

# CELSTEC Research Project Proposal

## Learning and Cognition Programme

### 1. Applicant(s)

Main applicant / Contact person		
Name, titles	Your Name, MSc	Sex:
Correspondence address		
Address		
Postal code	City	
Telephone	Fax	
E-mail address		

### 2. Title and Summary

Title of the part-project and concise summary of the problem definition (maximum 100 words)	
<b>Title (English):</b>	Flexible Learning in the WILD: Mobile (Ubiquitous) Communities of Learners
<b>Title (Dutch):</b>	Flexibel leren in het WILD: Mobiele (Alomtegenwoordige) Leergemeenschappen
<b>Summary:</b>	Emerging technologies as Personal Digital Assistants and mobile telephones offer unique opportunities to enhance the traineeship learning experience and make it more flexible. This project studies how modern mobile devices with functionalities such as sound and image recording and transmission enhance the traineeship experience of learners at Regional Educational Centres by creating small-scale learning communities that allow for just-in-time and learner-specific guidance and feedback, consisting of several learners and a supervisor, all supported by these modern, real-time technologies.

### 3. Under which line of research of the L&C programme is this application submitted?

<b>Line(s) of research</b>	Creating flexible environments for acquiring complex cognitive skills (theme leader: Dr. Liesbeth Kester)
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### 4. Composition of the research group

Name, titles:	Discipline	University	Number of hours per week	Charged to
Student Name		My HBO	20	My HBO
Prof. dr. Paul A. Kirschner	Educational Psychology	OUNL	1	CELSTEC
Daily Supervisor	Mobile learning	My HBO	2	My HBO

### 5. Duration for which you are applying

<b>Duration (years)</b>	4
<b>Starting date</b>	December 1, 2010

### 6. Financial contribution to the project by third parties

Is there any other financial contribution to this research?		
<b>No</b>	<input checked="" type="checkbox"/>	
<b>Yes</b>	<input type="checkbox"/>	What?
		How much?

## 6. Financial contribution to the project by third parties

	By whom?	
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## 7. Financial support

### 7.1 Staffing costs

	year	academic staff		non-academic staff	
		months	fte	months	fte
Application					
Estimate					
Estimate					
Estimate					
Estimate					

### 7.2 Running costs

(x 1,000 Euro)	Year	Durables	Consumables	Other Costs	Travel	Total
Estimate						
Estimate	2011		12.96			12.96
Estimate	2012		17.28			17.28
Estimate	2013		17.28			17.28
Estimate	2014		4.32			4.32
Total			51.84			51.84

#### Explanation for and motivation of the costs applied for in the tables above

Consumables: This project requires the availability of mobile communication devices and a carrier network. Costs are calculated on the basis of one-year contracts with a large telecom provider. The cost is calculated at: €30 per month for a period of three years (36 months) for 48 participants = €17,280.00 per year.

## 8. Research proposal (*Maximum 4200 words, excl References*)

### 8.1 Problem definition

Often heard complaints from learners during traineeships – integral to senior vocational education and training (sVET) – are that (1) the supervisor is often hard to reach and does not visit the work place often (Chen, 2007), (2) the problems encountered in the work-situation often cannot be solved with the knowledge the trainee already has and that there is no possibility to acquire the necessary knowledge at the moment it is needed (Lave, 1991), and (3) the trainee often feels lost and abandoned, leading to feelings of solitude, especially in traineeships in foreign countries. Schools attempt to alleviate these problems by sending supervisors to the workplace or having learners return to school at certain times and by making use of tethered information and communication technology solutions such as desktop PCs and electronic learning environments. This research will study how mobile technologies that are already used by learners can be implemented in traineeships to solve the abovementioned problems.

