Mobile Inquiry Based Learning

weSPOT

Web Content Display

Project type: Small or medium-scale focused research project (STREP)
Funding body: European Commission, ICT, Framework 7

Start date: 01 October 2012
Duration: 36 months
Total value: € 3,738,930
EU Funding: € 2,899,996

Centre for Learning Sciences and Technologies
celstec.org
Open Universiteit Nederland

1. Distance education

2. Innovation
   (technology-enhanced learning)

3. Teacher training in the Netherlands
   (influx)
OUNL, facts & figures

- Founded in 1984
- 19000 students (parttime)
- Adult education, continuous education
- 700 fte
- 15 local study centers in the Netherlands and Flanders
- Main office in Heerlen
- Budget M€ 60
Topics

- Mobiel Leren
- Serious Gaming
- Expertise-ontwikkeling
- Leren in netwerken
- Leren van professionals
- Informatievaardigheden
- Effectieve leerstrategieën
- Brein, leefstijl en leren
- Leren en Sociale Media
- Learning analytics
- Curriculum-innovatie
- Assessment
- Ontwerp en Ontwikkeling
- Onderzoeks- methoden
- Onderwijs-innovatie
- Doceren en begeleiden in de 21e eeuw
Inquiry Based Learning

- involves learners asking questions about the real world
- generating hypotheses
- collecting data, making observations
- test hypotheses, analyse and interpret data
- can be controlled experimentation, modelling, integration of existing ...
Inquiry Based Learning
PI Inquiry Cycle

Figure 1.3 The Inquiry Cycle
Problems, challenges

- introduction to teachers, connecting to curricula, time/formal constraints
- lacks of inquiry skills in students
- design and implementation of experiments
- support for self-tracking in the process for reflection
Problems, challenges 2

- need for data collection tools in context
- support for forming hypothesis and testing them via experimentation and data collection
- support for self-regulation
- take into account students domain knowledge as a starting point
Mobile TEL for Inquiry

* **DATA:** store data, aggregate data, perform complex computations and visualize data

* **CONNECTED:** mobile data collection, experience sampling, direct feedback, collaboration support and task sharing, context logging

* **COMPUTATION:** complex simulations support modeling, learning analytics and reflection support
what is weSPOT?

**Challenge 1:** A lack of inquiry skills

**Challenge 2:** Curiosity is not supported

**Challenge 3:** Construct personal conceptual knowledge.

**Challenge 4:** Linking e-learning with inquiry.

**Challenge 5:** How to measure impact?

**Objective 1:** To provide smart, adaptive inquiry support.

**Objective 2:** Bridge formal and informal learning activities.

**Objective 3:** Personal inquiry projects and link everyday life and classroom teaching.

**Objective 4:** Create an open source toolset.

**Objective 5:** we SPOT will evaluate the impact.

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**Services**

- Theory and Models
- Requirements Specification
- Diagnostic Instrument
- Inquiry Course & Templates
- Mobile Clients
- Services
- Classroom Clients
- Evaluation Report and Publications

**Theory and Models**

**Requirements Specification**

**Diagnostic Instrument**

**Inquiry Course & Templates**

**Mobile Clients**

**Services**

**Classroom Clients**

**Evaluation Report and Publications**

**Integrated Pilot Setups**

**Services**
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Challenge 2: Curiosity is not supported
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Objective 1: To provide smart, adaptive inquiry support.
Objective 2: Bridge formal and informal learning activities.
Objective 3: Personal inquiry projects and link everyday life and classroom teaching.
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Objective 5: weSPOT will evaluate the impact.
Challenge 1: A lack of inquiry skills in students in the target age range (12-25). The lack of these skills is a general lack of knowledge and competences about “how to do scientific inquiry” but also a lack of competences for systematic open inquiry, linked to the life cycle of inquiry. Therefore objective 1 of weSPOT is to research and develop how we can support enabling learners to develop their competences from confirmation inquiry towards open and self-directed inquiry. Enabling students to act as scientists by carrying out open and open-ended investigations: This includes as well a bottom-up and a top down process in inquiry, e.g. students can contribute to existing inquiries or start new inquiries by collection of their own data.

