Introducing China: Expanding the CSCL Research Community

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Abstract: This symposium brings together some of the leading CSCL researchers from China with the purpose of introducing them to the wider CSCL community. China has a strong recent history of CSCL research, but has yet to make real connections to the Western research literature. In part, this is due to the language barrier, but China also holds distinct research traditions, methodological perspectives, and epistemological perspectives about the purpose of scholarly research. We will begin with an overview of CSCL research in China, followed by introductions from six of the leading Chinese researchers, each providing a short summary of their work, including: (1) theoretical perspective, (2) research methods (3) technology infrastructure, and (4) findings and future research interests. Next, we will discuss the future of Chinese CSCL research and its role within the wider community, as well as opportunities for collaboration and exchange.

Introduction and Proposed Format

Long separated from the West by language and cultural barriers, China is rapidly moving to the center of global discussions in nearly every domain, including agriculture, industry, economics, and most academic disciplines. In recent decades, China has had a strong history of investment in higher education, rapidly constructing universities and investing in research. The number of students enrolled in institutions of higher education increased from 4.5 million in 1999 to almost 30 million in 2010, which makes the Chinese system of higher education the largest in the world (UNESCO 2003). Given the explosive growth of higher education and the smaller demographic cohorts expected in the next ten years, China is on track to have 40% of the eligible cohort attend university in 2020, with new frontiers in continuing education and life-long learning.

In the field of educational research, there is a vibrant community of scholars who are deeply engaged in responding to the growing needs for innovative approaches in the K-12, university, distance and lifelong learning sectors. There is also a long history in China of action-oriented research conducted by K-12 teachers, who work as a tight-knit school faculty, developing rich, multidisciplinary curricula for their students. Such school communities provide a wonderful resource for educational researchers. Overall, there is an excellent climate for CSCL research, and Chinese scholars are expected to produce a record of publications and funded projects.

As CSCL researchers from the West become acquainted with scholars from China, they are recognizing the wealth of ideas and research activity to be found there. Recently, a small conference was convened (Zhao, Wang & Slotta, 2010) where two dozen CSCL researchers from China and North America got together to share their approaches. Out of this event grew a shared understanding of the tremendous potential for both China and West as the traditional barriers that separated those two worlds dissolve. Increasingly, Chinese scholars are researching distance education, ubiquitous computing, collaborative inquiry and many other CSCL topics. This work often includes a unique theoretical lens or innovative methodology that may be atypical of conventional CSCL research. For example, at the recent workshop mentioned above, a comparison study was presented involving 3 different technology-enhanced professional development methods and 400,000 participating schools! Often, Chinese scholars have access to a wealth of multidisciplinary talent and human resources, allowing the development of materials, curriculum and technology systems that rival anything in the West. Still, there is a need for discourse and orientation, as Chinese scholars enter to the global research community. For example, it will be important to welcome Chinese scholars into our research conferences and journals, encouraging and supporting their submissions. This symposium hopes to begin such a discussion, making some personal introductions and encouraging connections and allowing for a discussion of the wider range of issues and opportunities.

Facilitating Knowledge Building with CSCL: An Empirical Study
Authors: Kedong Li & Shaoming Chai, South China Normal University

Information technology (IT) has been applied widely in Chinese schools, but there remains an important question of how to use IT effectively for helping students transform their modes of learning, and achieving a

greater understanding as well as important lifelong technology and inquiry skills.   David Jonassen (2005) claims that IT is not only used for supporting teaching, but also used as a tool for knowledge building and knowledge expression. Learners should know how to learn *with* IT, rather learning *from* IT! CSCL is one of the important modes of learning with IT. The purposes of this research thus include: (1) How to facilitate the transformation of students' learning modes in a CSCL environment? (2) How to facilitate knowledge building amongst a community of students using a CSCL approach (3) What are the impacts on student learning of such an approach?

