Towards Mobile Curriculum with Systemic Learning Solutions

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ABSTRACT
In this article, we discuss a work-in-progress study project, in which one of the main goals is to bring out the most relevant qualities of technologies for the instruction and school development. The Systemic Learning Solutions (SysTech) project is a joint value network project in which learning solutions are co-designed and created among research institutes, 12 companies and a wide range of educational piloting environments. The aim is 1) to find new and innovative approaches in curricular design including current and emerging mobile technologies, 2) to explore mobile learning in and across formal and informal settings, and 3) to create adaptive, virtual or collaborative environments for mobile learning. This paper presents some background knowledge, six key characteristics (Zhang et al., in press) of the mobilized curriculum (Looi et al., 2011.), a testing model, and initial findings from the first pilot experiments.

Author Keywords
Mobile learning, learning solutions, curriculum design, innovative learning

INTRODUCTION
The SysTech project aims to promote the learning and teaching of 21st century skills Binkley et al. (2012) and Finnish educational know-how by validating, implementing and disseminating innovative learning solutions on a large scale into different educational systems. It is a joint effort of two universities, 12 companies and a wide range of educational piloting environments. The project will build a portal of systemic learning solutions, consisting of six product families.

Mobile devices, one of the product families, bring new opportunities for teaching and learning, e.g. by creating authentic learning experiences to solve real life problems. They are cheap, portable, have no start-up time, require very little maintenance, and are easy to use. Students can exchange data quickly and accurately with peers without cluttering the classroom with cables, and can move among various collaborators in the classroom and establish a face-to-face interaction. For pedagogically effective and meaningful use of mobile technology systematic research and practical support and development are required.

The aim of the research experiments performed by SysTech is to explore what the user experiences are, how the mobile learning solutions could be improved and to define what the added value from using the learning solution is. In addition, we examine what kind of pedagogical support will be needed in the implementation process of mobile learning solutions. In this paper, the aim is to describe how we have been to building curriculum driven use scenarios based on theoretical framework of mobilized curriculum.

MOBILIZED CURRICULUM

We establish a theoretical framework based on earlier research on the pedagogy of mobile learning and learner-centered knowledge creation methods in network-based environments (e.g. Roschelle & Pea, 2002; Kynäslahti & Seppälä, 2003; Tella, 2003; Chan et al. 2006; Vesterinen et al., 2006; Sharples et al. 2007; Roschelle et al., 2007; Squire & Klopfer, 2007; Vahtivuori-Hänninen, Karaharju-Suvanto & Suomalainen, 2008; Spikol et al., 2009; Shear et al., 2010; Vavoula et al., 2009; Tuomi & Multisilta, 2011; Mylläri et al., 2011; Nousiainen, Kankaanranta & Neittaanmäki, 2012). To promote school development based on the new affordances and activities introduced by mobile learning solutions, we expand the earlier research with the concept of a mobilized curriculum (Looi et al., 2011, 272). Zhang et al. have listed the key characteristics of mobilized curriculum as follows:

- Mobile technologies are exploited to achieve learning in context
- Studying consists of student-centered and inquiry-based learning activities
- Constant access to student artifacts is utilized for formative learning assessment and adjusting teaching/instruction
- Collaborative interactions are enabled and promoted
- Community support and resources are enabled and utilized
- Teacher development for curriculum development is facilitated

Our research objectives bring together ideas from three following strands:

- New approaches in curricular design
- Contextual learning in and across formal and informal settings enabled by one-to-one computing.
- Mobile technology as a learning hub

As a novel approach to curricular design, the mobilization of the existing curriculum and conventions of instruction can take form in a single, mobilized lesson (Norris and Soloway, 2008) where e.g. an initial paper-based design is reshaped into benefitting from use of mobile technologies. On the overall level, a mobilized curriculum captures the systematic transformation from a content- and teacher-centered to a student-centered infrastructure, that fosters personalized and self-directed learning (Looi et al., 2009).