Objective 1: To provide smart, adaptive inquiry support for developing competences enabling personal and open inquiry in sciences: the project will do research on how to motivate and engage and enable learners to move from structured to personal open inquiry. It furthermore will develop a diagnostic instrument to measure the level of inquiry competence of students. The results can be used for personal assessment, for group reflection and for teacher feedback. The main outcome of this objective is a well structured reference model on inquiry competences, a set of interventions and tasks, and an diagnostic instrument to analyze ones individual inquiry performance.
Table 1. Level of inquiry according to (Tafoya et al, 1980)

<table>
<thead>
<tr>
<th>Level of inquiry</th>
<th>Problem</th>
<th>Procedure</th>
<th>Solution</th>
</tr>
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<tr>
<td>Level 4 Open inquiry</td>
<td>Student</td>
<td>Student</td>
<td>Student</td>
</tr>
<tr>
<td>Level 3 Guided inquiry</td>
<td>(teacher)</td>
<td>Student</td>
<td>Student</td>
</tr>
<tr>
<td>Level 2 Structured inquiry</td>
<td>(teacher)</td>
<td>(teacher)</td>
<td>Student</td>
</tr>
<tr>
<td>Level 1 Confirmation/verification</td>
<td>(teacher)</td>
<td>(teacher)</td>
<td>(teacher)</td>
</tr>
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</table>
Challenge 2: Students curiosity is not supported by today’s technology and learner’s cannot make their informal learning activities visible in the formal learning, i.e. classroom learning is often de-contextualised from learner’s everyday experiences. weSPOT will integrate scientific inquiry support with social networks mainly used by the target group and link an achievement system (open badge system) to the existing learning technologies in schools today, i.e. LMS systems. This will make informal personal inquiry visible and linked to the school curriculum. Furthermore there is no easy way for teachers to appreciate and use inquiry results of students in their teaching, therefore the project will build collaboration and reflection tools based on learning analytics approaches for enabling schools and individual teachers to use and appreciate individual inquiry efforts in group work. In order to develop scientific reasoning (science literacy), it is important that learners ground their claims in scientific concepts rather than personal convictions. The quality of their arguments is also better if they can connect not only supporting arguments, but also counterarguments (thus resisting confirmation bias) and

Objective 2: Bridge formal and informal learning activities with an open achievement system woven into social networks in use by the target group. The project will support the linking of everyday life experiences of learners to curricular content via an achievement system accredited by teachers, that makes their learning visible and engaging. This will reduce the efforts for teachers to recognize informal learning efforts as the achievement system will be build as an open badge system. On the other hand this will naturally link to personal everyday activities that learners in this age share in social networks. The main outcomes of this objective are the connection of personal inquiry projects to social networks used in the target group and an achievement system that links informal and formal learning activities.
Challenge 3: Supporting students to construct personal conceptual knowledge and develop creative applications of the theory. Today’s classrooms are not linked with learner’s everyday world experiences. Even more, current studies on media usage of teenagers show that the worlds of school and everyday life drift apart even more as teenagers pick up new technologies fast and use it for their means but rarely connected to school curricula. From the starting points of weSPOT the creative application of theoretical concepts taught in classrooms can only be fostered by raising students’ awareness about scientific concepts structuring their everyday environments and therefore pique students curiosity about the underlying principles and their magic.

Objective 3: weSPOT will support students personal inquiry projects and link them to the social and the curricular context learners are confronted with in everyday life and classroom teaching. weSPOT aims to overcome the de-contextualisation of classroom teaching with technology that links informal and formal learning contexts by low-threshold tools that support the learner in building episodic traces of authentic experiences and link them to scientific concepts.
Challenge 4: Linking e-learning support in schools with inquiry-based approaches: There is a problem of linking Learning Management Systems as the most prominent learning technology in schools today, to the social networks of learners, as also the personal mobile tools used by learners. The main technologies that weSPOT will use to solve the above mentioned problems are: An inquiry workflow service connecting Standard LMS systems to major social platforms used in the target group (Facebook) giving flexible methods for defining inquiry projects based on templates. Mobile experience sampling and data collection tools for collecting evidence for inquiries in everyday life and informal learning situations. These will be free tools available for the two major platforms iOS and Android via the related App stores. A set of low-cost classroom tools for collaboration, reflection, and inquiry analytics. An achievement system based on an open badge system for defining and making learning achievements visible and engaging.

