer tutoring and pair programming respectively team work.
- The most useful tasks were all forms for discovery learning: step-by-step exercises, reading corners, video-tutorials, mini exercises with solutions;
- The peer tutors indicated that they learned more than in a traditional classroom setting: They even learned contents exceeding the frame of the actual course content because they had to check the in books or to ask the teacher.
- The preparation of different material is too much work for teachers.

(2) Informatics – A Child's Play

- Child-adequate approach increases interest and motivation.

- The initially reluctant attitude towards informatics of primary school teachers changes after an introductory workshop showing the connections to the curriculum. They are surprised that they already use informatics concepts (e.g. algorithms).

(3) COOL as Computer-supported Open Learning

- Technology-supported learning, especially mobile learning, seems to be more motivating and "cool" than traditional learning methods.
- The relaxed atmosphere in the courses (for teachers and students);
- The possibility to ask different people and the possibilities of choice concerning tasks, topics and material.
- Self-responsibility or free work is sometimes misunderstood as "free and nothing to do".
- Teachers have fear of unexpected questions and technical problems.
- Assessment is difficult.

Learning outcomes

Concerning the learning outcomes we investigated in our projects if
(1) teaching by considering neurodidactical principles (brain-based teaching) could increase understanding and learning of informatics at university level and
(2) children can understand and learn core concepts of informatics when they are taught in a playful way and integrated in other subjects in primary schools.

(1) Brain-based Teaching

The main results for this aspect come from the project of "Brain-based Programming" with the aim of improving learning and understanding in Bachelor programming courses. After a successful pilot phase in 2012/13 (one group), the learning outcomes were tested (in two written exams, the same for all parallel groups) and evaluated in three experimental groups and compared to the four parallel groups as well as to the results of the three preceding years. Summarizing the results of the project it can be said that this concept is more effective than the traditional methods used in the courses up to now. The evaluation of 2014 (Sabitzer & Pasterk 2014b) reveals

- a higher success rate in the practical groups (52% instead of about 40% as usual);
- significantly better results in the first exam (comparison of the achieved points, t-test for independent groups, $p = 0.008$, Cohens $d = 0.42$);
- female students benefit even more (Cohens $d = 0.58$);
- better results in the second exam: The average of achieved points in the experimental groups was 10.73 (control groups 8.64) with a standard deviation of 6.98 (control groups 8.64).

These positive results should be interpreted as only cautiously optimistic. Empirical studies in this context are continuing and a closer look will be taken at special factors like the impact of discovery learning, gender and other personal aspects, as well as to problems during the implementation of the concept.

(2) Informatics – A Child's Play

The learning outcomes of the children participating in the pilot projects of "Informatics – A Child's Play" (Exploring and Discovering Informatics, Young

children learn from older, Informatics-Lab) were measured by immediate questions of the teachers and observation of the pupils' activities. Summarizing it can be said:

- Games and animations help to understand complex topics.
- They seem to support sustainable learning.
- Also young children are able to understand and learn core concepts of informatics.

CONCLUSION

The evaluation results in different schools and university courses indicate that the approach of "COOL Informatics" is not only appreciated by students and teachers of all levels, but also effective if it is taught in an appropriate way, like the projects "Brain-based Programming" demonstrated. The new teaching concept of the same name developed in this project got very good feedback from the participating students as well as from the teachers. The evaluation results further show that the concept is effective and has benefits especially for female students. This may be due to the applied cooperative learning methods, as females are generally more communicative and accustomed to solving problems by talking about them (Coan, 2008). Furthermore it seems that all exercises for discovery and step-by-step learning support the understanding of complex topics and hence also improve the learning outcomes. The gender gap usually observed in informatics education may be avoided if core concepts are taught already in primary schools. The pilot projects of "Informatics – A Child's Play" could not only increase the interest in computer science but also showed that girls are equally interested and talented for this subject. In any case, the gender aspects as well as the successful integration of COOL Informatics in primary education should be studied more in detail.

References

Bell, T., Alexander, J., Freeman, I., & Grimley, M. (2009). Computer Science Unplugged: School Students Doing Real Computing Without Computers. New Zealand Journal of Applied Computing & Information Technology, 13(1).

Bell, T., Lambert, L., & Marghitu, D. (2012). CS unplugged, outreach and CS kinesthetic activities. In Proceedings of the 43rd ACM technical symposium on Computer Science Education (p. 676). ACM.

Bischof, E. (2011). Interventionen im (Informatik-) Unterricht. Ein Versuch bei SchülerInnen das Bild der Informatik zu erweitern. Dissertation. Alpen-Adria Universität Klagenfurt.

Bohl, T., & Kucharz, D. (2010). Offener Unterricht heute: konzeptionelle und didaktische Weiterentwicklung. Beltz.

Bollin, A., Hochmüller, E., Mittermeir, R., Samuelis, L. (2012). Experiences with Integrating Simulation into a Software Engineering Curriculum. In: D. Chen, M. Baker, L. Huang (Ed.): Proceedings of 25th IEEE Conference on Software Engineering Education and Training CSEET 2012, 17-19 April 2012, Nanjing, Jiangsu, China. Los Alamitos (CA): IEEE Computer Society Press, April 2012, pp. 62-75.

Brainyquote (2001-2014). Retrieved from http://www.brainyquote.com.

Claypool, K., & Claypool, M. (2005). Teaching software engineering through game design. SIGCSE Bull., 37(3), 123–127.

Coan, R. W. (2008). Masculine, Feminine, and Fully Human. Author House, Bloomington, USA.

Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. Computers & Education, 59(2), 661–686.

Demouy, V., Kan, Q., Eardley, A., & Kukulska-Hulme, A. (2013). Using mobile devices for language learning in a higher education distance learning context: motivations and behaviours.

Elsenbaumer, Sabrina. 2013. Neurodidactics in Practice. A Practical Approach to Introducing
Informatics into a Primary School in a Brain-based Way. Unpublished Diploma Thesis, University of Klagenfurt.

Erlauer, L. (2003). The brain-compatible classroom. ASCD, Alexandria, USA. Retrieved from:
http://zung.zetamu.net/Library/Education/Education_Neuroscience/Erlauer_The_ Brain-Compatible_Classroom_2003.pdf

Greimel-Fuhrmann, B. (2006). Was ist und was kann Cooperatives Offenes Lernen (COOL)? Neues Unterrichtskonzept. Charakteristika, Chancen und Risiken. wissenplus 3-06/07. Retrieved from: http://www. wissenistmanz. at/wissenplus/zeitschrift/archiv/heft-3-2006-07/wp3_0607_imfokus.pdf (13.11. 2009).

