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A Tale of Two Studies: Challenges in Field Research with Low-literacy Adult Learners in a Developed Country.

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Abstract
Efforts to address the problems of literacy are often focused on developing countries. However, functional illiteracy is a challenge encountered by up to 50% of adults in developed countries. In this paper we reflect on the challenges we faced in trying to design and study the use of a mobile application to support adult literacy with two user groups: adults enrolled in literacy classes and carpenters without a high school education enrolled in an essential skills program. We also elaborate on aspects of the evaluations that are specific to a marginalized, functionally illiterate, group in a developed country – aspects that are less frequently present in similar studies of mobile literacy support technologies in developing countries. We conclude with presenting the lessons learnt from our evaluations and the impact of the studies' specific challenges on the outcome and uptake of such mobile assistive technologies in providing practical support to low-literacy adults in conjunction with literacy and essential skills training.

Keywords
User studies, evaluation methodology, mobile computing, interface design, educational interfaces, mobile learning, assistive technology.

ACM Classification Keywords
H5.2 User interfaces: Voice I/O, Natural language, User-centered design, Evaluation/methodology. K3.1 Computer Uses in Education: Computer-assisted instruction.

General Terms
Experimentation, Human Factors, Languages.

Introduction

Basic literacy skills are fundamental building blocks of education, yet for a very large number of adults, tasks such as understanding and using everyday items is a challenge. As the literacy-based demands of today's society are continually growing, adults with low literacy skills are becoming increasingly limited in their ability to understand, use, find, produce and benefit from textual information required in daily activities at home, at work and in the community. Although many community-based organizations offer resources and support to adults with limited literacy skills, current programs have difficulty reaching and retaining those that would benefit most from them. To address these challenges, we have proposed a technological solution to support literacy programs and to assist low-literacy adults in today's information-centric society. The ALEX© system [12],[13] was created together with low-literacy adults, following guidelines for inclusive design of mobile assistive tools (see Figure 1). It is a mobile language assistant for use both in the classroom and in daily life, in order to help low-literacy adults become increasingly literate and independent. It is designed to help develop language skills and knowledge acquisition pertaining to real life by providing intuitive access to various language-based tools.

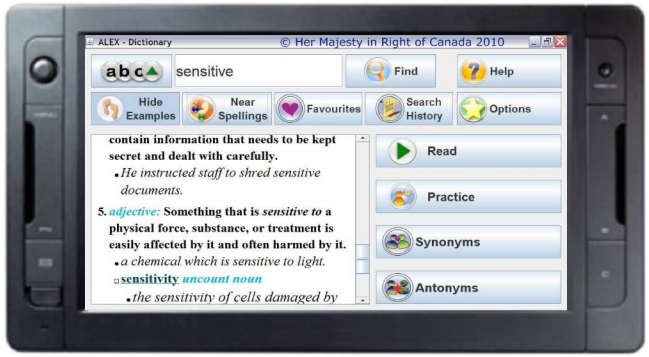

Figure 1: The ALEX© application, running on a 7-inch tablet.

This paper commences with an overview of the ALEX© system and the two field studies that were carried out: the first based in an adult literacy course and the second based in a workplace essential skills program. We then reflect on the overall challenges encountered during the two studies, and discuss the implications of those challenges for practitioners working with marginalized, functionally illiterate, adults in developed countries.

Supporting low-literacy adults through mobile technologies

The goal of this research project was to explore how adults enrolled in literacy programs and essential skills training can benefit from a mobile assistive technology that supports experiential learning, and furthermore investigate how the perceived usefulness and ease of

use of such technology influences students' independence and confidence, as well as their motivation for literacy and essential skills improvement.

We are located in the Canadian province with the largest percentage of adults with low literacy levels. As such, we have partnered with Government of New Brunswick's Community Adult Learning Services (CALS) to address the adult literacy and essential skills problem in this province. CALS is an integrated network focused on adult learning services, including computer, literacy, and workplace training, operating under the relevant provincial education departments. This project is one of the outcomes of this ongoing research partnership.

System overview

The main feature of our language assistant is the dictionary look-up. We have partnered with HarperCollins Ltd, the publisher of a large-circulation English dictionary and thesaurus that were embedded on the devices provided to participants. Two features assist users when looking up words: a choice between QWERTY and alphabetic keyboards, and a "near spelling" feature that is useful in both showing alternatives for misspelled words and presenting users with more choices when they are not sure of the correct spelling of a word.