Learning village (LV) is a CSCL platform where students explore topics collaboratively. Learning phases include: (1) Choosing the topics for collaborative learning. Students proposed a number of research questions, such as what are the major issues we are concerned with in our living environment; what are the impacts of the Internet on our lives; or what can we do about the air pollution. (2) Organizing exploring activities within pairing schools. 15 schools in Hong Kong with 13 schools in Guangzhou paired with each other in the first round, and 10 schools in Hong Kong and 10 schools in Foshan paired in the second round for collaborative learning based on LV.

Students were engaged in collaborative learning with support by LV. The learning process includes building house, building road, cleaning road, visiting house, publishing posts, and summarizing and reflecting. The qualitative data has been analyzed using a grounded theory approach. Six categories of data have been analyzed including posting, video clips, students' writings, teachers' narratives, students' online behaviors, and group interaction. An online behaviors analysis framework has been developed for this study with five steps: building the first house, responding questions, deepening questions, collaborative learning, and building knowledge.

Findings, Outcomes and Future Research

Based on the critical review of student activities using the Online Behaviors Analysis Framework, three topics were chosen for further analysis. Online interaction structure graphs were constructed, according to the status of students' interaction for the typical learning groups. Figure 1 is one of the results of this study – where the online behaviours and interaction patterns of students can be displayed a progressive chart, as well as in a social network diagram.

案例	房屋编号	回应方式		回应密度	回应效度		回应强度	互动方式			互动密度	互动效度	互动深度
		简单	详细	回应帖子数	有效	无效	高质量帖子数	星型	链型	网状	互动帖的个数/总帖数	有效互动帖数	三级以上有效互动帖数
个案三 2	10	3	37	32	12	3	X	7	X	7/44=15.9%	3	0	
13	16	7	32	37	6	4	5	8	X	11/43=9.3%	11	2	
16	16	6	51	2	4	1	7	9	11	39/60=65%	39	6	
Total	42	16	120	71	22	8	10	24	11	30% (平均)	50	8	

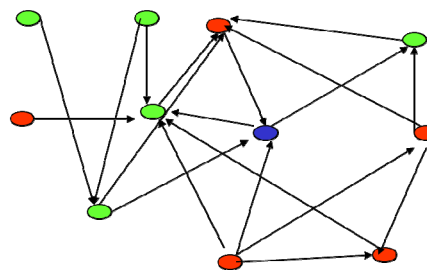Figure 1. The Result of Online Behaviors Analysis.

Figure 2. The Social Network within Culture Different Areas.

Based on this research, we have identified three categories of the approaches of knowledge building. The influential factors of LV for students learning have been explored. A general process of social knowledge building has been developed and will be presented and discussed.

How Position within a Social Network Relate to Knowledge Building in Online Learning Communities

Author: Lu Wang, Capital Normal University

Online learning communities exist within a wider environment which itself contains a multitude of networks. By obtaining information, producing insight, undertaking analysis and collaboration in the course of knowledge building and by way of an instructed learning process, these networks create all manner of interpersonal associations and learning opportunities. In online learning communities, knowledge is not a static object, but rather something that arises from society, and is implicated in social networks. Learning is not simply a case of receiving independent particles of knowledge, but rather about the active construction of knowledge by social exchange and collaboration between many participants (Cohen & Prusak, 2001; Nonaka & Konno, 1998). According to research carried out on social networks by organizational sociologists, some network positions have been recognized as having a particular influence on individual and group achievements. This is due to the structure of social interactions, which promotes or strengthens personal approaches by way of offering invaluable resources, such as suggestions, information strategies, social support etc. (Brass, 1984; Ibarra, 1993). Moreover many researchers have discovered that within a social network, actors tend to keep their personal strategy in mind; broadly speaking, the strategy of 'being in the right place' (Brass, 1984).

In considering social networks and learning, this research focuses on exploring how network positions are interrelated in online learning communities and the features of network positions with regards to knowledge building. Additionally, where such a relationship is found to exist, this study will explore the patterns thus observed.