Hattie, J. 2009. *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement.* Taylor & Francis, London, New York.

Mittermeir, R.T., Bischof, E., Hodnigg, K. (2010). Showing Core-Concepts of Informatics to Kids and Their Teachers. In: Hromkovič, J., Královič, R., Vahrenhold, J. (eds.) *Teaching Fundamental Concepts of Informatics ISSEP 2010*, LNCS 5941, pp.143-154. Springer, Heidelberg.

Peschel, F. (2006). *Offener Unterricht-Teil 1: Allgemeindidaktische Überlegun*gen. 4. Auflage, Schneider Verlag Hohengehren.

Porter, L., Bailey Lee, C., & Simon, B. (2013). Halving fail rates using peer instruction: a study of four computer science courses. In Proceeding of the 44th ACM technical symposium on Computer science education (pp. 177–182). ACM.

Renkl, A., & Atkinson, R. K. (2002). Learning from examples: Fostering self-explanations in computer-based learning environments. Interactive learning environments, 10(2), 105–119.

Roseth, C. J., Johnson, D. W., & Johnson, R. T. (2008). Promoting early adolescents' achievement and peer relationships: The effects of cooperative, competitive, and individualistic goal structures. Psychological bulletin, 134(2), 223.

Sabitzer, B. (2014). *A Neurodidactical Approach to Cooperative and Cross-curricular Open Learning: COOL Informatics*. Habilitation thesis. Alpen-Adria-Universität Klagenfurt.

Sabitzer, B. (2011). *Neurodidactics: Brain-based Ideas for ICT and Computer Science Education.* In: The International Journal of Learning, Champaign (IL): Common Ground Publishing 18, pp. 167-177.

Sabitzer, B., & Elsenbaumer, S. (2013). Exploring and Discovering Informatics - An Example of Teaching Informatics in Primary Schools. In: proceedings of ICERI 2013, 6th International Conference of Education, Research and Innovation, Seville, Spain, 18-20 November.

Sabitzer, B., & Strutzmann, S. (2013). Brain-based Programming. In: Proceedings of IEEE Frontiers in Education, Oklahoma City, Oklahoma, US, October.

Sabitzer, B., & Pasterk, S. (2014a). Mobile Learning for COOL Informatics: COopertive Open Learning in a Vocational High School. In: Proceedings of the 6th international Conference on Computer Supported Education, Vol 3, S. 232 - 239, SciTePress - Science and Technology Publications.

Sabitzer, B., & Pasterk, S. (2014b, in press). Brain-based Programming continued. In: Proceedings of IEEE *Frontiers in Education*, Madrid, Spain.

Sandberg, J., Maris, M., & de Geus, K. (2011). Mobile English learning: An evidence-based study with fifth graders. Computers & Education, 57(1), 1334–1347.

Speak Up (2011). The new 3 E's of education: Enabled, Engaged, Empowered, How today's students are leveraging emerging technologies for learning. Project Tomorrow. Retrieved from http://www.tomorrow.org/speakup/pdfs/SU10_3EofEducation_Students.pdf.

Thomas, M., Reinders, H., & Warschauer, M. (2013). Review of contemporary computer-assisted language learning. Announcements & Call for Papers, 26.

Windbichler, R.; Haslauer, M.; Marsching, C. (2012). Dokumentation eines schulbe-zogenen Entwicklungsprojektes für Cooperatives Offenes Lernen. Unpublished report.

Wu, W.-H., Jim Wu, Y.-C., Chen, C.-Y., Kao, H.-Y., Lin, C.-H., & Huang, S.-H. (2012). Review of trends from mobile learning studies: A meta-analysis. Computers & Education, 59(2), 817–827.

Tweeting The Disasters: A Sample From Geography Course

Ayse Akkurt, Gaziosmanpasa University, Turkey

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

Abstract
It has been a necessity to select and use popular information technologies depending on the content of the course in order to meet the learning needs. In this study, the following of up-to-date information about disasters was ensured in "Geography of Disasters" course during a semester by using Twitter, some information, precautions and news about the disasters both in Turkey and around the world were shared, the contributions and comments were done related to them in a variety of periods. Teacher candidates were asked to reply the tweets about the future of the earth shared by the lecturer. With the application of Twitter, it was aimed for teacher candidates to express their information or thoughts within 140 characters, to have knowledge about the information technologies; to raise awareness of disasters happened in Turkey, to find solutions related to them, and to share their solutions in-person. The study group was composed of 65 teacher candidates with 35 women and 30 men. In the data collection tool, there are questions about their twitter usage before/and in educational setting, and 23-item content-based test with 5-point likert type. As a result of the study, teacher candidates indicated that they had information about disasters both happened in the past and present, their motivation towards the lesson raised, their ability to comment on the disasters developed thanks to Twitter, they didn't use Twitter in an educational setting before but when they became teachers, they would certainly use it, and finally the communication within the classroom improved.

Keywords: geography, geography education, twitter, disaster, geography of disasters

1. INTRODUCTION

Growing rapidly as a microblog since 2006, Twitter is one of the most popular social media tools which is reached effectively, easily and freely by the users through a variety of communication devices such as computers and cellphones. The users can share their opinions, photos, videos and web addresses within 140 characters, and other users Express their thoughts about those shares and re-share them with the people in their own networks (Yukselturk, 2013).

Twitter is an actively used platform in Turkey as well as the World. As a matter of fact, according to the Twitter usage figures, the country where the Twitter is most common is Turkey. Twitter user number is 11,337,505 in Turkey with 36,455,000 internet users. In other words, 31.1% of the internet users in Turkey also use Twitter (Webrazzi, 2013). Besides, the number of Twitter users in Turkey has been increasing in recent years. The share of Turkey in the World in 2012 was 1.7% on the basis of the number of Twitter users (Webrazzi, 2012). This share increased to 6% in 2013. Moreover, one out of three internet users in Turkey uses Twitter (Webrazzi, 2013).

Twitter, used in Turkey commonly, can be used for a variety of purposes. Some of them are (Kazanci, Donmez, 2013, 44);

- With a limitation of 140 characters, it can help the students improve their writing skills through the activities requiring the usage of reflection, feedback and opinion and summarizing techniques.
- It can be used in classroom activities.
- It can help shy students to participate in the activities.
- It makes it easier to create an environment where everyone can express his/her opinions, realize the different perspectives and improve his/her critical thinking skills.
- It can be used as a supportive course material instantly.

