

# The implementation and investigation in combining mobile devices with smart object for ubiquitous learning environments

藍大勝、陳雍宗

E-mail: 319779@mail.dyu.edu.tw

## ABSTRACT

The issue of worth exploring in ubiquitous learning environment includes infrastructure, better teaching tactics and suitable content about teaching activities. And it will be effective critical success factors to adopt what kind of teaching design and tactics for the plural learning environment. In addition, using Smart Object is a kind of world trend. Therefore, we construct ubiquitous learning environment by Smart Objects and ubiquitous technology. We construct a subject related collaborative learning community. We propose STS collaborative learning model, and applying this model into instruction activities in ubiquitous learning environment we designed. Finally, we use nature science learning attitude questionnaire to understand whether there is difference of showing on student's attitude in "nature science and life technology" learning domain. The result of the study reveals that students using different smart objects are in the attitude toward nature course, attitude toward nature teacher, nature learning motivation and nature learning tactics all have positive result.

Keywords : Ubiquitous Learning、 STS Collaborative Learning、 Smart Object

## Table of Contents

封面內頁 簽名頁 授權書 . . . . .	iii	中文摘要 . . . . .	iii
. . . . . iv ABSTRACT . . . . .	iv	v 誌謝 . . . . .	v
. . . . . vi 目錄 . . . . .	vi	vii 圖目錄 . . . . .	vii
. . . . . ix 表目錄 . . . . .	ix	x 第一章 緒論 . . . . .	x
. . . . . 1 1.1 研究背景 . . . . .	1	1.2 研究動機與目的 . . . . .	1
. . . . . 2 1.3 研究範圍與限制 . . . . .	2	. . . . . 4 第二章 文獻探討 . . . . .	4
. . . . . 5 2.1 無所不在運算環境相關技術 . . . . .	5	. . . . . 5 2.2 無所不在的學習環境 . . . . .	5
. . . . . 10 2.3 教學模式 . . . . .	10	. . . . . 13 2.4 小結 . . . . .	13
. . . . . 16 第三章 研究方法 . . . . .	16	. . . . . 18 3.1 研究設計 . . . . .	18
. . . . . 18 3.2 無所不在學習環境與系統建置 . . . . .	18	. . . . . 20 3.3 STS合作學習模式與教學活動 . . . . .	20
. . . . . 26 第四章 資料分析 . . . . .	26	. . . . . 33 第五章 結論與建議 . . . . .	33
. . . . . 36 參考文獻 . . . . .	36	. . . . . 38 附錄 . . . . .	38
. . . . . 47	47		

## REFERENCES

- [1]王貴春(2000), STS教學與國小學生創造力及學習態度之研究, 台北市立師範學院自然科學教育研究所未出版之碩士論文。
- [2]朱敬先(1999), 教育心理學-教學取向, 台北:五南出版社。
- [3]邱秀玲(1998), 以STS教育實踐「生活科技課程」, 台灣教育, 575, 45-51。
- [4]晁瑞明, 張佳楠(2007), 建構無所不在學習環境 以合作模式探究之, 大葉大學碩士論文。
- [5]高俊傑(2004), 合作學習理論的教學理念, 馬偕學報, 4, 133-144。
- [6]張世璿(2001), 國小STS教學中進行合作學習之行動研究, 國立花蓮師範學院國民教育研究所未出版之碩士論文。
- [7]張基成, 唐宣蔚(2000), 架構於全球資訊網上的知識分散式網路學習社群, 遠距教育季刊, 13/14, 18-37。
- [8]許民陽, 王郁軒, 梁添水, 鄭紹龍(2001), 國小運用STS教學模式 天象與時空概念教學模組之探討, 科學教育學刊, 9(1), 79-100。
- [9]許政穆, 蘇雍智(2006), 以RFID無線射頻識別技術建置無所不在數位學習環境, 資訊科學應用期刊, 2(1), 128-137。
- [10]陳文典(1997), STS 理念下之教學策略, 物理教育, 1(2), 85-95。
- [11]黃信捷(1996), 電子資料交換EDI在圖書出版與圖書館編目自動化之應用一以「二維條碼」之應用談起, 圖書館管理學報, 2, 73-88。
- [12]黃國禎(2005), U-Learning時代的來臨與挑戰[線上資料], 來源: <http://www.elearn.org.tw/KMC/ExpertDefaultArticles/U-Learning時>

代的來臨與挑戰.pdf [2006, December 5].