Social network analysis, statistical analysis, content analysis and other research methods were used to research online learning communities at Capital Normal University, Beijing. Analysis of the two online courses resulted in the following conclusions: (1) Social networks of the two online courses form typical core-periphery structures; (2) Social networks of the two online courses contain 'structural holes', where some actors position themselves to become potential opinion-leaders within their social networks; (3) Actors, variously positioned within a core-periphery structure, show quite significant differences in terms of knowledge building; (4) Taking 'structural holes' into account, there exist considerable differences in knowledge building between opinion-leaders and non opinion-leaders; (5) Actors in the 'core' and 'structural hole' positions have very different characteristics in terms of knowledge building. These actors in particular play important roles in online learning communities, impacting on the level of the constructed knowledge.

Computer Network Supported Collaborative Learning between Urban and Rural Teachers

Author: Shaoqing GUO, Northwest Normal University

Unsurprisingly, the development of ICT for education in the urban and rural areas in China has not been balanced. Rural teachers lack the capabilities of using ICT in teaching, and need more training in terms of ICT abilities. However, there are some problems in the traditional training of rural teachers: short-term, concentrated training cannot really promote teachers' capabilities of using ICT in teaching; in-school training is not effective because of the limited capabilities of core teachers and the lack of support from the schools; systematic guidance and tutoring by experts can only benefit a small number of teachers and cannot be expanded to large scales.

In order to address these practical problems in the training of rural teachers, my colleagues and I explored a strategy and mechanism that can encourage effective learning and professional development of both urban and rural teachers. We examined the following questions in this project: 1) what is the model of creating a learning community for urban and rural teachers and the model of effective learning in such a community? 2) What is the strategy of sustaining the learning community for urban and rural teachers? 3) What is the strategy of transferring the knowledge that teachers acquired in training to the teaching skills they can use in practices? We believe that the result of this study will help us find ways to enhance both rural and urban teachers' information literacy and their capabilities of using ICT in instruction, and thus to change their approaches to instruction.

Using Moodle, we set up an online learning environment for teachers from urban and rural areas. The participants are 50 teachers from 5 schools in Lanzhou City – an urban area – and Linze County – a rural area. They made up 10 collaborative learning groups in this online learning community. This study includes three stages. In the first stage, we trained the teachers and examined their achievement of their learning. In the second stage, we carried out action research on practical teaching subjects. Teachers collaboratively worked on these action research projects and learned from each other as a learning community using the Moodle platform. We collected research data from discussion forms and teachers' blogs on the Moodle platform. In the third stage, we videotaped teachers' teaching practices in classroom. We analyzed these video data to examine effects of our approaches to training.

The result of this study indicates that: 1) An online course platform is an effective way of supporting teachers' systematic learning of professional knowledge in a learning community of urban and rural teachers. 2) A mixed-mode approach should combines short-term training of core topics, self-study, in-school and inter-school training, and collaborative action research supported by online learning system. This model was seen to enhance teachers' capabilities of using information technology, promoting their abilities to learn and interact with peers in an online learning community, and improve their technological pedagogical content knowledge. 3) Collaborative action research activity is an effective way of transferring the knowledge and skills teachers acquired in training to their practical teaching practices. Collaborative action research can help enhance the interaction between the urban and rural teachers, impel the form of learning community of urban and rural teachers, and change the teachers' classroom teaching practices toward a mode of more student discussions and less teachers lecturing. 4) Teachers are starting to implement collaborative approaches to learning in their teaching practices and a learning community that is favour of sustainable professional development is formed.

Research on the Organization Model of Ubiquitous Learning Resource — the Structure of Learning Cell and its Runtime Environment

Authors: Shengquan Yu, Xianmin Yang & Gang Cheng, Beijing Normal University

With the development of pervasive computing and Internet technologies, information space will be blended with physical space seamlessly to form a ubiquitous information space combing reality with fantasy. All of them make learning become more and more ubiquitous, which means learning happens anytime, anywhere and on demand. Current researches on ubiquitous learning mainly focus on the construction of conceptual models and supporting environments. However, how to organize learning resources to satisfy the needs of anytime, anywhere, on demand and adaptive learning is an emerging problem. Current learning technologies concern with learning resources sharing in a closed structure, which neglect the sustainable development and evolutionary capability of learning resources, the dynamic and generative connections between learning resources as well as between learners and teachers. Our research focus on solving that problem: to research on the organization model of learning resources and to explore on the organizational framework theory and practical foundations of learning resources within the context of ubiquitous learning supported by pervasive computing technology.