Text-to-speech functionality assists adult learners in reading definitions (as illustrated in Figure 2). Users can select a word or sequence of words to be read. If no words are selected, invoking the read feature will produce audio of the entire definition displayed at that moment. Text-to-speech is also enabled for buttons and menus.

Figure 2: Dictionary look-up with audio spelling.

To facilitate a wider range of learning activities, ALEX© allows words to be saved in a persistent, favourites-type list. Users have full control of the list, being able to remove words and to perform most functions offered by the application directly within the list. A non-persistent list is also available in the form of a search history that displays the most recent word look-ups. In addition, our application can be customized to provide access to the various resources of the installed electronic dictionaries, such as synonyms and antonyms.

Beside text-to-speech, ALEX© makes use of the built-in automatic speech recognition system to provide adult learners with a pronunciation practice feature. The practice allows users to first hear the correct pronunciation, then record their pronunciation and be informed of its correctness. Users can hear their own recording, and are able to compare their pronunciation with the correct one. Users are not given a numerical score for their pronunciation; a color-based dial is used

instead, accompanied by positive reinforcement messages.

After evaluating the language assistant capabilities of ALEX© (as described in the following Section), we adjusted the design and implementation to support learning in the context of essential skills training. For this, we have partnered with SkillPlan, a major Canadian publisher of science books for construction apprenticeship curriculum. We have extended the dictionary concept in ALEX© to include general science and math references, as illustrated in Figure 3. All general-purpose features from the previous version of ALEX© were preserved, and new features were added to assist users in navigating the more complex structure of science materials: calculator (both standard and scientific), table of contents, bookmarks, and an annotation capabilities that allows users to type in short notes anchored to any part of the displayed material (e.g. text, image, formula).

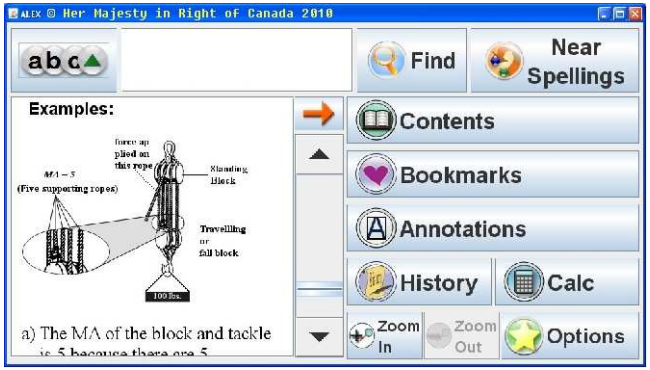

Figure 3: Interface and functionality adapted for use in workplace essential skills training.

Background

Although workplace training programs and adult literacy classes both appear sound alternatives to traditional educational institutions, there are major barriers for adult learners in literacy and workplace essential skills programs. Community organizations offer resources and support to adults with limited literacy skills, but issues such as work, lack of financial resources, childcare, and transportation often prevent potential learners from taking part in and benefiting from such programs [1]. Barriers to retention in workplace training programs include the inflexibility of program delivery (where participants have to leave their jobs for a set period to attend a program) that restricts the participant's ability to develop 'soft skills' needed for successful long-term employment (skills like literacy and numeracy) [20]. In Canada, 50% of adults are considered to have low literacy skills [1]. This has serious consequences for the economy – businesses are struggling to find local workers who have the basic skills necessary for the demands of today's information-centric society.

The affordability and portability of mobile devices offers a realistic opportunity to provide novel, context-sensitive resources both within and, more importantly, outside workplace essential skills programs and adult literacy classes. While there has not been much research published on the use of mobile devices for workplace training and adult literacy, researchers have developed mobile devices for language training. The majority of mobile language literacy research focuses on second language learning [8]. Mobile language literacy research for second language training uses mobile devices in innovative ways such as: delivering vocabulary lessons and quizzes to the learner's mobile

phone [21], capturing and sharing how learners practice language skills outside the classroom [5],[16] and sharing location-specific knowledge with other learners [14].