Computer supported collaborative learning and working, distributed over time and place, are becoming 'normal' in traditional educational institutions and workplace learning environments. This development is documented, for example, in the report of the Key Technologies Expert Group (EC, 2005) which notes that digital wired and wireless networks have become critical components for creating new knowledge within Europe. However, this shift towards online and distributed learning and working has drawbacks and brings new challenges. In distributed learning situations learners are limited to those places where there is access to a computer and a network and having done this, it is often difficult for them to locate and then access the right co-learners with the right knowledge, at the right time and for effective and efficient collaboration, knowledge sharing and knowledge production.

Mobile technologies such as Personal Digital Assistants (PDAs) and cellular telephones are creating opportunities to enhance the learning experience that were unimaginable a few years ago. The nature of these technologies (i.e., wireless, mobile, ubiquitous) allows learners to link their experiences across

multiple locations, affording them greater flexibility than desktop technology alone (Luckin, du Boulay, Smith, Underwood, Fitzpatrick, Holmberg et al., 2005). They can be used as micro-browsers for surfing the web, receiving/sending emails and text and multimedia messages, and creating, transmitting and storing image and sound files. These developments have given rise to the terms Mobile Learning and WILD Learning (Wireless Internet Learning Devices; Roschelle & Pea, 2002). Because of the growth in ownership of and familiarity with mobile devices, the possibility to learn anytime and anywhere has become a real possibility. According to recent studies, 90% of preteens in the UK have a mobile phone (BBC News, 2006), and there is nearly a 100% mobile-phone saturation among teens in Scandinavia and Asia (Katz, 2005). Schools are 'hopping on the bandwagon', making teaching and learning more flexible (i.e., no longer limited to the classroom) with these mobile devices. We see this, for example, in Frequency 1550 (<http://freq1550.waag.org/>) where use was made of mobile phones and global positioning information to help secondary school children learn about the history of Amsterdam, enhance their communication and collaboration skills, and acquire educational abilities such as interpreting historical sources and references, and in Savannah (Facer, Joiner, Stanton, Reid, Hull, & Kirk, 2004) where PDAs were used to help children develop a conceptual understanding of animal behaviour. Studies on the introduction of mobile technologies in schools and classrooms (e.g., Wentzel, van Lammeren, Molendijn, de Bruin, & Wagtendonk, 2005; Zurita & Nussbaum, 2004) affirm that they provide the physical affordances supporting peer-to-peer communication in computer supported learning environments. More importantly, they can be taken anywhere that learning can occur. In an SRI-International study on handhelds in many different learning situations (Crawford & Vahey, 2002), benefits mentioned were portability, ease of access, increased autonomous learning, increased motivation, and increased collaboration and communication. In the traineeship situation, for example, the University of Helsinki carried out a study (Seppala & Alamaki, 2002) where supervising teachers and teacher-trainees discuss and share their ideas about teaching methods through mobile devices also using SMS-messaging and digital pictures as a part of the supervising process. This approach proved "surprisingly [sic] successful". Generally speaking, successful use has involved utilising the mobile devices that learners already know and use, taking advantage of their features to create dynamic learning situations "where collecting and sharing information among the learners inspired true enthusiasm and emotional and intellectual engagement" (Nash, 2007, np). The major problem (Vavoula, Sharples, Lonsdale, Rudman, & Meek, 2007) is that there is no pedagogical approach to provide the necessary seamless interaction between possible mobile learning activities and other types of learning activities. A successful learning activity should be integrated with other learning events, building on them and contributing to their outcomes. This research will start building those bridges in a situation that is required in sVET in the Netherlands, namely the traineeship (NL: stage). Here follow two scenarios: the current traineeship scenario and the envisaged one.

