Student Assessment of Affective Variables in an Internet-based "Introduction to Quantitative Research Methods" Course

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Abstract

Two groups of first year university students who studied in a compulsory "Introduction to Quantitative Research Methods" course were exposed to two different modes of instruction. The first group of students was exposed to internet-based learning and the second group received traditional classroom based instruction. The content studied by internet-based learning as well as classroom-based learning was identical and the students received the learning material weekly during one academic year. Results of the study indicate that there were no significant differences between students exposed to the two learning strategies regarding academic achievement. However, there were significant differences between the two groups on the other research variables. Students who received internet-based instruction were significantly more positive on the three affective variables, namely learner motivation, learner autonomy and learner control of the learning process than students who received traditional class-based instruction. Results of the study indicate the great potential evident in sophisticated internet-based learning technology from the motivation, autonomy and control of learning points of view.

Introduction

Distance learning has developed over the years to overcome the limitations of traditional face-to-face learning which necessitates the presence of the student in a formal classroom setting. From its inception when distance learning was confined to the delivery of learning material via snail mail, landline telephone and radio broadcasts, it has progressed through delivery systems such as television broadcasts, videoconferencing and email and at present focuses on digital delivery systems such as internet and mobile learning platforms (Katz & Yablon, 2003).

In the wake of the development of sophisticated third generation Distance Learning systems which include, inter alia, internet-based and mobile learning technologies, learning activity through the medium of these Distance Learning systems has been redefined to include and focus on student self-learning (Trentin, 1997). Both internet-based learning and mobile learning methodologies offer tuition that is not bound by space or time and are especially characterized by flexibility. In addition internet-based as well as mobile learning allow tutors to modify, reinforce and even model educational processes, thereby fulfilling the cognitive as well as affective needs and requirements of students (Wilson & Whitelock, 1997).

Some research studies have indicated that third generation Distance Learning is especially suited to higher education mainly because of increased flexibility due to the sophisticated internet-based and mobile learning systems that are increasingly used at present. Other studies have emphasized the importance of student activity provided for by current Distance Learning systems and have indicated that the student activity variable contributes significantly to improved student achievement (Trentin, 1997). Hofmann (2002) confirmed that internet-based learning at the university level is more effective for students than traditional classroom-based learning because students are necessarily active in internet-based learning.

In the present study, the comparative effectiveness of internet-based distance learning and traditional classroom based learning of students in the compulsory "Introduction to Quantitative Research Methods" course was examined at the university level. Internet-based learning and traditional classroom learning served as the learning platforms in this study. In addition to academic achievement, student perceptions of the affective attitudinal variables of learner motivation, learner autonomy and learner control of the learning process were assessed.

Internet-Based Learning

Bennett (1999) contended that radical improvements in learning and instruction have been made as a

result of the advances achieved in three major areas: technology, measurement, and cognitive science. Of the three, new technology has probably been the most influential in the short term because it is increasingly pervading our society. Much effort and substantial financial resources are invested annually to create and make commonplace powerful, general technologies for commerce, communications, entertainment, and education. Due to their generality, these technologies can also be used to improve learning and instruction (Wideman & Owston, 1999).

The internet has been described by Bennett (2001) as an interactive, switched, networked, and standards-based communication medium that has contributed significantly to many areas of endeavour and particularly to the learning and instructional processes. When detailing the unique aspects that describe the particular strengths of the internet it is important to note that the 'interactive' aspect of the technology is designed for the presentation of a task to a student at the school or university level and allows for an immediate response to that student's actions and for the provision of assistance to the student when help is needed. Bennett added that 'switched' aspect of internet indicates the ability to engage in different interactions with different students simultaneously. In combination, these two characteristics (interactive and switched) make for individualized learning and instruction.

Bennett added that the 'broadband' feature of Internet allows for the manipulation of a wealth of information in interactions when using the internet for learning and instruction. The information utilized by students for their study through the medium of internet includes possibilities based on audio, video, and simulation technology.

According to Bennett the interactivity, switching and broadband aspects of internet are 'networked' which indicates that everything is interlinked. This linkage provides an electronic platform that ties universities, schools, resource centres, teachers and students together in order to provide improved efficiency and potential for the learning and instructional processes. Finally Bennett postulates that 'standards-based' Internet implies that the network runs according to a set of conventional rules that all participants follow. That fact facilitates the interchange of data and access from a wide variety of computing platforms, as long as the software running on those platforms (e.g., Internet browsers) adheres to those rules too.