Studies examining the use of mobile aids by marginalized users are currently being carried out in developing countries, and, to a lesser extent, in the developed world. Working with marginalized users presents researchers with a broad set of unique challenges for data collection, which can impact technology use as well as research methodology [7]. Users in developing countries who are less technologically literate conflate the hardware with the software in designs and discussions [11]. Such participants find abstract scenarios and abstract introductions difficult [3] leading to problems with participatory designs and paper prototypes [2],[3], [10]. There are also challenges particular to where data collection takes place. Working with marginalized groups in developing worlds, researchers often do not collect data in controlled laboratory environments. Instead data is collected in public spaces within the community [3].

Low text and computer literacy are also challenges for technology design [4]. Often marginalized users in developing countries have low literacy, resulting in a lack of confidence in searching for or finding information in textual sources [17], which can make traditional data collection methods, such as a structured questionnaire, difficult for researchers to administer. Lack of experience in formal information structures (like the basic organizational structure of a book) can also effect the uptake and evaluation of technologies based on these structures [9].

Similar issues are faced by researchers working with marginalized user groups in developed countries. Rural users in newly industrialized China, for example, mainly rely on information from oral sources, and may feel like they are too old to learn information structures and that technology is not useful in their everyday lives [15]. In North America studies working with homeless populations have demonstrated high attrition rates due to the users' social circumstances [6]. In our two studies, with adult literacy students and with low literacy workplace essential skills students, we encountered similar issues faced by researchers working with other types of marginalized groups in the developing and developed worlds.

Overview of the two studies

We conducted the evaluation of the ALEX© system through two long-term studies in 2010 and 2011. The first study was conducted within an adult literacy program for ten months in 2010, while the second study was carried out over four months in 2011 within an apprenticeship program[1]. Both programs are designed to help adults struggling with low literacy improve their skills: the literacy program is focused entirely on improving general reading and writing abilities, while the apprenticeship program is centered around basic science skills, tailored to apprentices who do not possess a high school degree and thus are not eligible to enroll in trade-specific certification programs.

[1] We will refer to the study conducted within these two programs as "literacy study" and "apprenticeship study", and to the respective participants as "L-P1" and "L-T1" to denote participant 1 and teacher 1 in the literacy study and "A-P1" or "A-T1" for participants and teachers in the apprenticeship study.

The unique characteristics of our user groups and settings (mainly, low-literacy adults in informal educational environments) presented significant challenges in determining appropriate evaluation methods. After conducting observation sessions in similar classes offered by our partner, including participatory design sessions and pre-study interviews with teachers, we determined that the only suitable evaluation methods is a long-term exploratory study. For this, each participant received one device running ALEX©, to be used both in and outside the classroom environment. We collected data by frequently observing participants using the device in the classroom environment. For assessing usage outside the classroom, we had to rely on participants' own verbal accounts, as the agreements in place with the literacy and the apprenticeship branches did not include the provision of interacting with them while not in class, and other alternatives (e.g. diaries) were not practical due to participants' low literacy skills.

For both studies, participation was entirely voluntary, and teachers did not pressure students to enroll. This was also ensured by the fact that sign-up for these classes were not mandatory for any of the participants. All participants were of legal age (19 years or older) – only adults outside the K-12 education system are eligible for these programs. Eleven participants in two classes (six in the morning class and five in the evening one, each with a different teacher) were enrolled in the literacy study. Seven students and 2 teachers in one class were enrolled in the apprenticeship study.

The adult literacy sessions are usually conducted in an informal setting resembling one-on-one tutoring. A typical class consists of several adult learners (maximum of eight, but usually three to four). There is one teacher per class. Students work independently on their assigned subject, making use of the support material (e.g. textbooks, dictionaries) provided to them by the teacher. The teacher moves between students' tables, assisting them or answering questions. Students are free to enter and exit the classroom at any time, as well as chat among themselves, occasionally helping each other with their work. In a given class, there could be students all studying the same subject, or each student studying a different subject. There is no formal evaluation of academic progress. The teachers' role is to facilitate the learning process and to guide students in their quest for self-improvement at the student's own pace toward their own individual goals.

The apprenticeship classes are also conducted in an informal setting, and there is very little classroom-type instruction. However, in contrast with the literacy classes, the learning materials are more structured, and students are encouraged to work independently on photocopied exercises at their own pace, with the instructor intervening only when students need specific help. There is also less interaction between students, as usually the instructor tailors the exercises for each individual student.