#### Current traineeship scenario

During traineeships, Dutch learners often spend prolonged periods of time outside of the classroom. Schools prepare them by 'giving' them much of the knowledge and skills that they need for success. During traineeships, learners have to deal with situations that were not anticipated and thus where prior learning is insufficient. The trainee can consult the workplace-supervisor (i.e., a teacher-surrogate who is an employee in the workplace and not a trained teacher) or can use traditional information and communication technologies (i.e., email, discussion boards) to consult with the supervisor. This usually means non-optimal problem solution oneself, feelings of solitude and helplessness with accompanying loss of self-esteem, inopportune delays in receiving assistance (i.e., the trainee must often wait until the work-shift has ended to access a computer and then sit down to describe the situation in an email to the supervisor, and then get an answer often too late to use). Problems here are time-delays detrimental to learning, use of media-lean (Daft & Lengel, 1984) written descriptions of the situation which are time-intensive to accurately compose and even then often lacking details forgotten through the time-delay or which the trainee – as a novice – did not notice, adopting sub-optimal solutions which might lead to loss-of-face in the eyes of co-workers or workplace supervisor, etc. Finally, when the trainee comes back to the school at preset consultation moments or when the supervisor visits the workplace, the conception of the situation proves different from the actual one and there have been so many new situations that debriefing becomes irrelevant.

#### Envisaged traineeship scenario

During a traineeship where all of the aforementioned applies, the m-trainee (i.e., mobile trainee) quickly – where relevant and possible – takes a photo or makes a video of the problem situation with the camera in her/his cell-phone and waits until the next break (e.g., refreshment, sanitary) to quickly describe the situation/incident into the voice-recorder in the phone and then sends this media-rich message a peer-group of m-trainees (community) in similar positions at other businesses and to the her/his supervisor at

school via a MMS (Multimedia Messaging Service, similar to Short Message Service (SMS), but allowing messages that include multimedia objects (images, audio, video)). This occurs via a computer-server that captures all messages and traffic. The other m-trainees and the supervisor receive the message in real-time and can access it immediately -if the situation permits - or at the first available free moment. The supervisor, realising the importance, responds quickly with an audio-MMS (to the community). Another group member notes that she/he has recently encountered a similar situation and describes how she/he dealt with it and sends it too. The problems in the traditional traineeship are replaced by potential benefits, namely minimal time delay, media rich messages composed quickly in real-time and which neither lack detail nor have been forgotten due to delay, implementation of a possibly better solution leading to higher esteem, feelings of self-efficacy, and even a feeling of community. There is also added value here in that the supervisor now has a number of 'co-supervisors' (i.e., other m-trainees) who help each other, thus easing her/his workload. The other learners – as is often the case in communities of learning or practice – become meaningful participants in the process.

Characteristics of these scenarios are: media richness, immediacy, and learner communities/ community forming. Taking these sequentially:

- Media richness is the "ability of a communication channel to handle information or convey meaning contained in a message" (O'Hair, Friedrich, & Shaver 1998, p. 60). According to media richness theory, the more cues that a medium provides a user, the richer the medium is. According to Daft and Lengel (1984) richness is determined by: (1) availability of instant feedback, (2) use of multiple cues, (3) use of natural language, and (4) personal focus. Face-to-face encounters in natural language are the richest communications while a telegram is an example of one of the leanest. Research shows that the level of richness of a medium affects how communication is perceived: higher richness leads to increased perceived social presence and sociability which in turn leads to increased feelings of community. See Kreijns (2004) for a discussion of these three concepts.
- Immediacy, while increasing media richness (i.e., instant feedback), also allows for just-in-time information for solving an experienced problem as well as feelings of involvement and community in participants (i.e., helps create a sound social space). A social space is sound if it is "characterized by affective work relationships, strong group cohesiveness, trust, respect and belonging, satisfaction, and a strong sense of community. A sound social space determines, reinforces, and sustains the social interaction that is taking place amongst the group members" (Kreijns, Kirschner, Jochems, van Buuren, 2004, p. 608).
- Groups of learners do not automatically form well-functioning teams or learner communities. Both Tuckman and Jensen (1977) and Wenger (1998) distinguish five stages of group/community development (T&J: forming, storming, norming, performing, adjourning / W: potential, coalescing, active, dispersed, memorable). Reaching the performing or active stage –where learning potential is optimal- is a gradual process requiring considerable time and communication for developing the social base needed to work well together and form a community. The process of developing the necessary firm social base is hampered in online, media-lean (Daft & Lengel, 1986) environments (Kreijns, Kirschner, & Jochems, 2003).