Based on the abovementioned characteristics, the internet has the potential to deliver efficiently and on a mass scale individualized, highly engaging learning and instructional content to almost any desktop and make information available to the teacher and student at anytime of the day or night. Thus, the very essence of internet is its efficiency, effectiveness, and its facilitating qualities that promise a long-awaited educational breakthrough at all educational levels.

Internet-Based Learning at University Level

Wideman & Owston (1999) declared that increasingly more university courses are being delivered to students through the medium of internet. Both university lecturers and students increasingly utilize the new medium to increase meaningful learning based on the use of online audio-visual material, databases, simulations and tutored exercises (Fabos & Young. 1999; Fetterman, 1998). Hellebrandt (1999) indicated that the internet provides students with authentic learning materials – difficult to obtain in the traditional learning situation – that increase the effectiveness of learning and instruction.

Idrus & Lateh (2000) confronted the implications of university learning and instruction using internet-based courses. They contended that the internet has moved formal instruction in these courses from the formal setting of the university campus to the home of the student. Learning has become significantly more flexible and content sources much more accessible. Creating, sharing and knowledge capitalization are all facilitated by internet. Wider sources of learning are provided in internet-based courses and worldwide expertise can systematically be brought to the student's desktop. In addition, a decade ago, Szuprowicz (1990) foresaw internet-based university courses as contributing not only added learning and instructional efficiency to the educational process, but also improved cost-effectiveness in university tuition in that internet-based courses can be made available to an almost infinite number of students.

With the rapid development of internet-based courses for use in university level education, increasingly more research studies have been conducted in an attempt to evaluate different issues related to e-learning. For example Blake (2000) investigated the level of learning enjoyment of students who studied through the medium of internet and Schramm, Wagner & Werner (2000) examined students' satisfaction with an internet-based training course. Johnson, Aragon, Shaik & Palma (2000) as well as Soong, Chan, Chua & Loh (2001) and Watson (2000) studied the academic performance of students who participated in an online course and Volery & Lord (2000) addressed the efficiency of an online course from the students' point of view.

Affective Variables that Enhance Distance Learning

Affective variables are strongly correlated with successful learning delivered in both traditional and technological modes. Recent studies have been conducted in order to investigate the relationship between specific attitudinal variables and the outcome of the learning process. Warschauer & Healey (1998)

conducted a research study that sought to identify those factors related to successful ICT based learning. They reported that learner motivation, learner autonomy, learner control of the learning process, learner curiosity, learning flexibility and ICT user friendliness are some of the major factors contributing to enhanced language learning through the medium of ICT strategies. Braten & Stromso (2006) suggested that perceived self-efficacy, self-regulatory skills, and familiarity with computers could enhance the use of distance learning by students. Limayem & Cheung (2008) indicated that ICT based learning enhances learner motivation. Mainemelis, Boyatzis & Kolb (2002), Zurita & Bruce (2005), Cavus & Ibrahim (2009) as well as Katz & Yablon (2009) confirmed the association of some or all of the above variables with effective ICT based learning. In the current study, particular attention is to be paid to three of the above variables particularly known to enhance effective learning, namely learner motivation, learner autonomy and learner control of the learning process.

Learner motivation is a critical factor in learning (Lee, Cheung. & Chen, 2005) In a comprehensive meta-analysis study on the connection between learner motivation and learning, Masgoret & Gardner (2003) clearly confirmed that learner motivation is a major factor known to enhance successful learning. Kiernan & Aizawa (2004), followed by Chinnery (2006) indicated that ICT technology promotes learner motivation in learning. Thus this study will examine the hypothesis that internet-based learning promotes learner motivation in university learning.

Howland & Moore (2002) as well as Blin (2004) stated that an important factor in learning in general is learner autonomy. They indicated that learner autonomy is a major contributor to effective learning enhanced by ICT strategies. Granic, Cukusic & Walker (2009) confirmed that learner autonomy is an integral factor in effective learning through the medium of sophisticated ICT technology. Another of the hypotheses of the present study is that internet-based learning is a learning strategy that enhances learner autonomy thereby contributing to the effectiveness of learning.