Data was collected through several instruments: discussions with participants, direct observations, questionnaires (administered by researchers as semi-structured interviews), and teacher interviews.

No hypotheses were formulated before the evaluations – both studies were exploratory, aimed to discover how

this particular technology is adopted and the outcomes[2] of using it in conjunction with adult literacy and workplace essential skills programs.

To avoid the risk of post-hoc interpretation specific to qualitative studies with small samples [19], we employed several mitigation strategies. Data obtained through student and teacher interviews, observations and discussions was collected by the principal researcher, and an analyst and developer associated with the project who acted as impartial observers. Care was taken to transcribe factual information and not interpret the observations during note taking. The transcripts were analyzed by employing clustering techniques [19] to identify the main themes and outcomes of the study.

Challenges

Several significant factors influenced the design and proceeding of the long-term studies, often representing departures from more "traditional" evaluation methods. We describe here some of the most challenging factors and the approaches we took in order to ensure the collection of relevant data from the two studies.

Literacy Levels

A typical student attending adult literacy classes has completed some years of formal schooling, usually up to the end of middle school, and works part- or full-time in a non-professional position (e.g. cleaning, farming, etc.). They are able to carry out non-complex reading and writing tasks, such as some newspaper reading, writing a very simple letter, etc. The apprenticeship students share similar educational backgrounds, however they are working in the trades (e.g. carpenters), typically in jobs not requiring a trade certificate. For both programs, the literacy and essential skills levels of adult learners are assessed directly by teachers during the enrolment interviews (using internally-developed guidelines, through direct observations during the interview, and based on the learner's education history).

The participants' literacy levels make it difficult for researchers to conduct rigorous, structured data collection. Even questionnaires that were phrased, with the help of teachers, at appropriate literacy levels, did not elicit meaningful answers (questions were not answered at all or participants provided answers from which no useful information could be extracted). Instead, most of the data was collected either through direct, individual interactions with users during the longitudinal study, or prompted by the verbal administration of the questionnaire at the end of the study – researchers rephrased questions and often set them in the context of a personal story or example in order to elicit an answer from the participant. In particular, the final questionnaire was administered in the form of a semi-structured interview, with the researchers adapting the questions to the literacy level of individual participants. It was determined that this approach was more practical given the particular challenges posed by our user group – participants' often-unsolicited narratives and direct observations provided researchers with an intimate understanding of both participants' struggles and needs, and whether our system addressed these needs.

[2] A complete description of the measures used and outcomes of this study can be found in [13].

Implications for Future Research
We make the following recommendation regarding the methods that should be used to gather data from the participants:

- Avoid written surveys and highly structured interviews in favour of informal conversation-styled interviews that are tailored to the individual.

Researcher Bias
It is expected that researchers conducting human-subject experiments maintain an unbiased position as observers during the proceeding of the evaluation and not intervene in a manner that can influence the collection of data. However, particular conditions surrounding the two studies we have conducted, particularly the adult literacy study, posed challenges in maintaining researchers' impartiality.

During the planning stages, teachers and program coordinators expressed concerns about the presence of researchers in the classrooms, anticipating that their presence could make learners uncomfortable. However, students became familiar with the researchers in very short time – a positive consequence being that they were unreservedly providing feedback to researchers, but also that they expected researchers to become more intimately involved in the class proceeding. For example, we have allowed students up to two weeks at home with the devices in order to be able to decide on their own time if they want to be part of the study (they also had a week to review the consent form if they required). During this initial period, we were visiting the classes daily to answer questions and provide technical support. Even before signing the consent forms, some users insisted on providing feedback and expected us to take notes.

Special care was required by researchers to maintain ability to collect impartial data (e.g. most of times having two researchers on site), and it resulted in a significant amount and depth of data being collected. This could be attributed to this specific user group no longer feeling marginalized. In fact, Teacher 1 reported that students were anxiously waiting for researchers' visits so they can tell them about something new they've discovered while using the device. Teacher 2 mentioned that students felt that someone was listening to them and to their needs and struggles, and that they can contribute to something that would help others like them.