This leads to the following research questions and hypotheses:

- Q1 What are the effects of speed of access in communicating with other trainees and supervisor(s) in small traineeship groups on cognitive, affective and social (i.e., community forming) aspects of the traineeship-experience?
- Q2 What are the effects of media richness of communication between team members and supervisor(s) in small traineeship groups on cognitive, affective and social (i.e., community forming) aspects of the traineeship-experience?
- Q3 What are the effects of community stimulation in small traineeship groups on cognitive, affective and social (i.e., community forming) aspects of the traineeship-experience?

## **8.2 Design and methods**

This research project will consist of a literature study, an experimental pilot study and three experimental studies.

### **Literature study**

The literature study will encompass empirical and qualitative narrative research and case studies relating to the effects of using mobile devices in authentic learning situations (i.c., traineeships). Literature (white and grey) will be sought in electronic databases such as ERIC<sup>®</sup>, Psychinfo<sup>®</sup>, EBSCO<sup>®</sup>, and Scopus<sup>®</sup>. Literature found using terms as *communities of learning* (knowledge communities, communities of practice...), *traineeship* (internship, workplace training...), and *mobile devices* (PDA, smart-phone, mobile phone...) will be retrieved and studied via best-evidence synthesis (Slavin, 1986). The synthesis will concentrate on the findings in the literature in relation to the effects of the factors: learner

communities/community forming, real-time access, and media richness. The outcomes will be translated into a model for implementing mobile devices in traineeships.

## **Experiments**

### Context

All projects will be carried out within ID-College's:

- level 3-4 curricula
- domains of ICT (e.g., network administrator, private digital researcher) or engineering (e.g., electrical technician, middle management technician)
- school-based training trajectory (BOL)
- in the traineeship year at IT-companies and/or Engineering enterprises.

Participants will work in teams of three learners together with a supervisor employed by ID-College.

### Tasks

Participants will not receive tasks different from their 'normal' traineeship tasks. Each condition will receive condition-specific instructions.

### Measures

#### *Communication*

- Quantitative: number of messages, frequency of messages, message length, social network analysis with the aid of UCINET 5.0<sup>®</sup> (Borgatti, Everet, & Freeman, 2002).
- Qualitative 1: message content in terms of physical attributes such as text, sound (e.g., mp3, wav, wma), static images (e.g., jpg, bmp, gif), and dynamic images (e.g., mpg, mov, wmv)
- Qualitative 2: message content in terms of usage and meaning measured through a coding scheme derived from Rainbow (Baker, Andriessen, Lund, van Amelvoort, & Quignard, 2007) and analysed with of MEPA (Erkens, 2005).

#### *Community formation*

- Social presence: degree to which the other in a communication appears to be a 'real' physical person via Social Presence Scale (Kreijns, 2004)
- Sociability: degree of perceived sociability of an environment; that is the extent to which an environment can facilitate the emergence of a social space via Sociability Scale (Kreijns, Kirschner, Jochems, Van Buuren, 2005)
- Social Space: the degree of perceived quality of a social space existing in a distributed learning group via Social Space Scale (Kreijns, Kirschner, Jochems, Van Buuren, 2004)

#### *Satisfaction*

- Supervisor / Learner: Satisfaction with the traineeship, the interaction with the supervisor (Questionnaire on Supervisor Interaction (Wubbels & Levy, 1993)) and with fellow learners

#### *Product & Competence Development*

- Digital Development Portfolio. Traineeship reports made in the learners' DDP (i.e., see part-project 5) provide information on competence development and product quality. The reports will be blind-reviewed by a traineeship supervisor who has not taken part in the research.