Learner control of the learning process has also been identified as an important factor that positively contributes to learning. Shin, Schallert & Savenye (1994) and Boekaerts (1997) indicate that control of the learning process allows students the freedom to learn more comprehensively, especially when learning is delivered digitally. Katz & Yablon (2009) confirmed that control of the learning process is a major contributor to successful ICT based learning. The third research hypothesis to be studied in this research will examine the relationship between learner control of the internet-based learning process and learning outcomes.

Method

Sample

The research sample consisted of 94 first year university students enrolled in the Faculty of Social Sciences at one of Israel's chartered universities. A breakdown of the sample indicates that the sample included 16 males and 78 females aged between 21 and 34 with a mean age of 24 with similar social and attitudinal profiles (Bar-Yaacov, 2001). The students were accepted to their course of study on the basis of grades attained in a psychometric university entrance examination as well as on the basis of grades attained in their school-leaving matriculation examinations. The students were enrolled in a year long compulsory "Introduction to Quantitative Research Methods" course. The students were randomly assigned to the two different research groups that received instruction as follows: 43 students received instruction via a sophisticated internet-based learning platform that included voice, text and simulation delivery as well as exercises; and 51 students were assigned to a traditional classroom where they received their instruction via formal lectures, manual demonstrations and exercises.

Instruments

Two research instruments were administered to the students in this research study. The first instrument was a standardized achievement test in order to assess students' mastery of the topic studied in the year long "Introduction to Quantitative Research Methods" course. The scale ranged from 0-100, higher grades indicating higher levels of acquirement. The second instrument was a 28 item Likert type Response Scale, designed to examine the attitudinal levels of the students toward affective aspects of learning on the three research variables. The first variable, learner motivation, contained 10 items (Cronbach α = .84), the second variable, learner autonomy, consisted of 10 items (Cronbach α = .86) and the third variable, control of the learning process was made up of 8 items (Cronbach α = .89).

Procedure

The internet-based "Introduction to Quantitative Research Methods" course consisted of three key pedagogical elements which were integrated into the learning and instructional process. The first element was a weekly asynchronous audio-visual presentation of the material to the students who logged in to the course. In each lesson the lecturer taught content of the course using aids, simulations and demonstrations. The second element consisted of a presentation of the content of each lesson in full text

specially compiled for the course. Students were able to access the full text asynchronously at their convenience. The third element consisted of pre-prepared exercises that the students answered and checked online. Throughout the duration of the internet-based course students were able to maintain contact with the lecturer via email messages and consult the lecturer in a course chat-room.

The traditional classroom-based course consisted of two weekly sessions, one of two hours and one of one hour. During the two-hour meetings the lecturer presented the students with content matter, explained the material and answered any questions arising from difficulties students' may have had understanding the material. During the one-hour weekly meetings the students participated in supervised exercise sessions in which they solved a series of problems directly related to the material taught in the weekly two-hour lecture. Students were at liberty to meet and consult with the lecturer during reception hours in addition to the two weekly sessions they attended.

The students in both internet-based and traditional courses studied identical content matter and handed in similar exercises. The lecturers in both internet-based and classroom-based courses participated in periodic faculty meetings in order to ensure that these courses would be similar regarding syllabi, content emphasis, and assessment. The standardized achievement test administered to students in the two research groups at the end of the year long "Introduction to Quantitative Research Methods" course was identical so that valid comparisons could be made. In addition to the standardized achievement test, the affective response scale was administered to the students the end of the year long "Introduction to Quantitative Research Methods" course in order to ascertain students' attitudes towards the two different learning strategies.

Results

The mean scores and standard deviations on the four research variables are presented in Table 1.

Table 1   Mean scores and standard deviations for achievement, learner motivation, learner autonomy, and learner control of the learning process

Variable	Learning Strategies			
	Internet-Based Learning		Classroom-Based Learning	
	Mean	SD	Mean	SD
Achievement	81.28	9.04	81.69	8.91
Learner Motivation	37.72	3.61	33.53	4.66
Learner Autonomy	36.86	3.31	32.33	3.57
Learner Control of the Learning Process	32.14	2.76	28.00	2.86

T-tests were used in order to compare students' achievement and attitudes related to the two learning strategies. While there were no significant differences on the achievement scores, with students from two groups achieving similar grades (see Table 1), significant differences were found for learner motivation, $t(92) = 4.80$; $p<.001$, learner autonomy, $t(92) = 6.33$; $p<.001$, and control of the learning process, $t(92) = 7.10$; $p<.001$. Students who participated in the internet-based course attained higher scores on the three affective variables than students who participated in the classroom-based course (see Table 1).

