Determining the Feasibility of Utilizing Mobile Devices for the Enhanced Acquisition of Primary Literacy Skills

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Abstract:

This paper examines existing approaches of mobile learning to help ascertain whether ICT-supported mobile learning will effectively enhance the teaching of reading and writing skills for functionally illiterate adults. Furthermore, this paper will reflect on the preliminary findings of the Enhanced Literacy Network (eLitNet), a research project that is making an attempt to create a mobile learning network for functionally illiterate adults in Austria to acquire and develop primary literacy skills.

1 Introduction

The purpose of this paper is to investigate the practicability of utilizing ICTs within a mobile learning context to help functionally illiterate adults to re-learn primary literacy skills such as reading and writing. This research can be viewed as a feasibility study utilizing the findings of relevant literature within the field of ICT research and literacy instruction. The intended outcome of this paper is to help ascertain whether ICT-supported mobile learning will effectively enhance the teaching of reading and writing skills.

1.1 Research Question

The motivation for writing this paper is to increase the awareness of the potentialities latent within information communication technologies (ICTs) in relation to the emerging field of mobile learning. The central question behind this research is the following: *Is it possible to effectively use ICT-supported mobile learning to enhance the teaching of reading and writing skills for functionally illiterate adults?*

Upon immediate reaction to the above research question one may ask the following: if a person cannot read or write how can they use ICTs to help them acquire these skills? This paper will attempt to answer this question, as well as stimulate a discussion and encourage further research regarding how to effectively harness ICTs that enhance the instruction of primary literacy skills for functionally illiterate adults.

1.2 Paper Structure

This paper consists of the two sections. The first section, entitled *Mobile Learning for Functionally Illiterate Adults*, is primarily a literature survey to determine the feasibility of ICT enhanced mobile learning for functionally illiterate adults. The second section follows with a presentation of some research reflections on the preliminary findings of the Enhanced

Literacy Network (eLitNet), a research project that is attempting to create a mobile learning network for functionally illiterate adults in Austria.

It is important to point out that this paper will not delve into a detailed analysis of which specific technologies can or should be utilized for mobile learning among functionally illiterates. Rather, this paper will focus on the core research question stated above and present literature that either supports the notion that ICT-supported mobile learning can effectively enhance the teaching of reading and writing skills for functionally illiterate adults.

2 Mobile Learning for Functionally Illiterate Adults

2.1 Working definitions

Within the framework of this paper it is important to take into consideration the working definitions used within the relevant literature. The following definitions have been extrapolated from the literature surveyed and also from several key research studies conducted within the fields of ICT and literacy research.

Literacy: Many researchers define literacy as a condition that an individual either has or hasn't. The National Assessment of Adult Literacy (NAAL) defined literacy as "using printed and written information to function in society, to achieve one's goals and to develop one's knowledge and potential" (White 2003). According to the International Adult Literacy Survey (IALS) to be literate one must possess the ability to understand and employ printed information in daily activities, at home, at work and in the community – to achieve one's goals, and to develop one's knowledge and potential (Statistics Canada, OECD). Furthermore, literacy can be viewed as a set of "proficiency levels along a continuum" which "denote how well adults use information to function in society and the economy" (Statistics Canada, OECD). To expand on this definition further, one can understand that in order to be literate one must have the capacity to utilize the knowledge and skills ones possess to understand and use information from text and other written formats.

Functional literacy: Within the context of this paper the term functional literacy will be used. This is a term that denotes the condition in which an individual has the "ability to function effectively as a member of the community and to be able to use language skills for personal and community development" (Greaney 1994).

Functionally illiterate: A person is *functionally illiterate* when they are not able to operate effectively within society through the use of their personal communication skills. Usually these persons have developed a social support network and unique abilities to help them get through their daily tasks without the need or reading or writing.

Enhanced acquisition: The term *enhanced acquisition* is used to refer to the utilization of ICTs to support learning and skills attainment. In other words, ICT enhanced acquisition is a form of learning that uses technology as a medium to deliver and support formalized instruction.

Mobile learning: Mobile learning is an emerging trend within formal and in-formal educational settings. This term can be understood as a method of learning using any portable information & communication technology (ICT). The portable devices this paper refers to are: mobile-phones, smart phones, (hybrid mobile phone) Multimedia Digital Assistants, (MDAs) personal digital assistants, (PDAs) notebook computers and Tablet PCs (TPCs). It is

also possible to include portable radios, portable televisions, portable DVD players, and portable audio devices (mp3, iPod) as devices used in mobile learning.