One-to-one computing in education means that learners have access to personal mobile devices at all times to mediate both the classroom and out-of-classroom learning activities (Looi et. al., 2011). The corresponding concepts such as "seamless learning environment" are used to bridge formal and informal learning (Chan et al., 2006). One-to-one computing encourages the design of mobilized lessons or learning projects to include elements such as interaction, collaboration and peer-teaching.

The mobile technology can be seen as a ‘hub’, that activates and integrates the variety of students’ learning resources, e.g. digital repositories, personal learning spaces and channels for peer communication and information. It also enables the digital production of artifacts that reflect conceptual understanding; as well as provides support for sharing, commenting and revising knowledge representations. These learning premises are strongly felt to emphasize students’ ability to take responsibility as well as ownership for their ‘personal inquiry’ (e.g. Looi et al., 2011).

RESEARCH QUESTIONS, METHODS AND DESIGN

The SysTech research questions address areas such as strengths, weaknesses and applicability of the learning solution to the curriculum-driven teaching-learning process quality and style of learning. Concerning the mobile technology, our research focuses on the transformative process of redesigning existing curriculum and the corresponding learning activities.

Data have been collected with online questionnaires and participant observation. In the pilot experiments, all learning solutions go through what we have labeled as the SysTech Testing Model:

- Assessment and analysis of the learning solution and the piloting environment performed by the researchers and experts in the field in order to address questions such as technical and pedagogical usability.
- Co-design of the pilot experiment. This is a collaborative effort of the researchers and the actors of the pilot environment.
- Pilot experiment with users of the pilot environment testing the solution as part of their current teaching-learning activities. The main data gathering method during the third step is observation.
- Data analysis
- Agreeing on the iterations and their modifications performed within the same pilot environment beginning again from the second step.

BUILDING USE SCENARIOS

Citynomadi, one of the mobile learning solutions, has been studied in two pilot cases. Citynomadi is a combination of services consisting of a mobile application for automated tracking and storing of user location, route and e.g. photos, videos and QR-codes. The objective of Citynomadi pilot experiments was e.g. paying special attention to teaching and learning 21st century skills, e.g. creativity, critical thinking and collaboration (see “KSAVE-model” in Binkley et al. 2012). The first pedagogical use scenario addressing 10 lessons was intended for a 5th grade local history projec, where

students used the mobile application installed onto their own smartphones to follow the routes created by the teacher and to track routes for the other students to follow and perform tasks on.

Looking at the initial findings, the option to work on the subject of history not only while moving independently outside the classroom, but also while utilizing personal mobile devices often restricted or banned from school work altogether was considered as a very positive factor. E.g. preferring Citynomadi over working with the history book was obvious (e.g. 66% of students agree or strongly agree with the proposition "learning history with Citynomadi is more stimulating than with books"). However, the students were not sure of how much the activity promoted the actual learning of history. From teacher's perspective the experiment with the learning solution seemed to be very rewarding. It e.g. provided new ideas on how to apply the technology in other subjects and on how to restructure the pedagogical-technical support available for implementing projects like this during the next semester.

The second use scenario was conducted within an interchange programme between two international schools of Helsinki and Barcelona, in which Citynomadi application was used in creating, sharing and exploring city routes together with the primary school children and their teachers. Descriptions, activities and pictures of drawings and scale models created by children as well as videos and links related to different places of interest were inserted into the city route maps. Through sharing the maps publicly in the Internet, children could express their points of view about their hometown.

From the perspective of 21st century skills, the pilot's intercultural nature enabled practising intercultural communication a well as collaboration and skills needed for global citizens. Learners were able to express creativity and innovativity when designing and creating contents for the maps. Children also practiced using virtual maps as well as technological skills and skills needed for acquiring good information literacy skills. Teachers viewed the activity positively but one of the biggest challenges is that designing cross-curricular and cross-cultural activities similar to this requires lots of time and collaboration between different teachers, which is not easy to arrange in hectic school environments with different timetables. Teachers should be given more time and support so as to be able to include similar projects in their regular lesson plans and to integrate them in the official curriculum.