Our research will propose a new description and package mechanism for learning objects, named Learning Cells (LC), which can better support informal learning, and the community construction and sharing of learning resources with the essential features of evolutionary. LC has the basic features of semantic aggregation, self-tracing, evolution, cognitive network connectivity and miniaturization. LC should satisfy the needs of evolutionary development, learning on demand, collaborative editing and dynamic adapting to users and contexts. The core design idea of LC is to introduce a temporal dimension and social cognitive networking into the concept of learning resources to make it evolve over time. Version changes, historical records and user-generated information will all be stored. Meanwhile, a network of knowledge relationships, consisting of knowledge and people, will be formed. The network will be used to promote students' knowledge construction and the sharing of collective wisdom during the process of knowledge evolution. Specific research emphases are as follows:

1. *The logical structure and organizational characteristics of ubiquitous learning resources in a pervasive computing environment.* The general trend of ubiquitous learning resources is generative, adaptive, intelligent and evolutionary. Current learning object technologies tend to focus on the sharing and management of constructed resources, neglecting the life cycle and the learning wisdom accumulated during the application process, which is unable to adapt itself to the future development of ubiquitous learning. In contrast, the LC approach provides resources related to users' learning, as well as a series of activities and tools set within a social cognitive network. LCs are not static learning materials, but a persistent channel for acquiring information and knowledge. Figure 3 displays the basic flow of interactions among learners, LC and other users. With the essential features of openness, generative, evolution, connection, cohesiveness, intelligence and adaptation, LC can realize the evolutionary growth of learning resources and aggregate learning resources and people to form a knowledge relationship network.
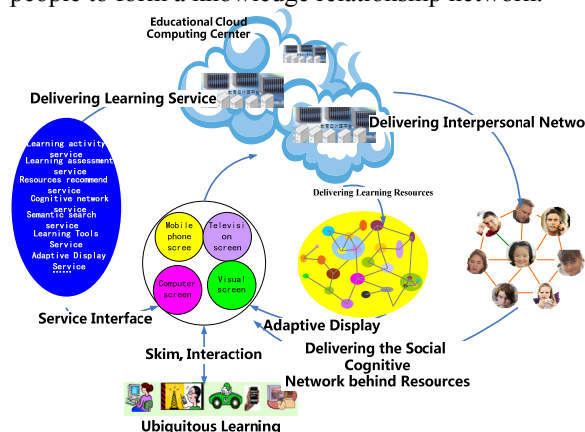

Figure 3. LC: The Ubiquitous Learning Process.

2. *Aggregation Model based on semantics and to control orderly development of resources with semantic gene (knowledge ontology).* LC is a new organizing method for learning resources that applies semantic web and ontology technologies to make learning resource like a living organism that evolve and grow under the control of internal semantic "genes." This research applies ontology and semantic web technologies creatively to construct the aggregation model of ubiquitous learning resource.

3. *Cognitive network computing model for learning resources and expanding sharing range from the materialized resources to social cognitive network.* Related specifications and standards of traditional learning resources are constrained to materialize resources, neglecting the factor of people. Besides materialized resource, there are also human resources connected through materialized resources, which is one key distinction between LC and traditional package model of learning resource. Finally, how to realize the sharing of dynamic social cognitive network through constructing cognitive network model based on uses' interaction and procedural data is one of the urgent problems in need of solution.

This research has combined modeling methods with design oriented methods and empirical research. The technical route is as following: (1) the construction of knowledge ontology model for LC. We have planned to use OWL language recommended by W3 as the basic description language for knowledge ontology. According to general knowledge classification theory, we have designed several basic knowledge types and corresponding attributes. Extended knowledge ontologies can be inherited from basic ontologies.