As already known, modern education supported by technology and novel technologies that can be selected in accordance with the course content make it possible to reach the *lifelong learning* goal in terms of both the improvement of the course and the personal development of the students.

With reference to the use of Twitter in education, the Disasters Geography course into which the Twitter integrated, has some goals such as introducing a variety of disasters occurred on earth, keeping students informed about the disasters occurred in a variety of countries through the human history, teaching the precautions against the disasters and help them understand the contributions of the geography discipline.

With the Twitter application in the Disasters Geography course, it is aimed for the candidate teachers to express their thoughts or knowledge briefly within the 140 characters, acknowledge the information technologies, increase their awareness by pointing out the disasters occurred in their geography and in the world with the help of the activities that they can participate effectively without getting bored, generate solutions to the problems related to the disasters and share them.

The defined sub problems within this context are as follows:

1- What are the opinions of the candidate teachers about the use of Twitter in an educational setting and Disasters Geography course in terms of the learning and motivation to the lesson?
2- What are the candidate teachers' opinions about the use of Twitter in the Disasters Geography course with regards to whether it creates awareness and knowledge about the disasters and current events in the world and Turkey?
3- What are the candidate teachers' opinions about whether the Twitter use in the course contributes to their skills on interpreting the disasters?

2. METHOD

2.1. Research Design: A descriptive method (Buyukozturk et al., 2013) was used in this study.

2.2. Participants: composed of 65 second grade candidate teachers currently studying at Gaziosmanpasa University Faculty of Education Department of Social Studies Teaching. 35 (54%) of the participants were female and 30 (46%) were male.

2.3. Data Collection Procedure: The Twitter was used for 14 weeks during the 2013-2014 academic year spring semester. At the end of the semester, the opinions of the students were gathered. The students were informed about the use of Twitter at the beginning of the semester. A Twitter account was created by the lecturer named as the Disasters Geography which was also the title of the course. Each student was asked create their own accounts. Each student added the Disasters Geography course account and other classmates, and they followed these accounts. The lecturer shared a sample related to the topics of the first week to be an example. Also, the list consisting of the names of the students that would share something weekly throughout the semester was shared with the students. In this list, there were the share topics and their weeks of the student groups composed of 6 or 7 people. The topics shared are as follows: the news about the major destructions in the world, the disasters in the world in the last six months, the disasters in Turkey in the last six months, the disasters in the world in the last month, the disasters in Turkey in the last month, the disasters in the world in the last week, the disasters in Turkey in the last week, the disaster prevention efforts in the world, the disaster prevention effects in Turkey.

The lecturer sometimes asked questions to the students after the lessons through her Twitter account and made the candidate teachers interpret the topics (Photo 1.). The lecturer also checked the shares of the student groups in the about the predetermined topics and time. The feedback was given to the students in the following week.

Photo 1. A capture from the tweets of the students.

2.4. Data Collection Tool:

In the data collection tool with 22 items in 5 Likert type, there are items consisting of opinions about the effects of the Twitter use in educational setting and Disasters Geography course on the learning and motivation to the lesson, creation of awareness and knowledge about the disasters and current events in Turkey and the world and the skill to interpret the disasters. During the preparation of the data collection tool, the specialists were consulted.

2.5. Data Analysis:

The data were examined by descriptive statistical analysis method and then interpreted. The findings about the items averages and standard deviations are demonstrated as a table.

3. FINDINGS AND DISCUSSION

The data in this section was interpreted under the tables.

The Findings Related to the First Research Problem

Table 1. The candidate teachers' opinions about the use of Twitter in the educational setting and Disasters Geography course in terms of the learning and motivation to the lesson.

Item Number	Item	M	SD
7	It seemed boring because I am not interested in technological devices and social networks.	1.81	1.03
8	I don't think that Twitter is instructive.	2.17	1.26
9	I use Twitter normally. but I didn't follow much since it appeared to me as a lesson.	1.68	.89
10	I find Twitter really boring.	2.03	1.01
11	I think that the Twitter should be used in education.	4.02	.83
12	I can tell that it had a positive influence on my perception about the Geography course.	4.34	.71

13	Using Twitter in Disasters Geography course led me to be interested in the course.	4.09	1.08
18	I can tell that it is effective in increasing my motivation to the lesson.	4.08	1.02
19	I don't like Geography even if there are different applications.	1.57	.98
20	The shares in Twitter arouse interest in Geography course.	4.16	.89
21	I think that following anything about the Disasters Geography course in Twitter is a waste of time.	1.49	.79

Items 7, 8, 9, 10, 11, 12, 13, 18, 19, 20 and 21 aim at determining the candidate teachers' opinions about the use of Twitter in education and Disasters Geography course in terms of the learning and motivation to the lesson. The following points were determined; the candidate teachers didn't agree with the opinion that this application about the disasters in Twitter was boring (M= 1.81), they thought that the opinion that the Twitter wasn't instructive wasn't true (M= 2.17) and they didn't agree with the opinion that even though they use Twitter normally, they didn't follow it much since it appeared to them as a lesson (M= 1.68).

Moreover, it was determined that they didn't find Twitter boring (M= 2.03), the application had a positive effect on their perception about the Geography course (M= 4.34), the use of Twitter in Disasters Geography course led them to be interested in the course (M= 4.09), it had an effect in increasing their motivation towards the course (M= 4.08) and the shares in Twitter aroused interest in Geography course (M= 4.16). Besides, it was determined that they didn't agree with the opinion that despite the different activities, they didn't like the Geography course (M= 1.57) and following anything about the Disasters Geography course in Twitter was a waste of time (M=1.49). It was determined that the candidate teachers thought that Twitter should be used in educational settings (M= 4.02).

Findings Related to the Second Research Problem

Table 2. The candidate teachers' opinions about the use of Twitter in the Disasters Geography course with regards to whether it creates awareness and knowledge about the disasters and current events in the world and Turkey.

Item Number	Item	M	SD
1	I became aware of many current events.	4.45	.68
2	I became aware of the disasters in the worlds.	4.43	.73
3	It drew my attention to hear many disasters immediately after they occurred in the world.	4.58	.73
5	By this means, current disaster news started to draw my attention more.	4.34	.78
15	I learnt much about the disasters geography thanks to Twitter.	4.28	.80
16	I get bored in Geography course; but thanks to this application, I learnt something.	3.05	1.23
22	I think that the things we learnt in the lesson may be helpful	4.34	.73

	in real life with this application.

