Designing and Developing Mobile Learning Applications in International Student Teams

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Tags

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This paper reports on an international collaboration in which students from different universities designed and developed mobile learning applications, working together in interdisciplinary teams using social and mobile media. We describe the concept, process and outcomes of this collaboration including challenges of designing and developing mobile learning applications in virtual teams.

1. Future Social Learning Networks

Future Social Learning Networks (FSLN) is an international collaboration aiming at building learning networks of higher education students and lecturers by means of social and mobile media. The concept was conceived at the University of Paderborn in the Computer Science Education Group (Heinze & Reinhardt, 2011) and was successfully carried out in 2010 and 2011 in collaboration with the University of Augsburg (Reinhardt et al., 2011). In the summer term 2012, six different universities from Germany and Israel participated in the third implementation of FSLN. This time, the collaboration aimed at bringing together students from different disciplines to design and develop mobile learning applications in interdisciplinary, virtual teams. The FSLN course 2012 (FSLN12) focused on two specific aspects of mobile learning: *contextualised information support* and *gamification*. The participating partner universities are summarised in Figure 1.

	PAD	BEU	LEV	HOL	BRA	DUE
Name	University of Paderborn	Beuth University of Applied Sciences	Levinsky College of Education	Holon Institute of Technology	Technische Universität Braunschweig	Heinrich Heine University Düsseldorf
City	Paderborn	Berlin	Tel Aviv	Holon	Braunschweig	Düsseldorf
Country	Germany	Germany	Israel	Israel	Germany	Germany
Domain	Computer Science	Media Didactics	Educational Sciences	Instructional Design	Information Sciences	Social Sciences
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Figure 1: FSLN12 partner universities

2. Designing and developing mobile applications

FSLN12 combined on-campus, course-related face-to-face and online learning phases with off-site, synchronous and asynchronous web-based learning phases in virtual teams. The collaboration process in FSLN12 was based on the paradigm of design-based research (DBR) in which development takes place through the continuous cycle of design, enactment, analysis, and redesign (Collins et al., 2004). Teams were composed of students representing each

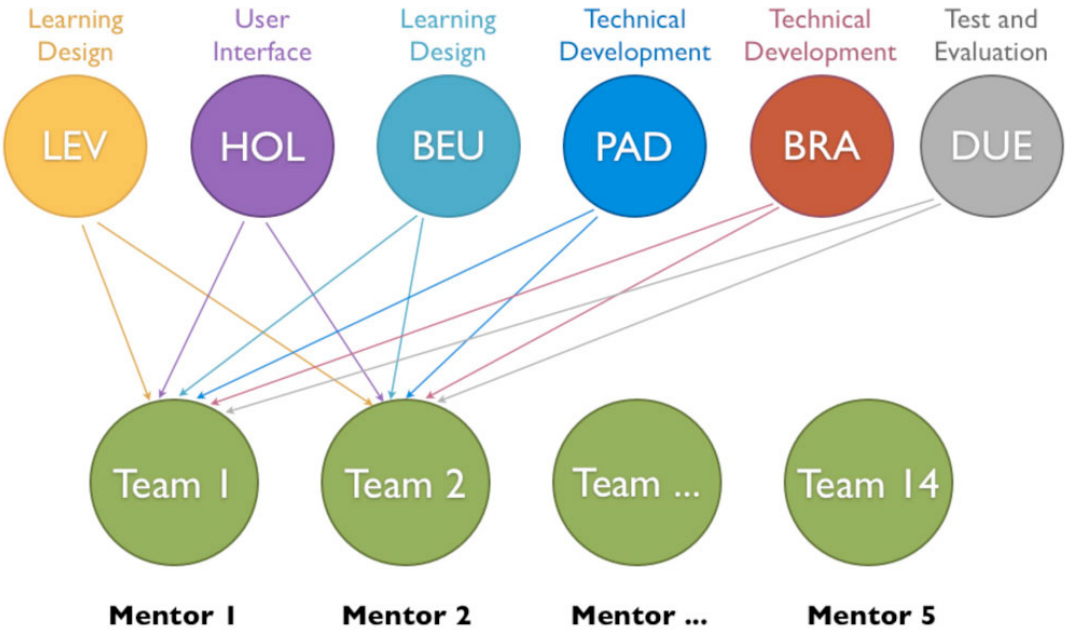

Figure 2: Composition of FSLN teams.

participating university and were guided by one of the course leaders as team mentors (Figure 2). In this way, diverse knowledge and skills were brought together to design and develop mobile learning applications starting from idea generation, through the analysis of the state of the art, definition of user requirements, elaboration of the learning design, to the technical development, test and evaluation.