The operations with knowledge ontology are based on Jena framework published by HP Lab, as well as the ontology searching language SPARQL recommended by W3C. (2) Automatic semantic connection and the construction of social cognitive network. On the one hand, automatic semantic connections among LCs could be built through constructing the similarity or equivalence relationship of field key words; on the other hand, automatic semantic connections could be constructed by analyzing users' learning routes to find out more relationships among LCs.   In addition, part of the automatic connections can be realized through inference engines.   (3) Realization of the evolutionary feature of LC. The core of our research on ubiquitous learning resources design is how to realize the orderly control of learning resources. Current e-Learning usually takes Web 2.0 as the core technologies in resources evolution, which has brought about a lot of unsatisfactory isolated resources in open environment. LC is expected to realize orderly control on ubiquitous learning resources with semantic technologies.

To date, we have successfully constructed the concept model and information model for LC, designed the package standards, developed the online knowledge ontology co-editing environment and realized the collaborative content editing, version control, and to some extent the knowledge evolution. We have also realized the visualization and sharing of knowledge relationship network with Flex technology and successfully constructed the visual modeling environment for knowledge structure. Next, we will strive for breakthroughs in the orderly evolution of learning resources, including the design and implementation of evolutionary mechanism, the construction of evolutionary model and the development of supporting environments. We have already released the LCPS (Learning Cell Prototype System) at present. You can access it through this URL: http://lcell.bnu.edu.cn.

Semantic Organization of Online Discussions for Active Collaborative Learning

Author: Yanyan Li, Beijing Normal University

Online discussion forums provide an open workspace where learners share information, exchange ideas, address problems and discuss specific themes. But a substantial impediment to the use of such environments as effective eLearning facilities lies in the continuously increasing messages but incoherent structure, as well as the loosely connected learners and often random responses. In order to motivate and facilitate active, collaborative learning, this paper describes the design of a forum with semantic link networking on discussion transcripts. Based on domain ontology and text data mining technologies, messages are automatically processed for structural modeling with semantic association, and special interest groups are automatically discovered using topic-centric measures of social context.   These measures lay the foundation for new, distinctive functionalities in the semantic forum (i.e. semantic search, relational navigation and recommendation).   This paper will address the following research questions:

- How can we organize discussion transcripts in a well-structured and semantic coherent manner?
- How can we connect learners who have similar interests to support their collaborative learning?

Researchers argue that learners' discussion comprises a series of phases, in terms of collaborative knowledge building: information sharing and comparing, concept exploring and discovering, and negotiation of meaning and construction of knowledge. Nevertheless, most research has show that learners' discussion transcripts actually fall primarily into the first phase of information sharing and comparing, so herein we classify the messages types into *Question, Opinion, Suggestion, Recommendation, Request and Citing*. The analysis of discussion transcripts for structural modeling comprises three phases: message topic recognition, message type identification, and semantic association of messages. In the first phase, the messages in a discussion thread are combined into a summary document and then are processed. In the second phase, by analyzing a large amount of messages on the forums, we define the most common patterns and keywords for each type. Afterwards, each initiating-message is parsed to identify the various types of messages in Chinese by following a three-step process: Chinese word segmentation, hint-keywords matching and pattern matching. Regarding the third phase, semantic link network is adopted to organize the messages with semantic associations, where semantic links between messages can be manually defined by forum participants, and automatically be discovered and derived under heuristic rules.

The normal way to analyze the discussion transcripts corpus is to use SNA to count the reply-to relationship between learners, which results in a one-mode network. By adding the topics to which the messages belong, the one-mode network can be transformed into bi-partite network. Additionally, this allows the community to define the knowledge map to express the domain knowledge. By building the semantic mapping from the topics in bi-partite network to concepts in KM, a theme-centered network can be constructed to indicate the persons gathered around one concept. In this way, the theme-centered network denotes the potential interests of the persons, and by adding the reply-to relationship, a special interest group (SIG) can be formed with respect to each concept in the KM. After discovering special interest groups within discussion forums, the next step is to compute criteria for SIG membership, including *participation, mutuality and activity*. Once a learner becomes a member of a special interest group, he will be informed of other learning companions to enhance the in-depth communication and learning, and any new, emerging information related to the SIG will be proactively pushed to him as well.