Implications for Future Research
We suggest that bonding with subjects is not only inevitable during long-term studies, but is desirable. We believe the benefit of increased trust and empathy that is fostered between researcher and subject outweighs the increased risk of researcher bias. In order to reduce the impact of bonding on the impartiality of data analysis, we make the following recommendations:

- Have at least two researchers present during observational studies.

- Include researcher involvement and interactions with subjects as a data source for analysis (as opposed to only considering the subjects' responses).

- Have at least one additional researcher who was not present during the observational study participate in the data analysis.

Participant Attendance

Irregular attendance at classes was an issue during both studies. The typical student in the courses juggled work, family and course commitments. In addition, many students did not own a private vehicle and as such, weather, particularly (for the adult literacy students) in the winter, was an important factor influencing attendance.

Attendance was particularly problematic in the workplace essential skills study. Nine students were initially enrolled in the course, but one dropped out prior to the first session and another accepted a job a few weeks into the course. By the end of the study, only five students were attending class at all, with only one attending on a regular basis (more than half the time). The class teacher was keen to highlight that this was not a usual occurrence:

"Overall attendance was an issue from the start, with the whole initiative… Not sure ALEX was for this group, part of this because of attendance, which is not normally an issue, but it was for this group." (A-T1)

The most obvious impact of the students' poor attendance was on the practicalities of carrying out a study: opportunities to observe the students in class and their use of ALEX© in the classroom environment were limited; students became difficult to contact, meaning that researchers could not perform all of the necessary closing interviews (6/11 for the literacy study and 5/7 for the apprenticeship study) and manual system upgrades.

Beside data collected directly from participants, the researchers engaged in extensive on-going discussions with the two teachers, followed by an in-depth interview with them at the end of the study. This provided us not only with teachers' perspective on the use and acceptance of the technology, but also complemented participants' narratives. Students' daily interactions with teachers were an important source of information that could not always be captured by researchers since they were not present for extensive periods of time.

While ALEX© was not designed to be limited for use within the classroom, we believe that attendance rates are just one aspect of the study's environment that play a potential role in the uptake and adoption of the technology being studied. If a student does not attend class, then they are less likely to use the technology at all. The next section will discuss the impact on the format and dynamics of the class on experimentation with- and adoption of the technology on those that do attend.

Implications for Future Research

Irregular attendance may be an inconvenience for researchers but it is the reality of the domain being studied. As such, we make the following recommendations:

- Supplement observational studies with interviews to reduce the potential bias of observational studies towards students who attend most frequently.

- In situations when researchers can only attend a subset of class hours, implement observation by proxy through structured interviews and ongoing dialogue with the teacher.

- Enable remote updates of the software, so that all participants can benefit from bug fixes and not just the participants who the researchers can contact.

Participant Engagement with the Study and Technology

Attendance aside, the level of participant engagement in the study varied greatly between the two studies, as well as across demographic groups. Overall, we have found that participants understood the process of validating technology through evaluations with real users. Once the study progressed and students became more comfortable with the researchers, they became less shy in providing feedback and criticism (particularly the older literacy students).

Participants in the adult literacy study took pride in being part of the study by identifying issues and suggesting solutions. They liked the fact that someone was listening to them in a field that they have not contributed to before, and felt that it was important to tell us about problems that they found. Some participants even spent time looking for such problems – unfortunately, it was difficult for the researcher to properly instruct the participants in identifying application-specific issues from hardware issues or from dictionary limitations, without overwhelming the participant with technical details. As such, many of the suggestions made by the participants were neither things that could be addressed by the research team nor benefit the further development of ALEX©.

In contrast, participants in the apprenticeship study were somewhat more disinterested in the study. This can be in part attributed to a more rigid class format, as well as to a dynamically-changing curriculum – although ALEX© has the possibility of updating the content manually, we did not anticipate the need for such frequent updates, often resulting in mismatches between the class needs and the currently-uploaded materials. Another possible explanation is students' rather dismissive attitude toward education in general. Although they do not posses a high school degree (thus limiting their career options), most of them acquired sufficient work experience to enable them to gain employment – they often expressed disdain for formal education, particularly mathematics.