[13]黃慶祥(1997), 資料自動收集與商業自動化, 台北:松崗出版社。

[14]楊子奇, 蔡佩珊, 黃國禎(2006), U-Learning環境的建置與效益評估-以單晶X光繞射研究人員培訓為例, 2006年行動與無所不在數位學習研討會, 1-11。

[15]趙怡晴, 陳玲慧(2000), 資料收集自動化的新利器:二維條碼, 電腦與通訊, 85, 31-36。

[16]蕭顯勝, 馮瑞婷(2006), 具情境感知式戶外生態教學系統之規劃與設計, 生活科技教育月刊, 39(5), 28-39。

[17]蕭顯勝, 蔡福興, 游光昭(2005), 在行動學習環境中實施科技教育教學活動之初探, 生活科技教育月刊, 38, 40-57。

[18]謝詩詠, 余鑑, 林弘昌(2006), STS融入生活科技課程教學活動設計, 生活科技教育月刊, 39(5), 16-27。

[19]魏來成(1998), 促進合作的網路學習活動與系統的發展, 國立臺南師範學院資訊教育研究所未出版之碩士論文。

[20]Barab, S. A., & Duffy, T. (2000). From practice fields to communities of practice. In D. Jonassen & S. M. Land. (Eds.) *Theoretical Foundations of Learning Environments*, Mahwah, NJ: Lawrence Erlbaum, 25-26.

[21]Chaisatien, P., & Akahori, K. (2006). Introducing QR code in classroom management and communication via mobile phone application system. *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications*, 2181-2187.

[22]Chang, C. Y., Sheu, J. P., & Chan, T. W. (2003). Concept and design of Ad Hoc and mobile classrooms, *Journal of Computer Assisted Learning*, 19(3), 336-346.

[23]Chao, R. M., Lan, T. S., Huang, J. T., & Cheng, J. I. Z. (2006). Realizing the ubiquitous STS collaborative learning environment: Using mobile devices with digital ink and RSS interactive instructional weblog. *IEEE International Conference on Sensor Networks, Ubiquitous, and Trustworthy Computing*, 2, 130-137.

[24]Chen, J. W. (2005). A ubiquitous information technology framework using RFID to support students' learning. *Proceedings of The 5th IEEE International Conference on Advanced Learning Technologies*, 337-342.

[25]Chen, T. (2003). Recommendations for creating and maintaining effective networked learning communities: A review of the literature. *International Journal of Instructional Media*, 30(1), 35-44.

[26]Cheng, L., & Marsic, I. (2002). Piecewise Network Awareness Service for Wireless/ Mobile Pervasive Computing. *Mobile Networks and Applications (MONET)*, 7(4), 269-278.

[27]Cheng, Z., Sun, S., Kansen, M., Huang, T., & He, A. (2005). A personalized ubiquitous education support environment by comparing learning instructional requirement with learner's behavior. *Proceedings of the 19th IEEE International Conference on Advanced Information Networking and Applications* (pp. 567-573). Washington, DC: U. S. IEEE Computer Society.

[28]Cohen, A. (1985). *The Symbolic Construction of Community*. New York: Routledge.

[29]Collins, A., & Bielaczyc, K. (1997). Dreams of technology-supported learning communities. *Proceedings of the Sixth International Conference on Computer-Assisted Instruction*, 1-8.

[30]Derntl, M., & Hummel, K. A. (2005). Modeling context-aware e-learning scenarios. *Proceedings of the 3rd IEEE International Conference on Pervasive Computing and Communications Workshops* (pp. 337-342). Washington, DC: U. S. IEEE Computer Society.

[31]Dey, A. K., & Abowd, G. D. (1999). Toward a Better Understanding of context and Context-awareness. Georgia Tech GVU Technical Report. (GIT-GVU-99-22).

[32]Feeney, L., Ahlgren, B., & Westerlund, A. (2001). Spontaneous Networking: An Application-Oriented Approach to Ad Hoc Networking. *IEEE Comm. Magazine*, 39(6), 176 – 181.

[33]Gabelnick, F., MacGregor, J., Matthews, R. S., & Smith, B. L. (1990). Learning communities: Creating connection among students, faculty and disciplines. *New Direction for Teaching and Learning*, 41, San Francisco: Jossey-Bass.

[34]Hagel, J., & Armstrong, A. G. (1997). *Net Gain*. Harvard Business School Press.

[35]Hagel, J., & Armstrong, A. G. (1997). *Net Gain: Expanding Markets Through Virtual Communities*. Boston, MA: Harvard Business School Press, McKinsey and Company.

[36]Hwang, G. J. (2006). Characters, characteristics and strategies of ubiquitous learning. *IEEE International Conference on Sensor Networks, Ubiquitous, and Trustworthy Computing*, 2, 72-77.

[37]Imel, S. (2001). Learning communities/communities of practice.

[Online]. Eric Clearinghouse. Available: <http://www.ericacve.org/fulltext.asp> [2006, July 15].

[38]Johnson, D. W., & Johnson, R. T. (1988). *Cooperation in the classroom*. Edina, MN: Interaction.

[39]Johnson, D. W., & Johnson, R. T. (1994). *Learning Together and Alone: Cooperative, Competitive, and Individualistic Learning* (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.

[40]Johnston, R. B., & Yap, A. K. C. (1998). Two dimensional bar code as a medium for electronic data interchange. *International Journal of Electronic Commerce*, 3(1), 86-101.

[41]Kanabo Consulting, Inc. (2005). Cracking the QR code.

[Online]. Available: <http://www.kanaboconsulting.com/newsletter105.htm> [2006, September 10].