In addition to the above analysis of group differences, a discriminant function analysis was conducted in order to identify the characteristics of participants in the two learning groups and to assess the contribution of each of the three affective research variables to the assignment of students to the two learning groups. It appears that of the three variables, learner control of the learning process was found to be most discriminating followed in descending order by learner autonomy and learner motivation (see Table 2). Achievement did not significantly contribute to the discriminant model. An overall assessment of the model reveals that it efficiently discriminates between students in the two learning groups (Wilks' Lambda = .49) and significantly distinguishes between the groups (Chi-square (4) = 63.26; $p<.001$). According to the model, 85.1% of the students were correctly classified as members of their learning groups.

Table 2   Standardized disciminant function coefficients

Variable	Function
Achievement	-.07
Learner Motivation	.15*

Learner Autonomy	.64*
Learner Control of the Learning Process	.69*

*p<.001

Discussion

From the results of the statistical analyses of the data obtained from the two research groups in this study it is clear that neither internet-based learning nor classroom-based learning held any advantage regarding academic achievement of students on the content taught in the "Introduction to Quantitative Research Methods" course. Students, who studied by way of both strategies, attained similar levels of academic achievement. Thus it appears that achievement is a factor that does not distinguish between strategies with measured achievement outcomes. This result confirms those indicated in a number of research studies that, on the whole, different learning strategies do not significantly contribute to differential academic achievement (Bohlen & Ferratt, 1993; Dyer & Osborne, 1996; Katz & Yablon, 2009).

However, the research findings clearly indicate that the different learning strategies employed in the present study are significantly associated with differential levels of students' attitudes, namely, learner motivation, learner autonomy and learner control of the learning process. Students who studied the "Introduction to Quantitative Research Methods" course delivered via internet-based learning indicated higher levels of learner motivation, learner autonomy and learner control of the learning process than students who studied the "Introduction to Quantitative Research Methods" course via traditional classroom-based learning.

Thus the results of the present study clearly indicate that internet-based learning is more effective than classroom-based learning regarding the affective aspects of learning. This finding confirms previous studies that indicate the relative strength of ICT learning strategies when compared to traditional classroom-based learning in relation to students' affective perceptions (Divitini, Haugalokken & Norevik, 2002; Garner, Francis & Wales, 2002; Kiernan & Aizawa, 2004; Lu, 2008; Seppälä, 2002; Stone & Briggs, 2002; Thornton & Houser, 2003).

Despite the clear affective advantages of internet-based learning over traditional classroom-based learning as indicated in the present study, it should mentioned that such differences do not exist in the domain of achievement. However, previous studies have indicated the importance of affective factors in the learning process in addition to the importance of achievement. For example it has been shown that positive affective feelings of students during the learning experience promote a feeling of well-being, belongingness, social acceptance, coherence and decreased non-adaptive behaviour (Zins, Bloodworth, Weissberg & Walberg, 2004). In education affective goals are accepted as part and parcel of the learning process. Despite the finding that the two learning strategies did not contribute to differential levels of achievement, nevertheless one cannot underestimate the educational importance of the contribution of learning strategies to students' affective well-being.

Conclusion

The results of the present study indicate that, although the two learning strategies examined in the study were no different from each other in promoting students' academic achievement, the relative advantages of internet-based learning over traditional classroom-based learning is clearly evident regarding the affective domain. This study adds to the list of research projects that have indicated the effectiveness of internet-based learning from the affective point of view (Divitini, Haugalokken & Norevik, 2002; Garner, Francis & Wales, 2002; Kiernan & Aizawa, 2004; Lu, 2008; Seppälä, 2002; Stone & Briggs, 2002; Thornton & Houser, 2003). Thus internet-based learning strategies can be offered as real alternatives to the more traditional classroom-based learning strategies, especially when affective goals are set as part and parcel of the learning process