### Pilot

Two teams (each with three learners and a supervisor) will be equipped with cell phones during a three month internship and will receive instruction as to their use in the traineeship (experimental condition). In addition, four teams with access only to stationary communication tools (i.e., e-mail and/or discussion board) will be formed. Two will be set up as a community where participants are provided with a discussion space and are stimulated to share information therein (shared-information control condition). The two other teams communicate via standard email with the tutor via a bi-weekly report format (standard control condition).

*Data* gathered consists of all communication within teams along with measures of communication, community formation, and satisfaction.

*Goal* is to determine whether the assumptions underlying the research are correct and how the instructions and tools can be improved for the three full-scale experiments.

### Experiments

In all experimental studies, three trainees and a supervisor will be randomly assigned to a team. Two supervisors will participate in each experimental condition to eliminate the effect of the supervisor on communication and learning.

*Data* gathered in all three experiments consists of all communication within each team along with measures of communication, community formation, satisfaction and product quality/competence development. Information from all conditions will be captured and stored for analysis.

#### Experiment 1: Immediate vs. Delayed

To isolate the role of immediacy, eight teams will be equipped with cell phones. Four will be instructed to use the cell phones in their teams in a 'real-time' manner (cell phone/immediate condition) for sending and receiving messages. Four other teams will receive the same cell phone and will be instructed to use them only after finishing their work-shift (cell phone/delayed condition).

Eight other teams will make use of stationary communication tools. Four will use PCs with e-mail (individual/delayed condition) and four will use PCs with a discussion board (community/delayed). These teams will be allowed to make use of any and all media to augment their messages (i.e., attaching sound and/or image files to their emails/postings). There is no stationary/immediate control condition. N=48 students and 2 supervisors; standard time -stamps of the devices will help determine proper use per condition.

*H1: Immediate communication leads to increased quantity and quality of communication, higher satisfaction, increased community formation and better products/ competence development above delayed communication.*

#### Experiment 2: Media rich vs. Media lean

To isolate the role of media richness, eight teams will be equipped with cell phones. Four will be instructed to use all attributes of the cell phones with respect to message content (i.e., MMS with text, sound, images), while the other four teams (media-lean condition) will be instructed to communicate only via text-messaging (i.e., SMS). Both conditions (i.e., cell phone/media-rich and cell phone/media-lean) will be required to save their messages and send them only after completing their work-shift. Eight other teams will use stationary communication tools (e-mail and discussion board). Four teams will be allowed to make use of any and all media to augment their messages (i.e., attaching sound and/or image files to their emails/postings). The final four will make use of stationary communication tools (PCs with e-mail and discussion board) without sounds or images attached.

N=48 students and 2 supervisors.

*H2: Media-rich communication leads to increased quantity and quality of communication, higher satisfaction, increased community formation and better products/ competence development above media-lean communication.*

#### Experiment 3: Community vs. Individual

To isolate the role of community, eight teams will be equipped with cell phones. Four (community condition) will be instructed to use the cell-phones to communicate with the other team-members and the supervisor. Four other teams (individual condition) will also make use of cell phones, but only to communicate with the supervisor.

Eight other teams will make use of stationary communication tools. Four will communicate individually (PC with e-mail) and four will communicate in a community (PC with discussion board).

All of the conditions will be allowed to make use of any and all media to augment their messages (i.e., attaching sound and/or image files to their emails/postings).

N=48 students and 2 supervisors.

*H3: Community stimulation leads to increased quantity and quality of communication, higher satisfaction, increased community formation and better products/ competence development above individual communication.*

### **8.3 Scientific importance and added value**

New generations of technologies bring new conceptual issues that learning scientists and educational technologists must deal with in order "to unlock the learning value of raw technological potential" (Roschelle, 2003, p. 260). What we have achieved in CSCL (i.e., the previous generation) is an understanding of two key issues: control and representation. To cite Roschelle, simply "...extrapolating from what the field has learned about control and representation in the field of computer-supported collaborative learning, however, will be insufficient to unlock the value of Wireless Internet Learning Devices (WILDs), which introduce new complexities of...communication" (p. 261). This research is a step in the direction of understanding these complexities.