Experimental Study and Findings

We used the W3CHINA discussion board (available at http://bbs.w3china.org/index.asp) and randomly selected 763 discussion threads in a view of "Semantic Web and ontology", with a total of 4512 messages from the source. Two

postgraduate researchers assessed each discussion thread, manually labeling the messages with the parent concept in the knowledge map and the type of message. We then compared these manual-labeling results with the labels assigned by the automated approach, which revealed that the approach was feasible and effective. Next, by classifying the discussion messages according to theme and identifying their types (using a tool called VINCA) learners' semantic relationship matrix can be obtained and accordingly the networks for SIGs on different themes were discovered. Figure 4 shows the original constructed relationship network on thread "DL" by means of SNA method, in which numerous learners are associated as long as they delivered messages on the theme. Comparatively, figure 5 shows the discovered SIGs on "DL" with additional consideration of message topics. As figure 4 and figure 5 illustrate, the number of learners decrease greatly and the organization structure of the SIGs become more clear-cut and visible.
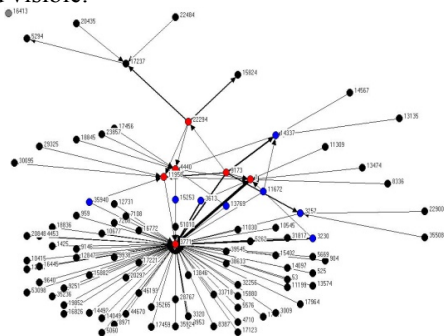

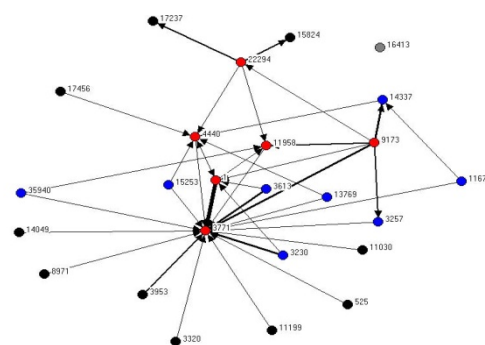Figure 4. Original Relationship Network on "DL".

Figure 5. Discovered SIGs on "DL".

Compared with traditional forums, the semantic forum has three outstanding features. First, it deals with the structural incoherence and content isolation within online discussion forums. Second, it enables active learning by providing learners with relational navigation to meet their learning demands. Third, it supports social context based ranking to recommend learning companions or transcripts for collaborative problem-solving. An experimental study will be described that demonstrates the impact of this new technology, showing that the approach is feasible and effective, enabling the dynamic formation of interest groups and demand-driven navigational guidance.

CSCL-Supported Online Teacher Training: A Case Study

Authors: Jianhua Zhao, Hui Xu, & Xidiao Chen, South China Normal University

CSCL offers an ideal setting in which participants' collaboration can be supported by technology. Many studies have addressed this vision, as reviewed by Kienle and Wessner (2005), who analyze the first ten years of the CSCL community.   Liu and Huang (2005) have also examined interactions that occur within a CSCL environment.

Our study focuses on how CSCL environment can be used for supporting online teacher training. The research questions include: (1) How to design an effective online course for supporting teacher training; (2) What are the effective methods used for teacher training online? (3) How do teachers respond to our online training? (4) How can we evaluate online teacher training and improve out materials and approaches?