Items 1, 2, 3, 5, 16 and 22 aim at determining the candidate teachers' opinions about the use of Twitter in the Disasters Geography course with regards to whether it creates awareness and knowledge about the disasters and current events in the world and Turkey. The following points were determined; candidate teachers became aware of many current events (M= 4.45), they became aware of the disasters in the world (M= 4.43), It drew their attention to hear many disasters immediately after they occurred in the world (M= 4.58) and therefore, current disaster news started to draw their attention more (M= 4.34). Moreover, the use of Twitter helps candidate teachers learn much about disasters geography (M= 4.28) and, although they get bored in geography course, they learnt something thanks to Twitter (M= 3.05).In addition to this, it was determined that the candidate teachers believed that the things they learnt in the course might help them in real life thanks to this application (M= 4.34).

Findings Related to the Third Research Problem

Table 3. Candidate teachers' opinions about whether the Twitter use in the course contributes to their skills on interpreting the disasters.

Item number	Item	M	SD
4	I think that I became skillful about interpreting the natural events.	4.11	.85
6	Sometimes, we had the chance to discuss the things we heard about in Twitter with friends.	3.91	1.07
14	I interpreted easily in the forthcoming weeks thanks to Twitter.	3.83	1.08
17	Thanks to this application, I was able to express my opinions briefly.	3.94	.97

Items 4, 6, 14 and 17 aim at determining candidate teachers' opinions about whether the Twitter use in the course contributes to their skills on interpreting the disasters. It was determined that the candidate teachers became skillful about interpreting the natural events thanks to Twitter (M= 4.11) and they were able to interpret more easily in the forthcoming weeks thanks to Twitter (M= 3.83).

Moreover, the candidate teachers sometimes had the chance to discuss the things they heard about in Twitter with their friends (M= 3.91), and therefore, they were able to express their opinions briefly (M= 3.94).

CONCLUSION AND RECOMMENDATIONS

As a result of the study, it was determined that candidate teachers became aware of many current events and disasters around the world thanks to Twitter. It was also determined that the Twitter application drew their attention to the current disasters and by this means, it helped them learn much about the disasters geography. Moreover, it was determined that the use of Twitter makes the candidate teachers skillful about interpreting the natural events and they can interpret more easily.

Although the candidate teachers get bored during the geography course, they learnt much about the course thanks to the Twitter and their perceptions, motivations and interest in the course was increased through the Twitter application. Also, they thought that Twitter should be used in educational settings.

It was determined that the use of Twitter in education and in disasters geography course increased the candidate teachers' learning and motivation towards the lesson, increased their awareness and knowledge about the disasters and current events in Turkey and in the world and improved their skills about interpreting the disasters.

Choosing instruction methods in accordance with the needs and interests of younger generation students and making use of information Technologies have been an inevitable necessity to reach the educational goals and equip the students with the knowledge and skills that prepare them for the life.

Social networks such as Twitter give an opportunity to enhance the learning environment, to increase the motivation towards the lesson, to socialize, to think, to express the thoughts, to interpret and to make comparisons when used appropriately. As for the students, these applications make it easier to participate in the lesson. As for the communication between the teacher and the students and among the students, it may be useful in conducting the lesson in a plan during the semester.

References

Buyukozturk, Ş., Cakmak, E.K., Akgun, O, E., Karadeniz, S., Demirel, F., (2013). *Bilimsel Arastirma Yontemleri [Research Methods]*. Ankara: PegemAkademi.

Yukselturk, E., Top, E. (2013). Web 2.0 Teknolojilerinin Ogretmen Egitiminde Kullanimi [Using Web 2.0. Technologies in Teacher Education]. Cagiltay, K., Goktas, Y. (Ed.) Ogretim Teknolojilerinin Temelleri: Teoriler, Arastirmalar, Egilimler [The Basics of Instructional Technologies: Theories, Researches, Trends]. (pp. 669-670). Ankara: PegemAkademi.

Kazanci, A., Donmez, F. I. (2013). *Okul 2.0, Egitimde Sosyal Medya ve Mobil Uygulamalar [The School 2.0: Social Media and Mobile Applications in Education]*. Ankara: AniYayincilik.

Webrazzi (2012). Turkiye Twitter kullaniminda 11inci [Turkey is 11th country according to Twitter usage]. Retrieved May 5, 2014, from http://webrazzi.com/2012/08/07/turkiye-twitter-kullaniminda-11inci/

Webrazzi (2013). Twitter'in Internet kullanicilari arasinda en yaygin oldugu ulke Turkiye [Twitter is the most popular in Turkey for Internet users]. May 10, 2014, from http://webrazzi.com/2013/10/07/twitterin-internet-kullanicilari-arasinda-en-yaygin-oldugu-ulke-turkiye/

Richardson, W. (2009), Blog, Wikis, Podcasts, and Other Powerful Web Tools for Classrooms, Second Edition, Corwin Press California USA.

Contact email: ayse.akkurt@gop.edu.tr

Use of E-Learning Strategies that Promote Meaningful Collaboration in Virtual Learning Environments

Jennifer Lauria, Wagner College, USA

The European Conference on Technology in the Classroom 2014
Official Conference Proceedings

Abstract
The primary focus of this paper is to share experiences and reflections on key elements related to development of virtual learning environments and practical applications for fostering meaningful collaboration in both hybrid digital learning models and full distance learning formats. Methods for development and implementation of effective pedagogical strategies used to promote meaningful collaboration online are presented. Reflections focus on practical applications implemented in undergraduate and graduate level courses in accredited professional teacher education programs at a private, American liberal arts college in New York City. Techniques for managing online learning communities in ways that promote mutual respect and democratic practice are shared. Challenges faced in creating both hybrid and complete distance learning course modules and lessons learned are reported. Testimonials representative of multiple perspectives are highlighted to reflect on the collaborative experiences from the perspectives of professors and students.

iafor
The International Academic Forum
www.iafor.org

Introduction

Ever changing advances in educational technologies are at the forefront of the modern classroom on a global scale. However, many present day schools have opted not to embrace the use of technologies to enhance the processes of teaching and learning, and others, perhaps minimally, if at all. "Traditional teaching strategies devoid of technology too often prevail in classrooms from early childhood settings through the university level and beyond. Some instructors in these classrooms can be disconnected from the outside digital world, which potentially can undermine their ability to deliver a relevant and high quality educational experience to their students" (Lauria & Preskill, 2011, p. 41). With the rapid onset of endless new advances in technology, how might educators connect with students and find some common ground with learners on this front? Use of virtual learning environments might serve as a potential solution for meeting somewhere in the middle. This paper presents practical applications and reflections on key elements of meaningful collaboration in online learning communities. The practical experiences with online pedagogy shared stem from those utilized in accredited American teacher education programs in both undergraduate and graduate level courses at Wagner College in New York City. However, most can be adapted for use in other fields.