CONCLUSIONS

In this paper we have presented our on-going efforts on constructing a theoretical framework for mobilizing an existing curriculum. We have also demonstrated mobile learning use scenarios designed together with teachers and students in the educational pilot environments. This paper is based on work-on-progress study and thus presents preliminary insight and results on these themes. With the theoretical framework we aim at building new approaches for curricular design and embedded innovative teaching practices. In Finland schools have a lots of freedom to develop their own local curriculum. The national core curriculum gives only a framework (see e.g. Niemi et al., 2012; National Core Curriculum, 2004). This allows schools to apply ICT and mobile tools in their own individual kinds of practices.

The pilot experiments have indicated that the co-construction of the use and implementation of mobile learning solutions together with teachers and pedagogical ICT experts enables their better integration into the curricular needs of different learning environments. This kind of mobilized curriculum and classroom learning activities requires one-to-one computing. However, the current state of restricted ICT access at schools challenges the possibilities of large-scale take-into-use of mobile use scenarios. In our study, we aim at carefully analyzing the factors related to effective technological and pedagogical take-into-use of mobile solutions. Our special focus is on the design of versatile pedagogical models and support structures as earlier research has pointed the slowness of change processes at school cultures compared to the speed of technology development, also in regard of access issues. In our framework of mobilized curriculum we conceptualize mobile technology as a learning hub for the mobilized curriculum. This emphasizes self-directed and collaborative learning as an integral part of a school's learning activities.

REFERENCES

Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley M., Miller-Ricci, M. & Rumble, M. (2012). Defining Twenty-First Century Skills. In P. Griffin, B. McGaw & E. Care, E. (Eds.) Assessment and Teaching of 21st Century Skills. Dordrecht: Springer, 17–66.

Chan, T., Roschelle, J., Hsi, S., Kinshuk, Sharples, M., Brown, T., Patton, C., Cherniavsky, J., Pea, R., Norris, C., Soloway, E., Balacheff, N., Scardamalia, M., Dillenbourg, P., Looi, C., Milrad, M., & Hoppe, U. (2006). One-to-one technology-enhanced learning: An opportunity for global research collaboration. Research and Practice in Technology Enhanced Learning, 1(1), 3–29.

Kynäslahti, H. & Seppälä, P. (Eds.) (2003). Professional mobile learning. Helsinki: IT Press: Helsinki.

Looi C.-K., Wong L.-H., So H.-J., Seow P., Toh Y., Chen W., Norris C. & Soloway E. (2009). Anatomy of a mobilized lesson: learning my way. Computers & Education 53, 1120–1132.

Looi, C.-K., Zhang, B., Chen, W., Seow, P., Chia, G., Norris, C., & Soloway, E. (2011). 1:1 mobile inquiry learning experience for primary science students: a study of learning effectiveness. Journal of Computer Assisted Learning, 27(3), 269–287. doi:10.1111/j.1365-2729.2010.00390.x

Mylläri, J., Kynäslahti, H., Vesterinen, O., Vahtivuori-Hänninen, S., Lipponen, L. & Tella, S. (2011). Students' pedagogical thinking and the use of ICTs in teaching. Scandinavian Journal of Educational Technology. London: Routledge.

National Core Curriculum for Basic Education (2004). Finnish National Board of Education, Vammala.

Niemi, H., Kynäslahti, H. & Vahtivuori-Hänninen, S. (2012). Towards ICT in everyday life in Finnish schools: seeking conditions for good practices. Learning, Media and Technology, 1–15. http://dx.doi.org/10.1080/17439884.2011.651473

Norrena, J.-M., Kankaanranta, M. & Nieminen, M. (2011). Kohti innovatiivisia opetuskäytänteitä. (Towards Innovative Learning practices.) In M. Kankaanranta (Ed.), Opetusteknologia koulun arjessa. Jyväskylä, Finland: University of Jyväskylä, 77–100.