References

1. Bar-Yaacov, M. (2001). *New statistical projects*. Jerusalem, IL, Central Bureau of Statistics.
2. Bennett, R.E. (1999). Using new technology to improve assessment. Educational Measurement: *Issues and Practice, 18(3)*, (pp. 5-12)
3. Bennett, R.E. (2001). How the internet will help large-scale assessment reinvent itself. *Education Policy Analysis Archives, 9(5)*
4. Blake, K. R. (2000). Using the world wide web to teach news writing online. *Journalism and Mass Communication Educator, 55(1)*, (pp. 4-13)
5. Blin, F. (2004). CALL and the development of learner autonomy: towards an activity-theoretical perspective. *ReCALL, 16(2)*, (pp. 377-395)
6. Boekaerts, M. (1997). Self-regulated learning: a new concept embraced by researchers, policy

makers, educators, teachers, and students. *Learning and Instruction, 7(2)*, (pp. 161-186)

7. Bohlen, G.A. & Ferratt, T.W. (1993). *The effect of learning style and method of instruction on the achievement, efficiency and satisfaction of end-users learning computer software* (pp. 273-283). Proceedings of the 1993 conference on Computer Personnel Research. St Louis, Missouri, USA.

8. Braten, I. & Stromso, H. I. (2006). Epistemological beliefs, interest, and gender as predictors of Internet-based learning activities. *Computers in Human Behavior, 22*, (pp. 1027–1042)

9. Cavus, N. & Ibrahim, D. (2009). m-Learning: an experiment in using SMS to support learning new English language words. *British Journal of Educational Technology, 40(1)*, (pp. 78–91)

10. Chinnery, G.M. (2006). Emerging technologies going to the MALL: Mobile Assisted Language Learning. *Language Learning and Technology, 10(1)*, (pp. 9-16)

11. Divitini, M. & Haugalokken, O. K. & Norevik, P. (2002). *Improving communication through mobile technologies: which possibilities?* (pp. 86-90). International Workshop on Wireless and Mobile Technologies in Education. Vaxjo, Sweden.

12. Dyer, E.J. & Osborne, E. (1996). Effects of teaching approach on achievement of agricultural education students with varying learning styles. *Journal of Agricultural Education, 37(3)*, (pp. 43-51)

13. Fabos, B. and Young, M.D. (1999). Telecommunication in the classroom: rhetoric versus reality. *Review of Educational Research, 69(3)*, (pp. 217-259)

14. Fetterman, D.M. (1998). Webs of meaning: computer and internet resources for educational research and instruction. *Educational Researcher, 27(3)*, (pp. 22-30)

15. Garner, I.; Francis, J. & Wales, K. (2002). *An evaluation of the implementation of a short messaging system (SMS) to support undergraduate students* (pp 15-18). European Workshop on Mobile and Contextual Learning. Birmingham, UK.

16. Granic, A.; Cukusic, M. & Walker, R. (2009). m-Learning in a Europe-wide network of schools. *Educational Media International, 46(3)*, (pp. 167-184)

17. Hellebrandt, J. (1999). Virtual collaborations in the Spanish class: from email to web design and CD-ROM development. *Journal of Educational Computing Research, 20(1)*, (pp. 59-70)

18. Hofmann, D.W. (2002). Internet-based distance learning in higher education. *Information Technology, 62(1)*, (pp. 28-32)

19. Howland, J.L. & Moore, J.L. (2002). Student perceptions as distance learners in internet-based courses. *Distance Education, 23(2)*, (pp. 183-195)

20. Idrus, R.M. & Lateh, H.H. (2000). Online distance education at the Universiti Sains Malaysia, Malaysia: preliminary perceptions. *Educational Media International, 37(3)*, (pp. 197-201)

21. Johnson, S. D.; Aragon, S. R., Shaik, N., & Palma, R. N. (2000). Comparative analysis of learner satisfaction and learning outcomes in online and face to face learning environments. *Journal of Interactive Learning Research, 11(1)*, (pp. 29-49)

22. Katz, Y.J. & Yablon, Y.B. (2003). Online university learning: cognitive and affective perspectives. *Campus Wide Information Systems, 20(2)*, (pp. 48-54)

23. Katz, Y.J. & Yablon, Y.B. (2009). *Mobile learning: a major e-learning platform. In   A. Szucs (Ed.). New technology platforms for learning revisited* (pp. 121-126). Budapest, HU, European Distance Education Network.