2.2 Mobile Learning and Literacy: Literature Search

Information and Communication Technologies (ICTs) are becoming increasingly more omnipresent within our societies and are widely regarded as a fundamental characteristic in social, economic and educational change (Castells, 1996, 2001). The field of education and the very nature in which people learn is directly affected by the ubiquitous nature of ICTs. It can be observed that through the convergence of mobile communications and handheld computer devices many opportunities are arising to develop technology that will assist individuals and groups to learn anytime, anywhere (Sharples & Westmancott 2002). The ability to learn anytime, anywhere, has tremendous implications within the field of adult literacy and basic skills education. This flexibility of learning can be the key to opening the doors for millions of functionally illiterate adults to acquire the basic skills needed to function within our communities.

Mobile learning (m-learning) is an emerging field of research and practice. Due to the fact that mobile learning is such an innovative and pioneering field there is currently not a substantial repository of research which specifically deals with mobile learning and basic primary literacy skills acquisition. M-learning is truly unique in that it allows for learning to take place anywhere, anytime and can be a form of highly personalized learning. It can be used to enrich, enliven or add variety to conventional lessons or courses. (Attewell 2005)

The literature examined came primarily from the broad subject field of technology and literacy. Although the literature that was examined for this study was limited the results of the search was very promising in supporting the suggestion that mobile learning can effectively enhance the teaching of reading and writing skills for functionally illiterate adults.

In reference to Bruce (1997) current literature shows that there are a variety of stances taken toward the integration of literacy instruction and technology found within existing literature. These stances toward using ICTs in literacy instruction are as follows:

- Neutral (sees no advantages or disadvantages to integration);
- Oppositional (integration causes problems);
- Utilitarian (technology is a useful tool);
- Skeptical (technology may be useful but its usefulness is unproven);
- Transformational (integration transforms the very nature of literacy);
- Aesthetic (technology provides opportunities for creativity), and
- Transactional (there is a transaction between literacy and technology).

Overwhelmingly, the literature demonstrated a very positive stance for the integration of ICTs within literacy instruction. Findings from several key studies and relevant literature within the field of ICT research and literacy instruction help support an argument for utilizing ICTs to enhance the acquisition of primary literacy skills for functionally illiterate adults.

One of the most poignant observations revealed in the literature search came from Daniel Wagner and Robert Kozma, in which they assert that: “literacy and technology are becoming inter-dependent and can be seen as ‘tools’ that have much in common. Neither is an end to itself, but each can amplify human intelligence and human capability. Literacy education will need to take advantage of the power of technology” (2003).

2.2.1 Mobile Learning Harnesses the Power of Technology

We come to a point in which it is appropriate to examine specific literature that gives examples of how literacy education is taking advantage of the power of technology.

Helen Steele, the project manager for the Workplace Basic Skills Network, based at Lancaster University, reveals that a perceived stigma is attached to learning basic skills that it deters many adult learners from attending literacy courses (M2 Presswire 2003). She goes on further to say, "[that] for many people - particularly older workers who have been made redundant - ICT skills are a high priority. But it becomes clear that what they really need is tuition in reading, writing and numeracy, so we (the Workplace Basic Skills Network) use computer skills as a [way] to get them [to attend these courses]. They are happier to acknowledge these needs (to learn basic skills) once they have signed up for computer training" (M2 Presswire 2003).

The above example from the *Workplace Basic Skills Network* shows how the power and attractiveness of using technology sparks the interest of adult learners. But, how can mobile learning directly help learners attending these literacy courses?

2.2.2 The Advantage of Mobile Learning for Learners

It can be observed that through the convergence of mobile communications and handheld computer devices many opportunities are arising to develop technology that will assist individuals and groups to learn anytime, anywhere (Sharples & Westmancott 2002). The ability to learn anytime, anywhere, has tremendous implications within the field of adult literacy and basic skills education.

According to the Enhanced Learning Research Centre (Attewell 2005) Mobile learning has the capacity to help learners:

- to improve their literacy and numeracy skills;
- to become self-aware of their own existing abilities;
- to encourage both independent and collaborative learning experiences;
- to assist in identifying areas where they need assistance and support;
- to counter resistance to the use of ICTs and can help bridge the gap between mobile phone literacy and ICT literacy;
- eliminate some of the formality from the learning experience;
- be more engaged in learning;
- remain more focused for longer periods;
- raise their self-esteem;
- raise their self-confidence.