While discussing the material covered in class, two participants stated that math exercises have "nothing to do with carpentry" (A-P2, A-P4). When asked if they thought they would learn better by doing more practical exercises A-P4 stated that he "can't see how the math and practical related", despite the teacher's effort to highlight the connection between math and real-world problems and the numerous examples of such nature found in their printed and ALEX© materials. A-P4 also explained that the past 3 bosses he's worked for hadn't taken the carpentry blocks because they didn't see the need. A-P2 confirmed this belief, that the blocks aren't needed, by stating that completing formal education doesn't mean you can do the job: "papersmart don't mean nothing at the jobsite."

As the apprenticeship study progressed we had a growing intuition that there existed a mismatch between what users expected from such technologies and what systems like ALEX© deliver. To verify this, we decided to conduct a participatory design session at the end of the apprenticeship study. Scheduling this at the end of the study allowed students to become comfortable with the idea of mobile assistive technology supporting their learning needs. Two students participated in this session, and provided good feedback about the device and their learning needs and expectations from mobile learning assistants. During the design session the participants were visibly more comfortable than during the classes, which could be attributed to their expressed aversion for formal teaching. A common theme that emerged from their feedback was their expectation of job-specific aids, for example for carpentry they envisioned building codes as the main reference provided by the mobile application. Other suggestions for more interactive functionality were centered around practical calculations, e.g. providing a fill-in formula for building a flight of stairs given the height that needs to be reached by the stairs. Despite the researchers' use of various props such as videos and efforts to lead the discussions toward learning goals, the students did not see the applicability of mobile technology in supporting learning. This attitude toward learning was predominant throughout the apprenticeship study – as one participant noted:

"The best way for me to learn is by taking something apart. That's how I've learnt the trade from my dad" [A-P5]

Similarly, participants expressed varying degrees of comfort and experience with technology. In general, technology use was not an issue for most of the participants. Those who were normally afraid of technology were eventually able and willing to use the system after a period of initial reluctance. One exception was A-P5, who used computers and the internet very infrequently and expressed no interest in technology per se:

"It's a generation thing – ALEX is for the younger generation. I am too old for this. The kids use computers all day, they will be able to use something like ALEX." [A-P5]

In addition, the status of the devices impacted the participant's willingness to use ALEX©. While in some cases, the status of having a new device proved to be a catalyst to use and interaction with others (as detailed in [13]), others were overly cautious with the devices. For example, one potential participant in the adult literacy class returned the device after a week of use and did not continue with the study. While initially he did not provide a reason, later he disclosed to researchers that he was afraid of losing the device. In other cases participants went to great efforts to conceal accidents and associated damages, despite our promises of no consequences for broken devices. For example, participant L-P4 returned the device to us after a week informing us that it stopped working. Upon further inspection we discovered super-glue inside the device, probably as a result of being dropped and subsequently "repaired."

Implications for Future Research

Varying degrees of engagement with an academic study and technology itself is to be expected when carrying out studies with populations that are not composed of early adopters. As such, it is also to be expected that some will reject the technology. We strongly discourage researchers from excluding such participants from the study. Therefore, we suggest:

- Take the opportunity to learn more about non-users and non-use (as encouraged in [18]) and find out what is of value to them.

- Be prepared to tailor the level of researcher contact and participant involvement to that which is acceptable to the individual participant.

Similarly, we need to acknowledge the limitations of technology's scope of influence. If a person is not motivated to learn, they are unlikely to use the system.

- Be aware of the difference between those that are unmotivated to learn and those who are unmotivated to use technology.

- For those unmotivated to learn, consider investigating motivational and practical barriers to learning that could be addressed by technology.

Finally, if devices are being distributed as part of the study:

- Budget for loss of devices and device repairs.

- Reassure participants that some accidental damage is to be expected and that they will not be charged for damage.

Importance of Proxy Support

As previously mentioned, the adult literacy sessions are conducted in a very informal setting, with no academic instruction or evaluation being conducted. In this context, the teachers' role is to assist students in achieving their individual learning goals.

Given the critical role that teachers had in the particular settings of the literacy classes, the successful adoption of technologies such as ALEX© is dependent on the availability of teachers' to support the deployment of such solutions – teachers act as proxies for students' acceptance of technology in the same way they support students' skills and knowledge acquisition[3]. For this, we have involved teachers in the early design stages of ALEX©, as well as in planning for the long-term study. This has lead to the adult literacy teachers successfully managing to integrate the technology in the classroom without negatively disrupting the class proceedings. Furthermore, our ease of access to, and interaction with, users was immensely facilitated by teachers; reinforcing the importance of proxy support when addressing the needs of marginalized user groups [10]. This was relevant not only in supporting the collection of meaningful data from users with low literacy skills, but in establishing a relationship between researchers and learners.

