

# Enhancing Outdoor Learning Through Participatory Design and Development: A Case Study of Embedding Mobile Learning at a Field Study Centre

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## ABSTRACT

*Outdoor learning seeks to engage and enthuse students through authentic practical inquiry lessons. This article explores how participatory design and development can enable outdoor learning organisations to introduce sustainable technological innovations within their teaching practices. A case study describing a collaborative project between university researchers and an environmental education charity is presented, which highlights the challenges and issues regarding the usability, scalability and sustainability of mobile technology at a residential outdoor learning centre. It is argued that participatory research with education service providers is a contributing factor to the diffusion of mobile learning and a necessary foundation for sustainable technology-enhanced learning.*

*Keywords: Outdoor Learning, Participatory Design, Portable Networks, Technology Adoption, Technology-Enhanced Learning*

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## INTRODUCTION

Outdoor learning provides exposure to learning environments that promote authentic practical inquiry and complement classroom learning. Mobile technologies offer an effective set of tools for structuring and guiding inquiry learning, but, without reliable network or internet connectivity, web applications are constrained in the level of support they can provide for social group interaction, which is an important aspect of outdoor learning. Therefore, portable

network solutions are needed in locations where connectivity is unavailable, unreliable or costly, in order to provide a basis for effective collaborative tools.

This article presents the design and development of the Field Network System (FNS), a portable networking system for supporting fieldwork undertaken by school groups at outdoor learning centres, and explains how a participatory approach was used to develop the system and embed its use as part of a set of lesson plans at an outdoor learning centre

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in the UK. The FNS was developed through working in partnership with stakeholders from a national environmental education charity. The process of participatory design and development presented here offers insights into the practical deployment of mobile learning, and the sustainable use of mobile technologies in outdoor learning contexts.

## Outdoor Learning

Outdoor learning refers to “learning that accrues or is derived from activities undertaken in outdoor locations beyond the school classroom” (Rickinson et al., 2004, p. 9). In summarising the key findings of their review of ten years of published research on outdoor learning Rickinson et al. concluded that fieldwork “offers learners opportunities to develop their knowledge and skills in ways that add value to their everyday experiences in the classroom” (2004, p. 5). With regard to fieldwork and outdoor visits, the memorable nature of a fieldwork setting was identified as having a positive impact on long-term memory, the residential experience was attributed as a source of individual growth and improvements in social skills, and the affective and cognitive impacts were noted as reinforcing one another and providing support for higher order learning (e.g. analysis, synthesis and evaluation). As part of a more recent study of a five-year programme in London, looking at the benefits of residential fieldwork for inner city students, Amos and Reiss (2012) further highlighted the social and behavioural benefits of fieldwork, and that learning in the cognitive, affective, social and behavioural domains were found to be complementary to one another.

## Inquiry Learning

One of the main findings across successive studies is that fieldwork provides exposure to learning environments that promote authentic practical inquiry (Nundy, 1999; Rickinson et al., 2004; Braund & Reiss, 2006; Amos & Reiss, 2012). As argued by Edelson et al. “authentic activities provide learners with the motivation to acquire new knowledge, a perspective for

incorporating new knowledge into their existing knowledge, and an opportunity to apply their knowledge” (1999, p. 395). However, they note that inquiry learning is challenging. Inquiry involves extended activities over time and students, therefore, need support to plan and coordinate their activities, and manage the available resources and resulting products within the constraints of the learning context (e.g. school schedule). Edelson et al. also raise the importance of motivation for sustaining student engagement in the inquiry process, and warn that students can struggle without sufficient background knowledge or understanding of relevant scientific investigation techniques.

Edelson et al. (1999) proposed that coordinated technology and curriculum designs can address these challenges by:

1. Focusing on a meaningful, controversial and open scientific issue;
2. Selecting and sequencing staging and bridging activities that help students develop scientific understanding and relate their existing knowledge; and
3. Creating tools and resources to support the inquiry process (e.g. record-keeping tools and information resources) and relevant investigation techniques (e.g. domain-specific visualisations).

Subsequently, a number of projects have explored how the use of technologies can support and motivate inquiry learning in schools, notably the Web-based Inquiry Science Environment for K-12 (primary) schools (Linn, Lee, Tinker, Husic, & Chiu, 2006) and the GLOBE programme for school-based citizen science inquiries (Penuel & Means, 2004).

## Mobile Inquiry

Advances in smart phone and tablet technologies have also been reflected in the recent tools developed to support inquiry learning. Examples include the LETS GO system that integrates open software tools and resources to enable students to participate in collaborative science

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