According to Jill Attewell, one of the coordinators of the European M-Learning Project and manager at the UK's Learning and Skills Development Agency, mobile learning "is not to replace normal education, but to re-engage those who have dropped out of learning and help them find out that learning is fun and can be a help in life rather than just something they are forced to do." (BBC News 2003)

2.3 Related Research

Currently there very few literacy projects that utilize mobile devices and learning software that is specifically designed for assisting functional illiterates to acquire basic skills. In examination of the 29 World Bank funded literacy projects between the years 1990 – 2002 not one of these projects are specifically configure as a mobile learning literacy project (Abadzi

2003). Traditionally, literacy projects have used classroom instruction and personal tutelage as the primary means for literacy training. This form of instruction is being challenged by innovative projects that are able to enhance the literacy acquisition of adults through the use of ICTs.

The following projects have been identified as examples of innovative efforts to enhance adult literacy program with mobile devices:

- **Computer-Based Functional Literacy (CBFL):** Tata Consultancy Services has initiated a computer-based functional literacy (CBFL) program to enhance adult literacy in India. The CBFL program consists of an interactive multimedia- learning package, which focuses more on reading than on arithmetic and writing. Reading skills are taught through cognition of words, syllables and letters. Upon completion of the 40-45 hours of the CBFL learning program, the learners are reported to be able to read report cards, ration cards, loan documents, posters and bus routes. (Financial times 2003)

- **The Enhanced Literacy Network (eLitNet):** The Enhanced Literacy Network (eLitNet) is an interdisciplinary research project conducted by the University of Salzburg. The aim of the eLitNet project is to evaluate, develop, and implement a didactically sound mobile ICT enhanced, blended e-learning course structure to help functionally analphabetic adults (secondary analphabetism) in Austria to re-learn to read and write. This project is in its early stages.

- **LiteracyLink:** The United States Department of Education initiated a project that supported the Adult Learning Service of the Public Broadcasting System (PBS), the National Center on Adult Literacy at the University of Pennsylvania, and Kentucky Educational Television to develop an Internet-based instructional system which employed television video-broadcast supplemented by on-line, internet based courses to help adults receive literacy and adult basic education instruction (Wagner and Hopey, 1999). As a learning system the LiteracyLink program incorporates Internet based hypermedia technologies (digitized audio and video, interactive multimedia), with broadcast video technologies (digital, closed-circuit, broadcast, satellite). Although this project in not explicitly a mobile learning project the technologies employed in this project could be easily be adapted to mobile devices.

- **M-Learning Project:** The M-learning is a European funded project headed by the Learning and Skills Development Agency in the United Kingdom. The objective of this project is to investigate how mobile communications technologies can be used by young adult learners to help develop their literacy and numeracy skills. Some of the key observations made within an international study conducted by the m-Learning project of the demonstrate that mobile learning is a truly viable method to enhance the acquisition of basic skills.

Given that this is an emerging field of research, and that there is a limited source of literature to draw any definitive conclusion, the overwhelming impression is that there is a truly a future in adapting mobile devices within a mobile learning context for the enhanced acquisition of primary literacy skills. The most convincing evidence to support the hypothesis that it is feasible to effectively use ICT-supported mobile learning for functionally illiterate adults comes from the findings of the M-Learning Project and the preliminary findings of the Enhanced Literacy Network Project (eLitNet) Project.

3 Research Reflections

The following research reflections will highlight the current work of The Enhanced Literacy Network Project (eLitNet), a project conducted at the University of Salzburg which is attempting to create a truly unique literacy course that is a blended online and face-to-face course structure enhanced by mobile learning devices. The eLitNet project is supporting by the University and is lead by Professor Jean-Luc Patry and Professor Wolfgang L. Pree with support from Dr. Ursula Maier-Rabler of the ICT&S Center at the University of Salzburg.

3.1 Introduction / Project Context

The aim of The eLitNet Project is to evaluate, develop, and implement a didactically sound computer-based program and mobile learning course structure to help functionally illiterate adults in Austria improve and acquire reading and writing skills. It is likely to presume that the eLitNet project is the first of its kind within the German speaking Nations.

The research conducted thus far has focused on evaluating the present status of adult literacy programs and training in Austria and determining which ICT-support is available for teaching literacy and which curricula are used. The outcome of this pre-phase research has allowed for an estimation of which ICT-support could effectively enhance the teaching of reading and writing skills and to help develop innovative and practical ideas to ensure an original approach to literacy acquisition. The research conducted during this pre-phase helped to determine the practicability of establishing a pioneering mobile learning literacy project and to help guarantee the success of the eLitNet Project.