[3] Particular to the literacy program, students seem to have a relation with the teachers that is not limited to academic matters – they ask teachers for help with general issues, such as advice on looking for jobs or assistance writing an official letter.

The apprenticeship classes were significantly less "hands-on" due to their science- and math-oriented curriculum and in that way, more closely resembling traditional classroom environments. During class there was very little discussion of the topics; instead students worked independently on photocopied exercises at their own pace with little interference from the instructor. The exercises they were given were mathematical, although there usually was a little bit of written instructions accompanying these exercises on the handouts.

Since the students worked on different exercises at their own pace, there was no lesson plan to follow. This made it difficult for the students to know which topics would be covered next. Also, students who missed a class were unable to do catch-up work, since they were unsure of what material would be covered in future classes.

[ALEX would be better] "If it was tailored to how the school was going to work. Here it was different – everyone was working in a different section and we jumped around a lot." (A-P4)

These aspects, combined with a shorter and less-frequent schedule than the adult literacy classes (two weekly classes of two hours each over three months, compared to four to eight hours a day for six to eight months for the literacy program) and with a more rigid setting for the class, lead to significantly fewer interactions between researchers and students (typically, 10 to 15 minutes during class time). The consequence for researchers was the inability to direct the study and guide the students in determining how ALEX© can address their learning needs; instead, participants decided entirely on when and how to use the ALEX© devices.

The importance of proxy support was also underscored during the participatory design session held at the end of the apprenticeship study. Students were more relaxed and were visibly more comfortable in the researchers' presence during this session, which was not the case during regular class time (possibly due to the more rigorous type of instruction). This positive interaction reinforced our observation of the importance of close interaction with researchers and active involvement of proxies in developing a supportive relationship with learners that is not limited to the usual rapports found in more traditional classrooms, in eliciting feedback from such user groups.

Implications for Future Research:
When researchers design studies they typically choose a setting that aligns with its intended real-world application. Our understanding of the importance of context of use and study setting is reflected in the involvement of course teachers in the design of the study. However, over the course of the second study we became aware of the assumptions we had made about the class format and style of teaching. We had assumed that there will be numerous and unconstrained opportunities for students to use the device during class. These assumptions did not hold.

Based on these experiences, we make the following suggestions:

- As with researchers, may need to include teachers' interactions with the students and the technology as a data source for analysis.

- Perform multiple studies in different instantiations of the same domain setting in order to fully understand the influence of proxy support and what helps/hinders technology uptake other than the technology itself.

- Consider how non-technological factors that influence uptake could be integrated into the system design.

- Address the question of how the technology should be promoted in non-study settings. If teacher/researcher involvement is central to uptake:

    - Could indicate a limitation of the system's potential scope.

    - Could indicate a need to integrate the system into a curriculum change/teaching package.

Conclusion

In this paper we have reflected on the challenges that we faced when carrying out two exploratory studies of a mobile application to support adult literacy and essential skills within two adult education courses, and the implications of those challenges for others working in the field.

The challenges that we faced came in many forms: literacy levels, maintaining impartiality, participant attendance, participant engagement, and the impact of proxy support. Two core themes have emerged from our subsequent recommendations:

1. Extending the scope of study design and data analysis from the student, technology, and context of use, to include the researcher, teacher, and impact of the study.

2. The tailoring of study protocols and methods to the individual participants.

Both of these have the potential to impact the scientific validity of any study. Arguably, the first stands to increase the validity of such studies by explicitly including factors that are known to influence participant behaviour in the body of data being analyzed. However, the second demands methodological flexibility that seems to stand in opposition to the methodological rigour expected within the field of Human-Computer Interaction. As evidenced in the examples we have presented in this paper, we suggest that this aspect needs to be carefully considered when conducting evaluations of mobile assistive technologies for marginalized groups, and that no "easy-to-follow recipe" exists for how to address this theme. As such, we would like to encourage the HCI community to reflect on such challenges and stimulate further discussions on this topic that will lead to the establishment of sound methodological guidelines within this field.

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