Online Collaboration for Learning

Opportunities for meaningful collaboration within a well designed online learning community can enhance educational experiences for all stakeholders in several ways. Collaborative learning offers unique experiences for exploration of multiple perspectives, combined with socialization, during the learning process. Belonging to a structured community of learners with shared goals and objectives, such as a preformed class, can help students develop the professional relationships necessary for successful collaboration. Generally, learning communities can help students come together as a cohesive group through which they can develop a sense of belonging, identify common purpose, thrive on intellectual stimulation, hone critical thinking skills, practice socialization, find guidance and support, interact with peers and the instructor outside of class, and strengthen their abilities to consider multiple perspectives (Lauria & Preskill, 2011). Creating learning communities online can provide instructors with the flexibility necessary to establish some very important learning conditions particularly appropriate for students with a variety of diverse learning styles and exceptional learning needs. Of course, as with most pedagogical strategies, careful thought, proper implementation, and evaluation of effectiveness are necessary components for successful implementation.

During the exploratory stages of designing online learning communities to enhance the processes of teaching and learning in undergraduate and graduate teacher education courses, professors quickly realized it wasn't sufficient merely to post information and assignments or require students to respond to simple questions. Rather, more frequent interaction with the instructor and fellow students was necessary to establish a rapport with fellow online learning community participants and to lay the foundation for collaborative learning. Adding an interactive asynchronous forum discussion component through which professors could pose more cognitively complex questions that required students to think critically, make clear connections to course content, and begin to develop their own understanding toward

mastery of course objectives was an effective technique that followed. Additionally, when viewed as vehicles for dialogue rather than online journals, blogs served as thoughtful forums for discussion that extended opportunities for collaborative learning well after lessons ended. The power of blogging comes from the conversation threads that can be carried on within them and comments made, either by classmates or others, can deepen learning and understanding (Utecht, 2007).

Conversely, one of the variables that clearly did not add much value to the online learning experiences, as reported through students' feedback, was the requirement to participate in open chat rooms, where discussion tended to be trivial and less connected. Instead, in-depth and focused discussion based on students' questions and comments about course readings and video tutorials served as a more effective use of student's time outside the classroom. Students forwarded their comments and questions about the readings and the most relevant topics were posted, which kept the conversations centered on course content. Students then provided commentary, which created opportunities to clarify key concepts for peers and to realize that others may have had similar questions. It also helped for instructors to ponder what those experiences must have been like for students with different learning styles and how instructional strategies could be better aligned with learning styles to enhance learning. Such reflection helped instructors to realize the need for building multiple supports into the structure of the learning community. The most valuable of these supports proved to be online tutorials, individual video chat tutoring sessions, and peer coaching in anticipation of a wide range of technological proficiency amongst the participants. Including opportunities for students and faculty to collaborate online served as a course enhancement and allowed for more differentiation outside the classroom through enrichment and remediation supports.

In addition to the hybrid virtual learning environments in which instructors used a combination of in person class sessions and online course enhancements, full distance learning models of online learning communities with no in person class meetings were implemented solely in condensed summer course modules. Experiences with distance learning formats predominantly reliant on assigned readings followed up with written exchanges between professors and students were not reported as preferred modes of online learning by most students. Instead, hybrid models of online learning communities that included a combination of online learning and in person interaction were favored. Therefore, E-learning techniques such as interactive video conferencing and video training modules were incorporated into subsequent hybrid virtual learning communities to maximize learning opportunities and student satisfaction. Expansion of instructors' pedagogical repertoires to incorporate online collaboration and discussion via virtual learning communities was a direct result of self-assessment of teaching efficacy and student feedback. Resultantly, the most common E-learning techniques adopted by instructors were video tutorials and small group work projects via Google Drive that allowed multiple students to work together and for the instructor to monitor students' contributions to the assigned task before final submission.

Essential Steps for Successful Collaboration

Conclusions drawn from prior experience with designing effective online learning communities for diverse populations of participants led to the development of the

following checklist of ten essential elements necessary for promoting successful collaboration in online learning communities. The ten essential elements apply to online learning communities used to enhance face to face formatted courses, as in hybrid models, as well as complete distance learning models where instructors and students do not meet in person.

Ten Essential Elements for Fostering Successful Collaboration in Online Learning Communities

1. Clear objectives and expectations for all
2. Supportive, safe, and democratic learning environment
3. Mutual respect
4. Effective virtual classroom management
5. Academic rigor
6. Advanced interactive discussion
7. Outstanding student participation
8. Differentiation and celebration of diversity
9. Critical thinking and deep reflection
10. Flexible teaching styles

The ten essential elements are crucial for developing and supporting the type of online learning environments needed for quality teaching and learning experiences. A description of the essential elements will shed light on the interdependence of the variables as follows:

1. Clear goals and objectives for all participants: A clear vision for the goals of the virtual learning community must be established at the onset. Without a definitive course of action, it is very difficult to evaluate whether or not learners have been successful because instructors won't know *how* to measure success if they aren't clear on *what* they are seeking to measure. Expectations for student participation and evaluation measures also must be clearly defined and communicated through a variety of modes, such as articulation via a welcome video posted by the instructor, interactive synchronous chat discussions and posting of the list of expectations in prominent locations on the virtual learning community's home page.

When objectives are openly discussed and the expectations for meeting those goals are transparently communicated, the opportunity to create a true democratic community, in which everyone is accountable to the same standards and has the same opportunity to demonstrate mastery, is greatly enhanced. Additionally, when learners have an opportunity to co-construct goals and objectives with one another and with the instructor, motivation and interest in collaboration increase.