Norris C. & Soloway E. (2008). Getting Mobile: Handheld Computers Bring K-12 Classrooms Into the 21st Century, District Administration Magazine, Professional Media Group, LLC, CT. http://www.districtadministration.com/article/handhelds-getting-mobile (last accessed 28 May 2012).

Nousiainen, T., Kankaanranta, M. & Neittaanmäki, P. (2012). Design activities and contributions in the creation of ideas for educational mobile applications for school-aged children. IADIS International Conference Mobile Learning 2012 (11-13 March). Berlin, Germany.

Roschelle J., Patton C. & Tatar D. (2007). Designing networked handheld devices to enhance school learning. In Advances in Computer, Vol. 70 (ed. M. Zelkowitz), 1–60.

Roschelle, J., & Pea, R. (2002). A walk on the WILD side: How wireless handhelds may change computer-supported collaborative learning. International Journal of Cognition and Technology, 1(1), 145-168.

Sharples M., Milrad M., Arnedillo Sánchez I., Vavoula G. (2007). Mobile Learning: Small Devices, Big Issues. In Technology Enhanced Learning: Principles and Products.

Shear, L., Novais, G. and Moorthy, S. (2010). ITL research executive summary of pilot year findings. Microsoft Partners in Learning.

Spikol, D., Milrad M., Maldonado H.& Pea, R. (2009). Integrating co-design practices into the development of mobile science collaboratories. In Proceedings of the 9th IEEE International Conference on Advanced Learning Technologies (ICALT 2009) (14–18 July). Riga, Latvia.

Squire K. & Klopfer E. (2007). Augmented reality simulation on handheld computers. Journal of the Learning Sciences 16, pp. 371–413.

Tella, S. (2003). M-learning—Cybertextual Traveling or a Herald of Post-Modern Education?. In H. Kynäslahti & P. Seppälä (Eds.) Professional mobile learning. Helsinki: IT Press, 7–219.

Tuomi, P. & Multisilta, J. (2011). Mobiilivideot oppimisen osana – Kokemuksia MoViE-palvelusta Kasavuoren koulussa. (Some experiences as mobile tools as a part of the learning process). In M. Kankaanranta & S. Vahtivuori-Hänninen (Eds.) Educational Technology in Schools Everyday Life II. University of Jyväskylä: Finnish Institute for Educational Research & Agora Center. (In Finnish)

Vahtivuori-Hänninen, S., Karaharju-Suvanto, T. & Suomalainen, K. (2008). Characteristics of Pedagogical Models in the Mobile Teaching—Studying—Learning (TSL) Environments: Findings of the I-Trace Project. In the Proceedings of the Pen-based Learning Technologies (PLT 2007) Aula Magna of the Palazzo Centrale of the University of Catania. IEEE Computer Society Digital Library. [http://doi.ieeecomputersociety.org/10.1109/PLT.2007.5]

Vavoula G., Sharples M., Rudman P., Meek J. & Lonsdale P. (2009). Myartspace: design and evaluation of support for learning with multimedia phones between classrooms and museums. Computers & Education 53, 286–299.

Vesterinen, Vahtivuori-Hänninen, Oksanen, Uusitalo & Kynäslahti (2006). Mediakasvatus median ja kasvatuksen alueena: deskripitiivisen mediakasvatuksen ja didaktiikan näkökulmia. (Direction for media education) Kasvatus (The Finnish Journal of Education) 37(2), 31–44. In Finnish, English summary.

Zhang B.H., Looi C.-K., Seow P., Chia G., Wong L.-H., Chen W., So H.-J., Norris C. & Soloway E. (2010). Deconstructing and reconstructing: transforming primary science learning via a mobilized curriculum. Computers & Education 55, 1504–1523.