Each team consisted of 5-7 students and one mentor. Students took on one of the core project roles, i.e. (a) *manager* (ensuring seamless team collaboration), (b) *designer* (conceptual design, including learning design and interface design), (c) *developer*, (technical development of prototypes integrating learning design and interface design), and (d) *administrator*, (technical setup and support of team tools, e.g. team wiki and blog).

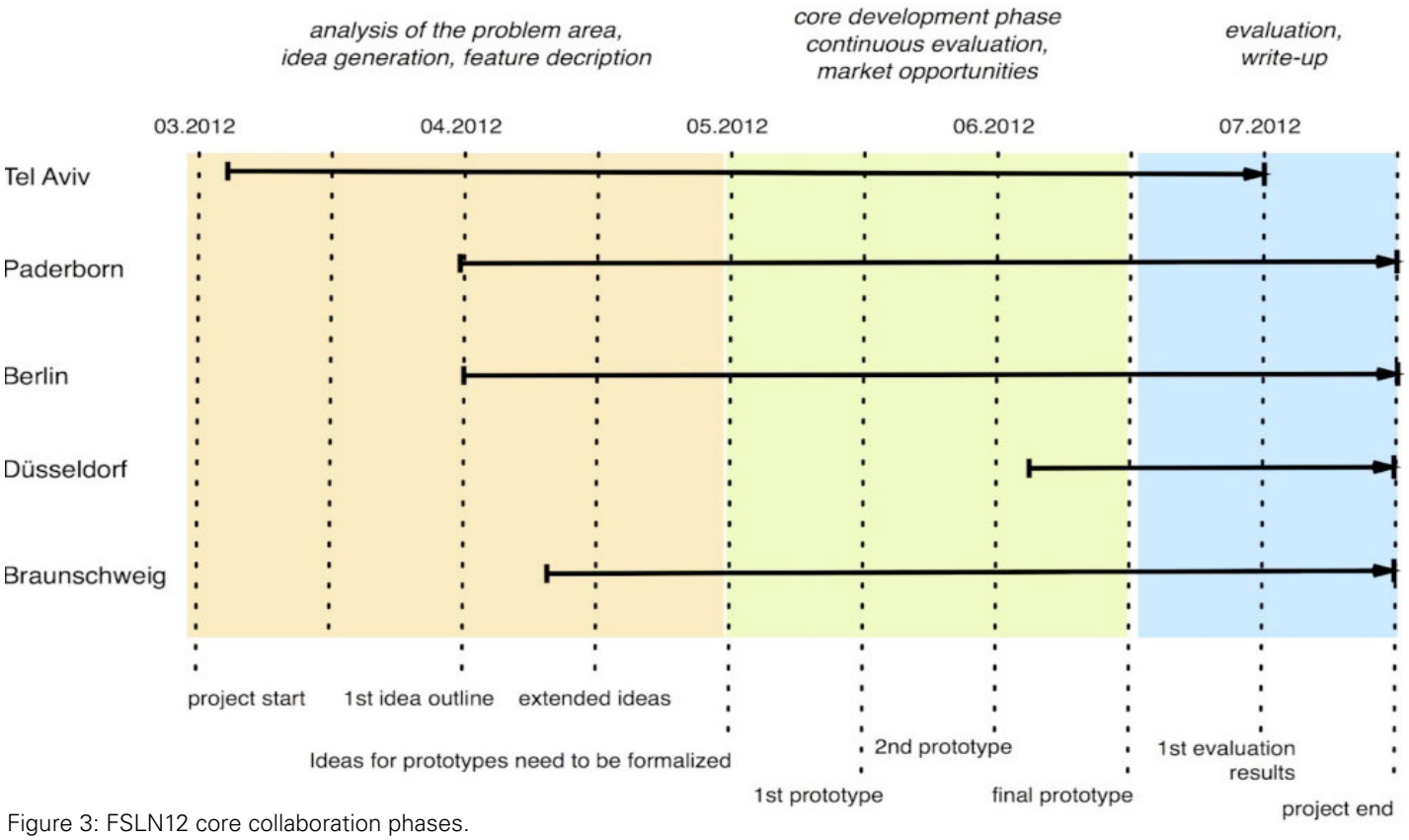

Figure 3: FSLN12 core collaboration phases.