### **8.4 Originality**

In contrast with most educational research using modern information and communication technologies, this project seeks not to impose new technologies or tools on participants (often called disruptive technologies or approaches), but rather to make use of prevalent and established technologies to solve a recognised problem in sVET and, thus, to improve both learning in the traineeship situation as the appreciation of the traineeship experience. This is a high pedagogy / low threshold approach to improving education which is relatively unique.

### **8.5 Expected scientific output**

Scientific publications: The results of each of the experiments will be published as articles in SSCI journals and will be used as the main body of a PhD thesis. On a yearly basis, results will be presented at one national (ORD) and one international (EARLI/AERA/ISLS/CSCL) congress.

Professional publications: To improve dissemination of results to educational praxis (e.g., teachers and other educational professionals), results will be published in professional journals and presented at professional conferences in collaboration with the partner school.

### **8.6 International orientation (optional)**

Due to the nature of this project, which will be fully integrated with an innovation at a Dutch ROC (ID-College), there is no direct collaboration with international partners. However, with regard to community formation and collaborative learning, there is ongoing collaboration with research groups in the USA (e.g., David Wiley and Shelley Henson Johnson, Center for Open and Sustainable Learning, Utah State University; Richard Clark, Rossier School of Education, University of Southern California; Roy Pea and Jeremy Roschelle, SRI), Germany (e.g., Frank Fischer, Faculty of Psychology, University of Munich; Peter Gerjets, Knowledge Media Research Center, University of Tuebingen), and England (e.g., Richard Joiner, Department of Psychology, University of Bath; Mike Sharples, Learning Sciences Research Institute, Nottingham University).

### **8.7 Practical significance**

Schools are not well-equipped to educate a new generation of learners whose sophisticated use of emerging technologies is incompatible with current teaching practice. Personal, portable, wirelessly-networked technologies are becoming omnipresent and persistent in the lives of all learners. As Wagner (2005) stated:

Whether we like it or not, whether we are ready for it or not, mobile learning represents the next step in a long tradition of technology mediated learning. It will feature new strategies, practices, tools, applications, and resources to realize the promise of ubiquitous, pervasive, personal, and connected learning. (p. 44)

This phenomenon has transformed our lives outside of school (Dede, 2005). The school, as usual, lags far behind. This ubiquitous availability of and access to mobile, connected, personal, technologies has created "the potential for a new phase in the evolution of technology-enhanced learning, marked by a continuity of the learning experience across different environments" (Chan et al., 2006, p. 6). The practical significance of this research is to provide an answer to the questions that Chan et al. proposed, namely:

- Will learners who have come to expect mobile, connected, personal devices outside of school demand to use them within school? and
- How will classroom life and everyday life be connected?

### **8.8 References (Maximum 1 page)**

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## 9. Work and dissemination plan

### 9.1 Detailed description of the work plan for the first twelve months

Month	activity
1-6	Literature study Development of theoretical framework
7	Development of instructional materials for pilot experiment Where necessary adaptation of existing measurement instruments
8-9	Pilot experiment
9-12	Data analysis
10	Article 1: Framework and pilot Adaptation of material for Experiment 1
12	All materials and instruments ready for conducting Experiment 1

### 9.2 Global description of the work plan for the remaining duration of the project

In the second year study 2 will be completed and results will be described in a scientific article. In this year also the preparations for the third study will be done. In the third year the third study will be conducted and reported in a scientific article, and the last experiment will be prepared. The fourth year will start with the realisation of the last experiment. The second half of this year will be for writing a scientific article about the last experiment and finishing the dissertation.

### 9.3 Dissemination

year	Publications / conferences
1	Scientific article pilot experiment



- 2 National conference - ORD  
Scientific article Experiment 1  
National and international conference  
Professional article
- 3 Scientific article Experiment 2  
National and international conference  
Professional article
- 4 Scientific article Experiment 3  
National and international conference  
Professional article  
Dissertation

**Applicant:**

**City:**

**Signature**

**Date:**