24. Kiernan, P.J., & Aizawa, K. (2004). Cell phones in task based learning: are cell phones useful language learning tools? *ReCALL, 16(1)*, (pp. 71-84)

25. Lee, M.K.O.; Cheung, C.M.K. & Chen, Z. (2005). Acceptance of Internet-based learning medium: the role of extrinsic and intrinsic motivation. *Information & Management, 42*, (pp. 1095–1104)

26. Limayem, M. & Cheung, C.M.K. (2008). Understanding information systems continuance: the case of internet-based learning technologies. *Information & Management, 45*, (pp. 227–232)

27. Lu, M. (2008). Effectiveness of vocabulary learning via mobile phone. *Journal of Computer Assisted Learning, 24(6)*, (pp. 515-525)

28. Mainemelis, C.; Boyatzis, R.E. & Kolb, D.A. (2002). Learning styles and adaptive flexibility: testing experiential learning theory. *Management Learning, 33(1)*, (pp. 5-33)

29. Masgoret, A.M. & Gardner, R.C. (2003). Attitudes, motivation, and second language learning: a meta-analysis of studies conducted by Gardner and associates. *Language Learning, 53(S1)*, (pp. 167-210)

30. Schramm, R. M.; Wagner, R. J. & Werner, J. M. (2000). Student perceptions of the effectiveness of web based courses. *Distance Education Report, 4(18)*, (pp. 1-3)

31. Seppälä, P. (2002). *Mobile learning and Mobility in Teacher Training* (pp. 130-135). IEEE International Workshop on Wireless and Mobile Technologies in Education, Växjö, Sw,

32. Shin, E.C.; Schallert, D.L. & Savenye, W.C. (1994). Effects of learner control, advisement, and prior knowledge on young students' learning in a hypertext environment. *ETR&D, 42(1)*, (pp. 33-46)

33. Soong, M. H. B.; Chan, H. C.; Chua, B. C. & Loh, K. F. (2001). Critical success factors for on line course resources. *Computers and Education, 36(2)*, (pp. 101-120)

34. Stone, A. & Briggs, J. (2002). *ITZ GD 2 TXT – how to use SMS effectively in m-learning* (pp. 11-14). European Workshop on Mobile and Contextual Learning. Birmingham, UK.

35. Szuprowicz, B. (1990). Future technology: a huge boon ahead for interactive multimedia. *Computer World, July*, (pp. 32-34)

36. Thornton, P. & Houser, C. (2003). Using mobile web and video phones in English language teaching: Projects with Japanese college students. In B. Morrison, C. Green, & G. Motteram (Eds.). *Directions in CALL: experience, experiments & evaluation* (pp. 207-224). Hong Kong: English Language Centre, Hong Kong Polytechnic University.

37. Trentin, G. (1997). Telematics and on-line teacher training: the POLARIS project. *Journal of Computer Assisted Learning, 13*, (pp. 261-270)

38. Volery, T. & Lord, D. (2000). Critical success factors in online education. International *Journal of*

Educational Management, 14(5), (pp. 216-223)

39. Warschauer, M. & Healey, D. (1998). Computers and language learning: an overview. *Language Teaching, 31(2)*, (pp. 57-71)
40. Watson, K. (2000). French topics online: Natural errors with virtual wine. In Chambers, J. A. (Ed.). *Selected papers from the 11th International Conference on College Teaching and Learning* (pp. 171-175). Jacksonville, FL:
41. Wideman, H. & Owson, R.D. (1999). Internet-based courses at Atkinson College: an initial assessment. *Technical Report 99(1)*, Center for the Study of Computers in Education, York University.
42. Wilson, T. & Whitelock, D. (1997). Monitoring a CMC environment created for distance learning. *Journal of Computer Assisted Learning, 13*, (pp. 253-260)
43. Zins, J.E.; Bloodworth, M.R.; Weissberg, R.P. & Walberg, H.J. (2004).The scientific base linking social and emotional learning to school success. In J.E. Zins, R.P. Weissberg, M.C. Wang. & H.J. Walberg (Eds.). *Building academic success on social and emotional learning: what does the research say?* (pp. 3-22). New York: Teachers College Press.
44. Zurita, L. & Bruce, B.C. (2005). *Designing from the users side: reaching over the divide.* Paper presented at Computer Supported Collaborative Learning (CSCL) Conference, Taipei, Taiwan.>