2. Creating a supportive, safe, and democratic learning environment:
The instructor in any class has a decisive role to play in creating a supportive, safe, and democratic learning environment. This role is probably even greater, however, in a virtual learning environment. As stimulating as it can be to learn online, it can also be isolating and even alienating. Instructors must make a substantial effort to stay in touch with learners, to respond promptly to student posts on discussion boards, to keep discussion going in productive directions when interest begins to wane, and to demonstrate to students that what they have to offer is not only worth listening to, but needs to be taken into account as everyone thinks about the course content. Since

students' comments are recorded in discussion forums, they can be reviewed, quoted in new posts, and linked to whatever the group is reading or studying together. This gives the whole community a sense that others are invested and are paying close and respectful attention. Students need to feel secure and supported by the instructor, their peers, and resources available.

3. Climate of Mutual Respect: The instructor must establish a climate of mutual respect within the virtual learning environment, just as one would need to do in a traditional face to face classroom environment. Initial steps toward this goal include modeling the target respectful behaviors and providing examples of appropriate behaviors that demonstrate compassion, empathy, and acceptance. When the instructor sets a respectful tone in any type of learning community by demonstrating considerate behavior toward all participants and modeling professional discourse, students tend to follow suit. The instructor earns the respect of the participants by reaching out to students and demonstrating respect for the members of the learning community through responding thoughtfully to students' questions and comments and by taking the time to get to know students as individuals through reading students' profiles and conversing with participants. When the instructional leader of the virtual learning community demonstrates a caring disposition, students begin to realize the instructor genuinely wants them to succeed, which fosters the development of trust and, eventually, leads to the emergence of mutual respect. Once mutual respect is evident within the virtual learning community, students tend to work harder and make better academic choices out of a growing respect for themselves, their peers, and teachers (Lauria, 2014).

Our teacher candidates are asked to post profile information regarding personal interests, hobbies, reasons for wanting to enter the teaching profession, and other topics they might like to explore related to course curricula but not planned as course content and professors reciprocate. This strategy helps the instructor to get to know the students and vice versa, but perhaps more importantly for students to learn more about one another. It is an effective technique for establishing important connections and building a favorable rapport amongst all members of the online learning community. The resultant sense of connectedness is conducive to quality collaborative learning. Guiding students to appreciate the value of treating others justly in a thoughtful, compassionate manner produced a plethora of positive outcomes, including the often expressed desire to take more classes in our department where student voices, experiences, and ideas received consistent validation

Additionally, devoting time and effort toward building a culture of respect within each learning community created opportunities for participants to develop key dispositions integral to professional development. Opportunities for practicing mutual respect within the online learning community supported students' professional growth toward adopting a respectful mindset and learning to value its effectiveness and importance.

4. Establishing Effective Virtual Classroom Management - The nature of students working at all hours of the day makes classroom management difficult. However, although online teachers cannot be physically present at all times, they can work diligently to model appropriate behavior and to thereby become a constant authoritative presence for students. By devoting substantial effort to establishing a

reasonable system of classroom management in the virtual learning environment, teachers can directly and indirectly guide appropriate student behavior, supervise cooperative learning activities more positively, and foster more constructive classroom discussion. Assuming the best from students is essential for long term learning and for ensuring that positive connections take place in the learning environment (Smith & Lambert, 2008). The teacher's attitude and approach to classroom management set a respectful and supportive tone where the instructors assumed the best rather than the worst from the onset. Use of this type of optimistic and affirming mindset transmitted positive energy to students who regarded this approach as far more appealing than the more traditional disciplinary and punitive approach to classroom management.

Consistency, proactive measures, and fairness are crucial components to effective classroom management. Consistency means that the online procedures have been established for discussion forums, for peer evaluation, group work, or for sharing learning experiences, should be adhered to without exception. Proactiveness allows the teacher to anticipate and address the roots of potential problems, making the use of later disciplinary interventions unnecessary. Being proactive in an online environment has a great deal to do with cultivating the aforementioned climate of mutual respect, developing professional relationships with students and maintaining a positive, firm, and supportive social presence throughout the online experience. But it also means scheduling individual meetings with participants who are approaching the boundary of inappropriate behavior, which can be done via video chat or telephone. Fairness is critical for perpetuating the positive virtual classroom climate. The teacher must work very hard to bring everyone's voice and concerns into the conversation without favoring one perspective over another. Fairness provides an important basis for creating a safe and democratic environment in the learning community where students feel secure to take risks and express their opinions. When students feel free to be themselves without fear of ridicule, true diversity has a fair chance to blossom and flourish.

As with the parameters of the online learning community itself, classroom management systems must be clearly and concisely shared with all stakeholders. Involving learning community participants in the development of the planned system of classroom management, either online or in the traditional classroom environment, is effective in developing a sense of ownership in the learning community, which in turn, enhances participant buy-in. When students feel a sense of responsibility through active participation in the decision making process regarding creation of the rules and consequences that will govern the learning community, they tend to feel a greater sense of motivation for compliance. Choice driven classroom management systems have been effective for us in our teacher education programs and have tended to leave fewer items open to interpretation. There has been a heightened sense of student responsibility as learning community participants made their own choices to take particular actions or display certain behaviors knowing the consequences were factors they had agreed upon.

A brief introductory video clip of the instructor welcoming the students to the learning community and outlining the major objectives and expectations for successful participation served as an additional resource for students, which provided another level of support by alleviating any possible intimidation students' may have

felt as they were getting to know a new instructor. Extra positive attention to tone of voice, body language and facial expressions resulted in better welcome videos. Online tutorials were used to model favorable and unfavorable examples of responses to peers' comments and demonstrations of providing effective feedback using remarks that would prompt further discussion as opposed to students' reliance of the use of praise or constructive criticism in their comments to peers. These were helpful tools, particularly for those inexperienced with use of appropriate professional discourse.

5. Setting a tone of academic rigor – Raising the bar to include higher standards and increased levels of accountability for all learners, demanding equity in levels of student effort, engaging students with academically challenging course materials and meaningful collaborative learning activities, and inspiring students to want to advance their own learning are practical measures educators can utilize to set an authentic tone of academic rigor in an online learning community. The professor must create a learning climate that fosters student engagement with challenging course objectives and enthusiastic inquiry combined with stimulating dialogue among learning community members.

Effective questioning techniques naturally contribute to increased levels of academic rigor by encouraging students to engage in thought processes at higher levels of the cognitive domain. Quality questions posed by the professor can spark lively discussion and debate capable of expanding students' consideration of diverse points of view centered on a particular topic. Use of spontaneous student responses can add breadth and depth to an online discussion. Instructors should aim to provide supportive and nurturing responses to students' comments in order to foster more student participation.