3.2 Project Goals

The principal aim of the eLitNet project is to adapt information and communication technologies [ICTs] to enhance the literacy instruction conducted by practitioners in the field of literacy and to assist overall in reducing adult functional illiteracy in Austria.

The eLitNet project is determined to:

- significantly extend the capacity of currently existing teaching centers by providing the communication infrastructure for blended learning;
- develop an innovative curriculum and content, that is learning software, that relies on an appropriate mix of constructivist and instructionist didactical approaches, to teach both reading and writing to functional illiterates;
- develop a highly accessible and intuitive user interface design that is adequate for teaching reading and writing using tablet personal computers (TPCs), and mobile devices such as Multimedia Digital Assistants MDAs and Personal Digital Assistants PDAs.
- increase the awareness and understanding of new uses of ICTs in the field of literacy and adult education.

3.3 Initial Findings

Currently there are four literacy centers within Austria that engage in activities to help reduce adult functional illiteracy. These centers are located in Vienna, Graz, Linz and Salzburg, and they collectively form the *Netzwerk Alphabetisierung*[1] [eng. transl., Literacy Network] which represents an Austrian-wide initiative to reduce adult functional illiteracy, which, by recent conservative estimates, has reached the level of 300.000 adults (Rath 2003). To serve this cross-section of Austrian Society, these four centers primarily use conventional teaching

[1] For more information about the Netzwerk Alphabetisierung please visit: http://www.alphabetisierung.at

methods and have a limited capacity for those seeking assistance. Mobile learning methods are not currently utilized for the acquisition of literacy skills within Austria.

3.3.1 More teaching capacity required.

In the preliminary phase of our research we found that the capacity for teaching functionally illiterate adults does not meet the demand. Many functionally illiterate adults have to be turned away as not enough capacity and resources are available currently at the existing teaching centers of the *Netzwerk Alphabetisierung.*

3.3.2 Inadequate (re)design of current eLearning software.

We regard the appropriate design and implementation of ICT-enhanced learning within literacy instruction as one means to increase the capacity of these literacy centers. Our preliminary findings corroborate that the potential of ICTs for supporting literacy teaching is largely untapped.

Just to highlight the findings of our current preliminary study, we have discovered that most software used for literacy courses is badly designed from a human-computer-interaction perspective. Sometimes, we have found that even the basic expectations are not met, as one would need to be able to read and write fairly well to use most of the software.

On the other hand, most ICT-based means to achieve a higher level of literacy are not designed for adults. It seems that the software that is designed for teaching children to read and write is not, or only slightly, adapted for adults. There are several implications that can be derived from these findings:

- Above all, many students using the currently available software say it is not fun at all. None of the motivational elements such as attracting attention of the students, providing relevant information, taking into account competence attributions, and providing a sense of satisfaction are taken into account (Astleitner 1995).
- The approaches are designed for teaching people with primary reading/writing deficits (learning to read and write to people who never were able to do so), whereas we need teaching materials for secondary illiterates.
- The software does not take into account the situations which the functionally illiterates may have to cope with, for this reason transfer is very unlikely.

We expect that the software can be significantly improved. One means is to take constructivist teaching approaches into consideration with regards to software development.

Another aspect that points in favor of an ICT-enhanced literacy curriculum is that we have discovered in our research that many functionally illiterate adults prefer to engage in an anonymous teaching setting. This helps avoid the embarrassment associated with being functionally illiterate. We believe that an adequate set up of ICTs could satisfy this requirement of anonymity very well.

3.4 Technical Description

Figure 3. describes the components that constitute the project framework of eLitNet, which consists of the following entities:

- Hardware platform: we have chosen a tablet PC (with an optional keyboard) as pen-based computers allow the recognition of handwritten input.
- Internet-based communication infrastructure that heavily relies on voice and gestures so that teachers and functionally illiterate students can exchange information

- Learning modules (software for students) that is motivating and resembles real-life problems that students face in their daily lives and include evaluations and tests
- Software for teachers: that allow the guidance of students through the curriculum and contains evaluations
- Teaching-learning arrangements with blended learning.