Objective 4: Create an open source toolset for structuring workflows and supporting personal experience sampling. The toolset will be open source and also have open interfaces for integration with existing learning solutions in use with the target group. The toolset will include an open source backend service for inquiry workflows, open client APIs, and dedicated user interfaces for mobile experience sampling, collaboration, and reflection, as well as concept mapping and argumentation interfaces.
Challenge 5: How to measure impact? Whilst a variety of inquiry projects and frameworks have been developed (see Part 1.2) the impact and the effectiveness of the approach have rarely been quantified, qualified, and developed in a meta-approach. weSPOT will not work on one specific domain for inquiry support but develop a reference model of inquiry skills as well as a diagnostic instrument for measuring the qualitative and quantitative changes in inquiry based learning methodology.

Objective 5: we SPOT will evaluate the impact of personal open inquiry in laboratory and field studies. The project will evaluate the effectiveness of personal open inquiry in experimental, quasi-experimental, and field studies. The effects and qualitative impact of the approach will be demonstrated via the developed assessment framework and in laboratory and test-beds in 8 different subject domains and age groups ranging from 12-25 years.
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how will weSPOT?

WP1 Project Management

WP2 Pedagogical Design

WP3 Workflow and Semantic Technologies

WP7 Evaluation and Validation

WP4 Mobile Communication and Data Collection Technologies

WP2,7 Pedagogical Development and Evaluation

WP5 Collaboration and Reflection Technologies

WP8 Dissemination and Exploitation

WP6 Integration with stakeholder context

Products of weSPOT

Diagnostic Instrument

Inquiry Workflow Services

Inquiry Course & Templates

Collaboration Clients

Mobile Clients

software engineers

educational scientists

test-bed partners

WP 3, 4, 5 Technology Development
weSPOT works in 8 domains (#1 Food, #2 Biodiversity, #3 Earthquake, #4 Sea, #5 Energy, #6 School, #7 Innovation, #8 Economy), and implements these in 8 primary evaluation test-beds in 5 European countries. The distribution over 5 countries is due to the fact that there are partners in the consortium which are leading in the evaluation part of the project and other which are leading in the technological development of the project. Based on these primary (mandatory) test-beds optional evaluations will be done in 4 more European countries and 3 international partnerships (Brasil, Singapore, US). The optional international evaluations have to be negotiated with the external partners building on strong international relationships of the consortium and on going research cooperation.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Leading Scientific Partner</th>
<th>Leading Partner Schools = Test-beds</th>
<th>Potential Transfer Sites (Optional), Test-beds</th>
<th>Number of Evaluations planned (Student n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Food</td>
<td>OU</td>
<td>T#1 UK, Wikid schools English</td>
<td>OU, 2 evaluations, n = 60</td>
<td></td>
</tr>
<tr>
<td>#2 Biodiversity</td>
<td>OU</td>
<td>T#3 UK, Wikid schools English</td>
<td>T#2 OUNL, Netherlands, Secondary School, Dutch</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OUNL, 2 evaluations, n = 60</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T#4 FORTH, Greece,</td>
<td>FORTH, 1 evaluation, n = 30</td>
<td></td>
</tr>
</tbody>
</table>
WP 4
Mobile Inquiry Technologies
Task 4.1 Mobile Personal Inquiry Manager

**personal inquiry manager** available on main mobile platforms (iOS, Android) as free apps supporting learner’s in a self-directed approach for

creating personal inquiry projects on mobiles as also managing there existing on-going inquiry projects.

The personal inquiry manager will also be the **central Hub for personal badges** and mobile profile access and networking.
Task 4.2 Context-aware notification system

**notification of mobile users** based on open notification protocols as XMPP.

Using sensor technology in smartphones the notification of users can be based on contextual filters relevant for inquiry projects.

Learners can **link inquiry projects to certain locations, physical objects, or combinations of contextual factors, i.e. the weather at a certain location at a specific time of the year.**

Notifications can **trigger the collection of data**

ubiquitous and context-dependent messaging services
Task 4.3 Mobile Data Collection System

direct submission of sensor data and manual measurements into the workflow system.

annotations and multimedia materials. For this aim all available sensor systems on-board of mobile smartphones (Location, Accelerometer, Camera, Microphone, Lightsensor) as also extensions of existing platforms with special sensors can be used.

older mobile phones can be integrated via notification and submission of information via SMS systems.
Task 4.4 Mobile Inquiry Coordination Interface

Inquiry coordinators access to the current on-going inquiries and the contributions of all participants.

It will allow central dispatching of messages and management of tasks and data.

Guided inquiry approaches linking formal and informal learning activities as also multi-user inquiries.
Workshop:
How to eat healthy?
or
An apple a day keeps the doctor away?
An apple a day keeps the doctor away?

Why is that?