The collaboration encompassed all key stages of mobile learning development, i.e. (a) *idea generation*, (b) *user requirements*, (c) *learning design*, (d) *user interface design*, (e) *technical prototypes*, and (e) *test and evaluation*. FSLN12 encompassed three core collaboration phases (Figure 3):

- *Phase1: Explore and generate ideas*: students investigated the state of mobile learning, brainstormed and described first ideas for a mobile learning application.
- *Phase 2: Design and develop*: students specified user requirements and user stories, elaborated on the learning design, created elements of user interfaces and developed functional prototypes.
- *Phase 3: Evaluate and report*: students tested mobile learning application with selected users, evaluated usability and documented the collaboration process and outcomes in final reports.

FSLN12 teams used a number of social and mobile media to communicate and collaborate over distance. In order to create collaboration spaces for each team and at the same time a common online environment for all FSLN12 teams, diverse web-based tools were combined (Figure 5):

- Team spaces were created using *team wikis (PBWorks)* for intra-team asynchronous collaboration, and *web conferencing (Adobe Connect, FlashMeeting, Skype)* for synchronous communication in teams.
- The common project space was created using *team blogs (Wordpress)* for inter-team communication of development steps (milestones), documenting team progress and providing feedback between teams; *microblogging (Twitter)* for quick, spontaneous communication and sharing of resources on stationary and mobile devices, using the project hashtag #FSLN12; *web conferencing (Adobe Connect)* for synchronous meetings of all teams after reaching each milestone, enabling teams to present their outcomes and receive feedback students and mentors, *video portals (Vimeo)* for sharing videos.