Another strategy for establishing academic rigor was to gradually build toward increasing levels of difficulty and complexity of questions to increase critical thinking at more challenging cognitive levels. Avoidance or minimal use of simpler questions to which students can provide brief responses without complete comprehension of careful consideration to the topic helped to challenge students' levels of understanding. The practice of further probing, practiced by both professors and students, rather than accepting answers at face value, required participants to think carefully beyond their initial responses, which contributes to a sense of academic rigor in the learning community. Teachers who ask the right questions kindle fires of critical thinking to create problem solvers resulting in cognitive student engagement (Hannel and Hannel, 2005). A basic measure of academic rigor was to invite students to articulate the ways they felt they had grown intellectually as a result of their participation in the online learning community.

6. Advanced interactive discussion as a valuable pedagogical tool -In order to make discussion work in any classroom setting, especially online, instructors must know how students are experiencing the class. Are the discussions seen as engaging, affirming, and stimulating, or are they regarded as distancing, confusing or unproductive? Do some learners regard certain participants as too domineering in discussion, and do they think the dynamics hinder other students from participating more fully? Asking for consistent feedback demonstrated respect for students. It communicated the notion that professors cared about what their students' opinions

and that they were interested in using students' feedback to make adjustments for the best possible educational experience for all.

The instructor as discussion leader in the virtual learning environment must be skilled at asking questions that keep inquiry open, not to close it down prematurely. They need to utilize questions that require considerable thought and foster critical reflection in order to spark meaningful discussion.

7. **Outstanding student participation**-The technique of developing online learning communities to foster collaboration tends to naturally encourage student participation This trend might partially be due to students' comfort level and preferences for technology use for instant communication and information retrieval. However, there are other ways instructors can invite students to participate and make the required interaction more appealing. In our teacher education programs, at both the undergraduate and graduate levels, heavily weighting active student participation as a substantial portion of the final course grade has proven to be a successful technique when clearly defined evaluative criteria were utilized via basic rubrics for assessing quality of student reflections and posted responses. Use of evaluation rubrics allowed all participants to be on the same page and led to an understanding on the students' part that grades were being *earned* rather than subjectively assigned by the professor. The paradigm shift helped students to take more responsibility in the teaching-learning process by acknowledging the importance of their roles in the determination of course grades.

Time constraints sometimes curtail engaging interactive class discussions in traditional classroom settings. Further discussion in the hybrid online learning community allows the learning experience to continue via forum posts, blogs entries, etc. and generates interest in additional resources on course topics provided through podcasts, video modules, and supplemental reading, which is ideal for many types of learners. Fostering desire for students to continue the learning process outside of class time is a natural way to encourage student participation with minimal effort required from the instructor. In addition, students that might not normally converse, but rather avoid contact all semester unless directed to collaborate, have a chance to interact.

8. **Differentiation and Celebration of Diversity** -Supporting students' individual learning styles and exceptional learning needs is important for establishing an equitable learning environment for diverse students in an online learning community, Grasha (1996) defined learning styles as "personal qualities that influence a student's ability to acquire information, to interact with peers and the teacher, and otherwise to participate in learning experiences (p. 41)". Other descriptions more specifically identify learning style as the way in which individuals begin to concentrate on, process, internalize, and retain new and difficult academic information (Dunn & Dunn, 1992). Along with the Dunns, Thies (1979) and Restak (1979) reported that learning style is comprised of both biological and developmental characteristics that make the identical instructional environments, methods, and resources effective for some learners and ineffective for others.

Online learning communities can serve as appropriate learning environments for students whose learning styles are not best suited for the traditional classroom setting. Learners raised in a digital age often have to adapt to less preferred traditional

learning environments. However, pedagogical techniques utilized in prior generations may not be appropriate for modern students due to effects of coming of age in the technology era. Although, digital learners might perform better in an online format, they do still need to learn vital skills taught in more traditional class settings. Perhaps by combining the virtues of an online learning community with the strengths of more traditional, face to face classrooms, a highly effective learning environment can be fashioned to support an otherwise struggling learner.

Students tend to participate more when they feel close to or within their "comfort zone" during online discussion. One distinct advantage of online learning is the absence of an underlying intimidation factor of face to face dialogue when offering a comment in a class discussion in front of peers and professors A student may be less likely to state their true opinion in class when they feel unsure because they don't know what their peers and instructor may be thinking about the topic. They might be more comfortable taking an opposing position in a discussion in an online format. Expressing a differing position than the majority is less threatening in an online format where the student might not be responding in real time. Instead, they can see the posts expressing their classmates' thoughts before taking the risk of responding, important information they would not be privy to during an in class discussion. In such cases in a classroom setting, students might choose not to participate. However, online discussions grant participants opportunities to function as reflective thinkers. They can review posts by peers, reflect on divergent viewpoints, and organize their thoughts before responding, luxuries often not afforded in an interactive, fast-paced discussion in class. There is a heightened accountability factor built in to online discussion as well. All are required to participate, but in their own time, which is perfect for students with different processing styles-might need to absorb all the information first and perhaps might become inspired to contribute to the discussion later on after the class has ended.

An important aspect of our success with online collaboration has been celebration of diversity rather than being satisfied with merely tolerating differences within the learning community. This paradigm has been a direct outgrowth of our dual teaching certification programs. Our teacher candidates are trained to differentiate instruction for very diverse learners in inclusive learning environments. Therefore, it is crucial for professors to model effective techniques for effective differentiation in our classes. Frustrating a student's desire to learn will have lifelong repercussions and, therefore, educators need to pay more attention to individual learning styles and individual mindsets so that we can maximize students' learning potential (Levine, 2002). However, learning appropriate pedagogical strategies for individualizing instruction is just part of the challenge. Teacher candidates can learn methods for celebrating the diversity inherent in an inclusive classroom by focusing of how group members tend to be more alike than different and how diversity can be celebrated, instead of merely tolerated.

9. **Critical thinking and deep reflection** – By design, virtual learning environments can support the development of critical thinking and deep reflection on course content. With asynchronous online interactions, time is available for participants to reflect on the content they are learning or to thoughtfully consider how others have responded to that content. This time to reflect removes the pressure to respond spontaneously to what is being taught and to pretend to have mastered it

sufficiently to comment on it immediately. The additional time permits deeper levels of thinking through the assumptions of that content, to understand the origins of the thinking behind it, to investigate possible biases associated with that content, and to craft an appropriate written response. Furthermore, because there is time to read and to digest what other students in the class are saying, there are opportunities to begin to understand some of the reasons for the multiple perspectives that are represented in the class. As students begin to consider other people's perspectives learn more about the topics, they can develop a more solid position and become more able to offer an informed point of view that is connected to what others are pondering. An online learning community is well suited to help students think critically and deeply about their world, and to rely on their peers as valuable learning resources.