The research methods used in this study include design-based research (DBR), case study, questionnaire, content analysis, and narrative study. 10,000 school teachers from 10 Districts of Guangzhou participated in the study, with 16 tutors from South China Normal University. The online course is titled, "Educational Research for School Teachers."   The study employed the Moodle virtual learning environment and included two phases in the training program: online tutor training, and teacher training. The time is from September, 2010 to July, 2012. The design of the online course materials was focused on the notion of "learning by doing," including experiential learning, project-based learning, and community-based approaches. Online teaching methods were defined in terms of the training goals, learning activities, online discussion, experience-sharing, social communication, reflection, interdisciplinary communication, and practice-oriented training. The conclusions of the study will be presented in terms of teacher participation and outcomes of teacher research activities.   The presentation will examine the roles of CSCL in teacher training, its function, and teachers' attitudes toward CSCL.

Design Sharing Mechanism for a Co-Cons Community

Author: Xiaoqing Gu, East China Normal University

How can we stimulate people to share their expertise in a virtual community? We focused on this problem in our development of a co-construction system for building learning resources. My presentation will introduce the first phase of our research in which strategies for a sharing mechanism were designed to stimulate participants to share in the system. We began by designing an intervention model from the perspective of social capital, with the intention of creating and sustaining social capital among the participants for the entire process. With data collected from the

first round pilot, we conclude that this design was effective in attracting and maintaining users' interest in contributing to this virtual community, while leaving some designed actions and tools still in need of improvement. These findings will be used to make future modifications of the system.

In order to develop a learning resource where lifelong learners pick up learning materials on the move, we developed a co-construction system (Co-Cons) to engage the diverse expertise of users. Even in an age where there are well established trends toward user-led content, sharing activities that require effort and skill are comparatively less frequent than in a more typical structured online environment that require only simple inputs such as filling in forms or adding comments (Kalmus et al., 2009). This research, is concerned with what drives individuals and how to stimulate their willingness to invest in sharing within this Co-Cons system.

The Co-Cons system works within a life-long learning network (Wang et al., 2009) to enable users who typically have different backgrounds and preferences to collaborate with each other in creating mobile learning resources for practical learning needs (Gu & Li, 2010). The system is designed as an instance of social computing, where the major sharing behavior has been intentionally designed as creating mobile learning resources. To ensure that the resources co-constructed in the system by different users meet a basic quality standard, templates and tools are provided that scaffold and guide the users to design and develop a resource. In the system, a Co-Cons task will be initiated when the practical learning needs expressed by users reach a threshold number. Once the Co-Cons task is established, users interested in the same topic participate in the co-construction of a learning resource. Co-Cons guides the members as they share their expertise in the task area, edit the scripts, and contribute resource material, including social tags and comments. In this process, strangers from across the life-long learning network are supported in a co-construction process with one another.   The goals of this research are to design the Co-Cons sharing mechanism in order to stimulate strangers to participate and share in the virtual community, and to build new knowledge about sharing and co-construction within online communities of strangers.

A design-based research (DBR) approach has been used in developing the Co-Cons system, with the sharing mechanism as its key component. This paper explores how the sharing mechanism facilitates participation. The intervention model is used as a framework of data collection and analysis. Findings in this pilot phase will be used to make successive improvement of the mechanism design as well as the Co-Cons system itself.   Using an intervention model designed according to social capital theory, we identified factors that mediate willingness to share according to structural, relational and cognitive dimensions. we then designed an intervention model with the intention of increasing these three dimensions of social capital by strategies, functions and tools. This intervention model will work within the Co-Con system and is expected to foster and increase social capital and therefore foster willingness and participation in the co-construction process.

A group of 17 graduate and undergraduate students from a university in Shanghai participated voluntarily in the three-week pilot from February to March 2010. Four graduate students acted as the volunteer leaders while the other 13 students acted as voluntary contributors in the pilot process. All participants were experienced social computing users. Two co-construction tasks were initiated by the four leaders, and three types of data were collected to see whether the intervention model (i.e., strategies, functions and tools) facilitated this virtual community. Self-report question sheets with 23 questions were provided to the participants at the outset, and participants were asked to make self-reports during the activities. System logs were also collected to capture the level of participation in the pilot process. In addition, a focus group meeting of participants was conducted at the end of the pilot, in an effort to find which functions, tools and strategies were most helpful and in which were in need of improvement.