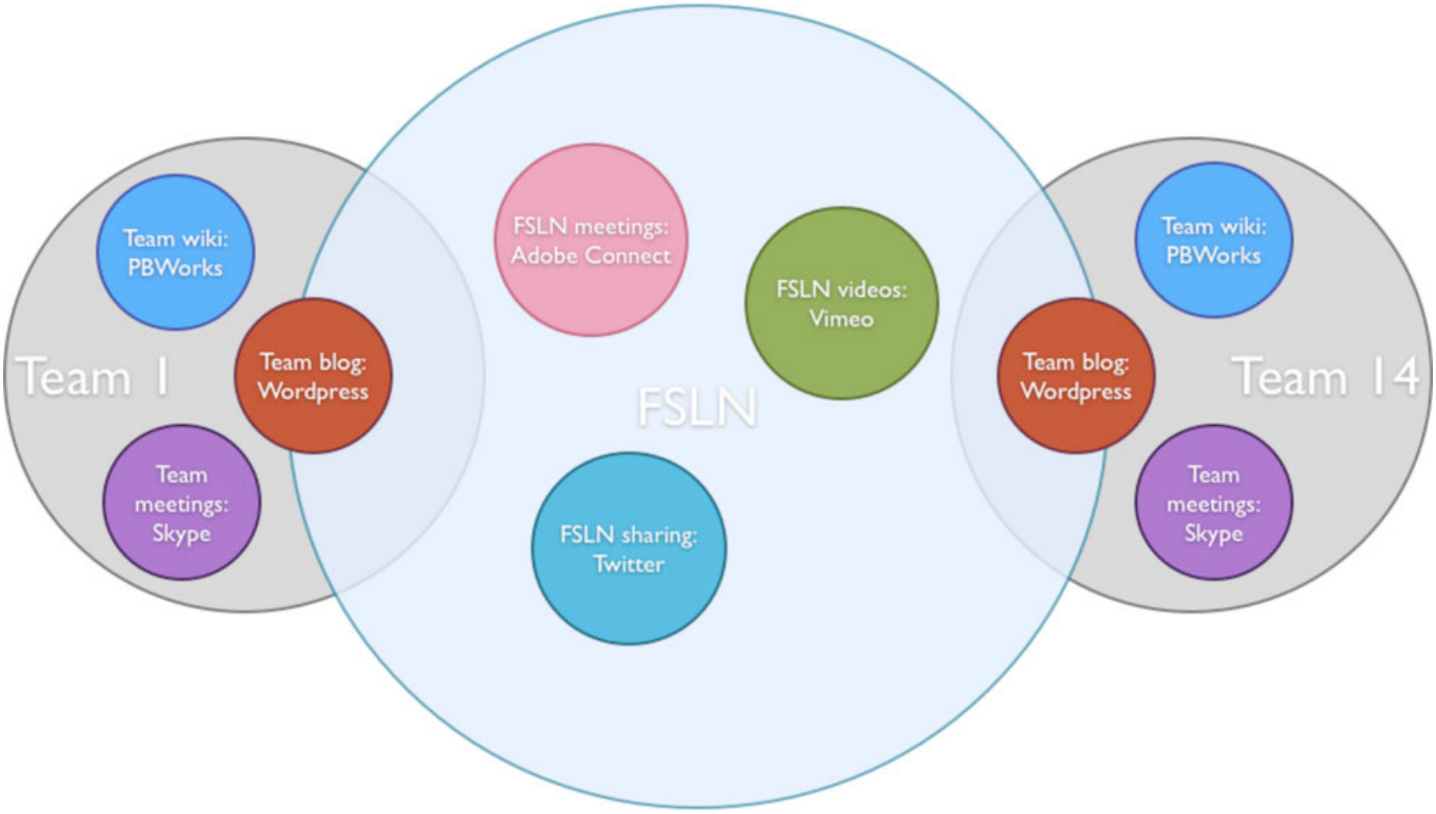

Figure 4: Collaborative spaces in FSLN12.

Figure 5: Selected prototypes developed in FSLN12.

By using Web 2.0 tools for collaboration it was possible not only to create a common project space but also to share and communicate with a wider public.

3. Outcomes of the course

The outcomes of FSLN12 have been manifold and can be described from three perspectives:

3.1 Learning Outcomes

Beyond the subject-matter knowledge of each participating course (e.g. learning design, application development), the FSLN12 students acquired a number of generic, extra-curricular skills. First, students learned how to work in interdisciplinary, virtual teams applying different skills and competences to reach common outcomes. Second, students learned to use and integrate Web 2.0 tools in project-based learning. Third, students learned to create learning designs and implement technical prototypes for mobile learning applications. The learning outcomes related to the subject-matter differed for each participating university.

3.2 Teaching Outcomes

By bringing together courses from different universities and disciplines and integrating technology into teaching, FSLN12 course leaders acquired a number of valuable teaching skills. Some of the key teaching outcomes include experience in mentoring international, virtual teams, managing diversity in teams of students from different cultures and domains, creating technology-enhanced spaces for virtual collaboration, designing the educational process of design and development of mobile learning applications and incorporating design-based research principles into their teaching repertoire.

3.3 Application Outcomes

The key application outcomes of FSLN12 are the mobile learning applications developed in student teams, including the different stages of the development which were reflected in the project milestones (Figure 4). The teams were not only free in the choice of the specific application area, but they could also choose the programming language and mobile frameworks. In consequence, students developed for both Android and iOS platforms, using native Java, Objective-C and HTML5 frameworks. The bandwidth of developed applications ranges from language learning applications to applications aiming at helping users structure study tasks. Selected prototypes are depicted in Figure 5.

4. Conclusion

FSLN12 was a truly international and interdisciplinary collaboration with more than 90 students from Germany and Israel, integrating various disciplines, knowledge and skills in the team-based process of mobile learning applications design and development. The many benefits of this virtual collaboration have been accompanied by problems resulting to a large extend from the lack of face-to-face communication accompanied by the high degree of collaboration (teams worked on the common goal). Other challenges included coordination of activities within and between FSLN12 teams, and psychological and social effects associated with intercultural and mediated communication, such as uncertainty about roles, different perceptions of team-work and leadership, different degrees of commitment, difficulties in establishing trust. Despite these difficulties, all FSLN12 managed to collaborate and to find solutions in designing and developing mobile learning applications in virtual, intercultural and interdisciplinary teams. Due to the distributed nature, FSLN12 mentors had to conceive effective ways of guiding and supervising teams, overcoming language, knowledge and cultural differences. The outcomes of FSLN12 are encouraging when regarding the learning progress that both students and mentors made. The prototypes developed by FSLN12 teams can be found in the respective team blogs, linked in the FSLN12 project blog, URL: http://imhotep.cs.upb.de/blogs/fsln12.

References

Collins, A., Joseph, D., & Bielaczyc, K. (2004). Design Research: Theoretical and Methodological Issues. *The Journal of the Learning Sciences*, 13 (1), 15–42.

Heinze, N. & Reinhardt, W. (2011). Educating Educators with Social Media, Vol 1 of Cutting-edge Technologies in Higher Education, Chapter Future Social Learning Networks at Universities – an Exploratory Seminar Setting, pages 153–170. Emerald Publishing Group, 2011.

Reinhardt, W., Moi, M. & Heinze, N. (2011). Analysis of Twitter usage in an exploratory seminar setting. Form@re, (74), http://formare.erickson.it/wordpress/it/2011/analysis-of-twitter-usage-in-an-exploratory-seminar-setting/

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