10. Flexible Teaching Styles -While an online learning community can be used in lieu of face to face class sessions, as with a distance learning format, the hybrid combination of in-class meetings supported by online collaboration and discussion might be preferable to those with certain teaching and learning styles. Quitadamo & Brown, (2001) reported instructors demonstrating delegator and facilitator teaching styles have been effective in the online realm due to the ability to nurture student confidence and guide student development of independent research and critical thinking skills. Educators skilled at modeling, and in turn, teaching, effective listening also are well suited for the type of learning interactions necessary for successful collaboration with students, such as responding thoughtfully to students' inquiries and comments and teaching students how to learn by listening to and carefully considering the diverse perspectives of peers.. Meaningful and lasting learning occurs through personal active engagement, which requires teaching styles that are both social and facilitative. Additionally, teachers' level of comfort using alternative teaching resources, such as emerging educational technologies, tends to dictate the types of learning experiences that will be implemented in the online learning community.

Overall, (Quitadamo & Brown, 2001) maintained that the quality of human interaction determines online learning success. Flexible, creative, and student-centered pedagogical approaches are aligned with facilitative teaching styles necessary for effective collaboration online. Lastly, teacher language, what we say to students and how we say it, is one of our most powerful teaching tools that shapes how students think, act, and ultimately learn (Denton, 2008). Therefore, instructors that demonstrate teaching styles mindful of the power of their words might be more effective in an online collaborative learning community.

Student and Faculty Testimonials

Colleagues teaching in professional education programs at the undergraduate and graduate levels shared the following testimonials regarding the use of online collaboration to enhance learning in their courses:

"There are vast opportunities for "active listening" within the online learning community through challenging instructional activities that require participants to respond thoughtfully, analytically, and respectfully".

"By developing learning goals at gradient levels of difficulty, I can address the diverse needs of students. The spirit of participation can be alarming! A creative

approach to teaching online is a necessity to ensure student motivation and continuous, enthusiastic participation."

Additionally, students that participated in online learning communities offered feedback on their experiences as follows:

"I knew I was more likely to do well because I felt welcomed right from the start by my professor and classmates. That helped me to connect with the other members of my learning community outside of class in the online part of the course. I really felt like I was able to make important contributions many different times, which boosted my confidence. Normally, I would have been more of a listener in class, but the extra opportunities online made me do more than I would do in my other courses."

"It was exciting to be able to use technology to do my homework. That made me comfortable about my ability level in the course because I use technology so many areas of my life, Even though the course was difficult, the technology part made it much easier for me to stick with topics that challenged me because I could bounce ideas off my classmates and teacher. I felt better to know other people had questions about the readings too. We worked through things as a group and that was helpful for me."

"Sometimes reading the comments my classmates post makes me consider an idea in an entirely different way. At first it felt hostile when people stated extreme points of view, but listening to how the professor asked them to explain their opinions or provide evidence to support their comments helped me learn how to look at things through someone else's eyes."

Conclusion

Faculty and student testimonials were valuable indicators of the strengths in which online learning communities can effectively facilitate collaboration. Novice technology users might find the online learning community format a less threatening way to incorporate technology because of the strong foundation in effective discussion and questioning techniques. Rather than having to master a new mode of technology and demonstrate its use for the class, the teacher does not have to fear appearing inept. Instead, through use of online learning communities, educators can facilitate from behind the scenes at first while mastering the technology at their own pace without the pressure of not appearing to be the expert in his or her classroom, which many teachers cite as a reason for avoiding use educational technology. Technology has massive potential to transform the processes of teaching and learning while maximizing the uniquely multifaceted role of the teacher. Traditional methods of skillful questioning designed to promote critical thinking, interactive discussion, and deep reflection can merge with techniques that utilize newer modes of technology (Lauria & O'Hare, 2014). The most promising outcome of online collaboration is that when students feel like authentic stakeholders in the learning community, a truly collaborative learning environment develops where all participants are equal partners in the teaching-learning process.

References

Denton, P. (2008). The power of our words. *Educational Leadership, 66*(1), 28-31.

Dunn, R. & Dunn, K. (1992). Teaching secondary students through their individual learning styles: Practical approaches for grades 3-6. Boston, MA: Allyn and Bacon.

Grasha, A. F. (1996). *Teaching with Style*. Pittsburgh, PA.: Alliance.

Hannel, I. & Hannel, L. (2005). *Highly Effective Questioning (*4th ed). Phoenix, AZ: Hannel Eductional Consulting.

Lauria, J. (2014). Promoting mutual respect and democratic practice in diverse learning environments to support positive classroom management. In Cohan, A, & Honigsfeld, A. (Eds). *Breaking the mold of classroom management: What educators should know and do to enable student success* (pp. 119-126). Maryland: Rowan & Littlefield Education.

Lauria, J. & O'Hare, L. (In press). Virtual learning environments in higher education: Online pedagogical techniques implemented in accredited American teacher education and nursing programs. *Journal of Academic Perspectives.*

Lauria, J. & Preskill, S. (2011). Building, promoting, and supporting successful online learning communities: Practical applications for effective collaboration from an accredited New York City teacher education program. *Excelsior: Leadership in Teaching and Learning, 6*(1), 41-55.

Levine, M. (2002). *A mind at a time*. New York: Simon & Schuster.

Quitadamo, I. & Brown, A. (2001). *Effective teaching styles and instructional design for online learning environments.* National Educational Computing Conference, Building on the Future, Washington, DC: July 25-27, 2001.

Restak, R. (1979). *The brain: The last frontier*. New York: Doubleday.

Smith, R. & Lambert, M. (2008). Assuming the best. *Educational Leadership, 66*(1), 28-31.

Theis, A. P. (1979). A brain behavior analysis of learning style. *In Student learning styles: Diagnosing and prescribing programs* (pp. 55-61). Reston, VA: National Association of Secondary School Principals.

Utecht, J. (2007). Blogs aren't the enemy: How blogs enhance learning. *Technology and Learning, 27*(9), 32-36.

Contact email: jlauria@wagner.edu

iafor

The International Academic Forum (IAFOR)
Sakae 1-16-26-201
Naka Ward, Nagoya, Aichi
Japan 460-0008
ww.iafor.org