The findings in this first design iteration have helped us to understand how to foster sharing and co-construction within online communities of strangers.   First, we found that the Co-Cons intervention model fostered users to participate and maintain their activity in the community; as well, clearly outlined task description help to draw people together who have mutual interests. Further, the findings of users' interests in the 'Wall' and users' verbal appeal to incorporate more attractive activities confirm that a plan for maintaining interest in a multi-stage style must be in place as this m-Learning project moves forward into subsequent design stages.

Design of Museum Exhibits: An Informal Learning Perspective

Authors: Jian Zhao, Xianqing Bao, Kangli Li, East China Normal University

The course of life-long learning is not only constituted by formal schooling, but also includes education in the family, and in society. Even though schools are the main subject of the current educational system, schools only constitute one source of knowledge. Even more knowledge is obtained through various informal learning venues (Banks, et al. 2006). There are many sources of informal learning, including museums, zoos, botanical gardens, and every-day learning (i.e., watching TV, developing individual interests, reading books, shopping). Such informal learning has been addressed by educational technologists and learning scientists, and has become a hot topic for research. Compared to school learning, learning in informal environments can be seen as more random or irregular, making it difficult to control or measure, and there are limited methodologies or theoretical formalisms to address these forms of learning. Because of this, there is far less research in this area than there is on formal school learning, despite the fact that researchers acknowledge the importance of this field.

Museums, which constitute a human-designed environment for learning outside of school, have been seen

by European and North-American researchers as an important path to understanding and researching informal learning. Falk et al. (2005) analyzed a large number of articles and empirical studies to derive a Contextual Model of Learning, which states that the experience of learning in a museum is the result of a combination of individual factors, the physical environment, and social culture. Individual factors include: visitor motivation, expectations, previous knowledge, individual experience, interest, etc. Social culture includes co-visitors and social interactions in the family. It remains to be investigated whether this model is appropriate for Chinese museum settings, and whether it properly reflects Chinese visitors' individual factors. In addition, there is little research about the collaborative and constructivist learning that happens between visitors while visiting a museum. Given these questions, this paper proposes the following research questions:

- What are the factors that impact museum visitors' acquisition of knowledge during a museum visit?
- What is the collaborative learning behaviour of museum visitors?
- Can information technology promote collaborative learning between museum visitors during or after the visit?

Using The Vancouver Pavilion at the 2010 World Expo as a source of data, this paper will (1) evaluate the impact of each exhibit on the visitors, recording and analyzing the behaviour of visitors at each area of the pavilion, and contrasting this with the designer's knowledge frame and intention; and (2) analyze the impacts of different exhibits to explore the relationship between the design of the exhibits and the acquisition of knowledge by visitors. Using a random sample of the visitors to the Vancouver Pavilion, this study employed participant observation, work sheets, and interviews with visitors to collect data about their reactions to the design of the exhibits. It used exhibit design analysis sheets and interviews of the designers to collect data about the design of the exhibits. A second phase of research addressed the use of worksheets to encourage collaborative learning in a museum setting. Using the Shanghai Scientific Museum as a case study, the researchers studied participatory behaviour in some areas of the museum through observation and recording, analyzing the collaborative learning behaviour of the visitors. Next, using a design research methodology, we implemented three cycles of designing participatory learning worksheets and offering these to visitors. Through discourse analysis and the recording of visitor actions, we compare and analyze the impact of worksheets on collaborative learning behaviour.

The data from the first study show that the design of the exhibits certainly impacts the participants' acquisition of knowledge. Moreover, the composition of the visitor groups, as well as their interests and hobbies, can influence how long they stay at the exhibit, which impacts their recall of information about the exhibit. In the second study, we found that worksheets can play an intermediary role in encouraging visitors to ask questions, explain, clarify and engage in other similar behaviour, which increases the interaction within a visitor group. Based on study one and study two, we are designing handheld technology and Web 2.0 technology for use in museum settings to encourage collaborative learning, and to understand its effects.

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