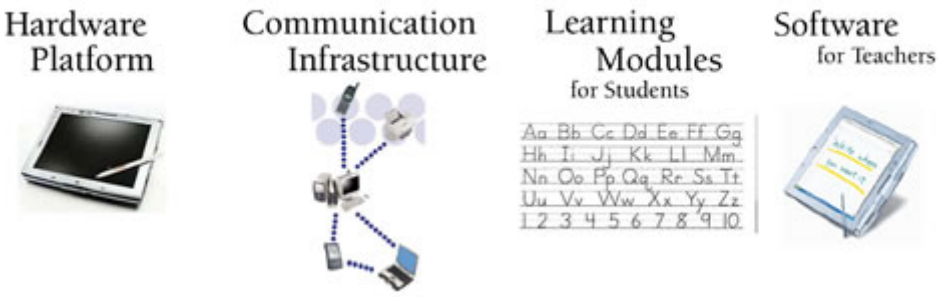

Figure 3: The eLitNet components.

3.5 Initial Prototype

During the pre-phase of our research we have developed a basic prototype of the software used for the acquisition of writing skills. This was accomplished by employing rapid prototyping methods. The initial software has been installed and tested using a Tablet PC, which has been chosen for this research because of the multimodal input options Tablet PCs afford, such as pen, voice, or keyboard. It is foreseeable that our software delivery platform will migrate to smaller, more portable handheld devices such as MDAs and PDAs.

3.6 Research Areas

The following disciplines: Computer Science and Pedagogy – Educational Science are the primary research areas involved within the eLitNet Project. Due to the inherent nterdisciplinary nature of the eLitNet project we anticipate that our research will broaden and encompass collaboration with the fields of behavioral psychology, cognitive psychology, linguistics, psycholinguistics, sociolinguistics and semiotics; as these fields have particular methods and approaches which can improve our research and the implementation of our project framework and learning network.

3.6.1 Computer Science

From a computer science perspective the main areas of research required for the eLitNet project are:

- **Software engineering**: in which the design and prototypical implementation of the eLitNet components, in other words, the communication infrastructure and the software for students and teachers requires a sound software engineering background.
- **Human-computer interaction (HCI) & usability:** in which the adequate and optimal user-interface design of a platform for mobile-learning for functionally illiterate persons represents a formidable challenge that requires adaptive user interfaces which integrate voice and pen-based gestures.

3.6.2 Pedagogy - Educational Science

From a pedagogical and educational perspective the main areas of research required for the eLitNet project are:

- Identifying the particular needs of the functionally illiterates: The software to be designed must take into account the particular motivational background of the participants
- Developing an adequate curriculum: This is based on the curricula for functionally illiterates, not on those for first reading and writing learning of elementary school children.
- Formulating appropriate didactical approaches: The basic didactical framework is constructivism comprising as central element what we call "viability check" as developed at the Department of Education at the University of Salzburg;
- The application of an appropriate evaluation design according to the principles in practice at the Department of Education, particularly based on the approach of "critical multiplism" (Cook 1985) also further refined at the Department of Education which has a particular strength in the domain of evaluation and evaluation designs.

3.7 Expected Results

A successful eLitNet project contributes to overcoming the problems summarized above. As a target group we have selected those functionally illiterate persons who can barely read and write at all, that is, those who are at the lowest level of literacy. The eLitNet project results should raise their literacy proficiency to a level where they become socially inconspicuous and to acquire the capacity to adequately function within society**.**

4 Conclusions

The purpose of this paper was to help determine the feasibility of effectively using ICT-supported mobile learning to enhance the teaching of reading and writing skills for functionally illiterate adults. Given that this is an emerging field of research, and that there is a limited source of literature to draw any definitive conclusion, the overwhelming impression is that there is a truly a future in adapting mobile devices within a mobile learning context for the enhanced acquisition of primary literacy skills. It is clear however that the literature supports the observation that mobile communications and handheld computers are converging and that these devices open the doors to many opportunities in which technology is able to assist individuals and groups to learn. The unique feature of mobile learning is the ability to learn anytime, anywhere. This flexibility of learning can be the key to opening the doors for millions of functionally illiterate adults to acquire the basic skills needed to function within our communities.

It can be argued that mobile learning represents the next stage in a long tradition of technology mediated learning. It can be anticipated that mobile learning will naturally become an accepted form of learning adopted by literacy programs and individuals who are trying to acquire the basic skills to allow them to function more full within our societies.

The Enhanced Literacy Network Project highlighted in the research reflections has has the ability to make an impact within the field of adult literacy and basic skills education. By making mobile learning a part of a blended learning strategy the eLitNet project has a tremendous potential for adults seeking to acquire or re-acquire basic skills.

It is the hope of this researcher that this paper as well as the work of the eLitNet Project will prompt further discussion and encourage additional research to aid in the development of innovative and practical ideas to ensure an original approach to literacy acquisition and development using mobile devices. This approach will truly enhance the instruction of primary literacy skills for functionally illiterate adults throughout the world.

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