[42]Kawahara, Y., Minami M., & Morikawa, H. (2003). Aoyama: A real-world oriented networking for ubiquitous computing environment. IPSJ

SIG Technical Reports, 39, 1-6.

[43]Kaye, A. R. (1992). Collaborative Learning through Computer conferencing. NY: Springer Verlag.

[44]Khan, B. (1997). Web-based instruction (WBI): What is it and why is it. Englewood Cliffs, NJ: Educational Technology Publications.

[45]Kindberg, T., & Fox, A. (2002). System Software for Ubiquitous Computing, *PERVASIVE Computing*, 70-81.

[46]Kwon, O., Yoo, K., & Suh, E. (2005). ubiES: An intelligent expert system for proactive sServices deploying ubiquitous computing technologies, the 38th Hawaii International Conference on System Sciences (pp. 3-6). Washington, DC: U. S. IEEE Computer Society.

[47]Levin, J. A., & Thurston, C. (1996). Educational electronic network: A review of research and development. *Educational Leadership*, 54(3), 46-50.

[48]Luppigini, R. (2003). Categories of virtual learning communities for educational design. *The Quarterly Review of Distance Education*, 4(4), 409-416.

[49]McCormack, W. F., & Yager, R. E. (1989). The Iowa assessment package for evaluation in five domains of science education. Iowa City, IA: The University of Iowa Science Education Center.

[50]Minami, M., Morikawa, H., & Aoyama, T. (2004). The design of naming-based service composition system for ubiquitous computing applications. 2004 International Symposium on Applications and the Internet Workshops, 304 - 312.

[51]Paolo, M. D., Furr, W., Hearn, N. N., & Tae, K. K. (2000). RFID: Replacement or supplement to bar codes. Master ' s thesis, University of Colorado at Boulder.

[52]Pavlidis, T. (2000). A New Paper/Computer Interface: Two-Dimensional Symbolologies. *Proceedings of The 15th International Conference on Pattern Recognition*, 2, 145-151.

[53]Pavlidis, T., Swartz J., & Wang, Y. P. (1992). Information Encoding with Two-Dimensional Bar Codes. *Computer*, 25(6), 18-28.

[54]Pavlidis, T., Swartz, J., & Wang, Y. P. (1990). Fundamentals of Bar Code Information Theory. *IEEE Computer Magazine*, 23, 74-86.

[55]Pownell, D., & Bailey, G. D. (2001). Getting a handle on handhelds. *American School Board Journal*, 188(6), 18 – 21.

[56]Sakamura, K., & Koshizuka, N. (2005). Ubiquitous Computing Technologies for Ubiquitous Learning. *Proceedings of the 2005 IEEE International Workshop on Wireless and Mobile Technologies in Education*, 11-20.

[57]Schilit, B., & Theimer, M. (1994). Disseminating active map information to mobile hosts. *IEEE Network*, 8(5), 22-32.

[58]Sharan, S., & Shachar, H. (1988). Language and learning in the cooperative classroom. N.Y.: Spring- Verlag.

[59]Sharples, M. (2000). The design of personal mobile technologies for lifelong learning. *Computers and Education*, 34, 177-193.

[60]Sherry, L., & Wilson, B. (1997). Transformative Communication as a Stimulus to Web Innovations. Englewood Cliffs, NJ: Educational Technology Publications.

[61]Solomon, J. (1993). Teaching science. technology and society, Philadelphia: Open University Press.

[62]Soon, T. J. (2001). An Introduction to Bar Coding.

[Online]. ITSC Synthesis Journal 2001. Available: [http://www.itsc.org.sg/synt\\_hesis/2001/itsc-synthesis2001-jinsoon-bar-coding.pdf](http://www.itsc.org.sg/synt_hesis/2001/itsc-synthesis2001-jinsoon-bar-coding.pdf) [2006, August 10].

[63]Tobin, K., & Tippins, D. (1993) Constructivism as a referent for teaching and learning. In K. Tobin (Ed.). *The practice of constructivism in science education*. Washington, DC. AAAS Press.

[64]Tobin, K., & Tippins, D. J. (1993). Constructivism as a referent for teaching and learning. In K. Tobin (Ed.), *The practice of constructivism in science education*, (pp. 3-21). Washington DC: American Association for the Advancement of Science Press.

[65]Uemukai, T., Hara, T., & Nishio, S. (2004). A Method for Selecting Output Data from Ubiquitous Terminals in a Ubiquitous Computing Environment. *Proceedings of the 24th International Conference on Distributed Computing Systems Workshops*.

[66]Weber, J. (2000). Learning communities in higher education. A field observation case study. Unpublished doctoral dissertation, Widener University.

[67]Yager, R. E. (1990). The science / technology / society movement in the United States: Its origin, evolution, and rationale. *Social Education*, 54, 198-201.

[68]Zhang, G., Jin, Q., & Lin, M. (2005). A framework of social interaction support for ubiquitous learning. *The IEEE 19th International Conference on Advanced Information Networking and Applications*, 2, 639-643.

[69]Ziman, J. (1980). Teaching and Learning about Science and Society. Cambridge University Press.