DEVELOPING INFORMAL EDUCATION THROUGH MOBILE COLLABORATIVE LEARNING

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ABSTRACT
By using mobile devices, informal education could be developed through collaborative interactions at any time or location. The use of properly designed mobile computer applications can support and boost situations that lead to informal education. Thus, in this work a new perspective is proposed which uses mobile collaborative learning for the development of informal education. This work presents an approach based on this perspective, as well as a prototype interface that illustrates the ideas and the design decisions. The paper also presents a discussion about the impacts of the approach on informal education.

KEY WORDS
Mobile Learning, Informal Education, Mobile Collaborative Learning and MCSCL

1. Introduction

The fast evolution of the technology, social network services and mobile platforms transformed the traditional notions of community and intercultural communication. According to Naismith et al. [1] it is possible to notice the emergence of a connected and mobile society, with a variety of information sources and means of communication available at home, at work, at schools and in the community.

In this new scenario, mobility can also be used to support education. Keegan [2] points out that the recent evolution in supporting technology for education can be seen firstly in distance education (d-Learning), then in electronic learning (e-Learning) and finally in mobile learning (m-Learning), called the “mobile revolution of the XXI century”. Mobile learning can be developed by mobile devices such as: Personal Digital Assistant (PDA), Handhelds, Smartphones and Mobile phones. These devices can be exploited in the development of daily learning anywhere and/or anytime. According to Sharples [3], these mobile learning devices allow learners to learn wherever they are located and in their personal context so the learning is meaningful.

The literature also highlights the need to make this approach in learning more interactive and collaborative, stimulating the sharing of knowledge in a way that is not restricted to certain issues, place or time constraints. In order to achieve this objective, it is necessary to create situations that lead to the social and cultural impact on the use of mobile technologies, contributing in a practical way with the education and socialization of the citizens.

There are several relevant related works which have contributed with the mobile collaborative learning in the field of Mobile Computer Supported Collaborative Learning (MCSCL), (e.g. [4], [5], [6] and more recently Arrigo et al. [7]). However, the approach adopted in these works focus mainly on classroom activities inside the school environment. Thus, it is also necessary to think and develop new appropriate methodologies and techniques for the use of mobile devices in learning processes outside the classroom. These methodologies and techniques can focus more than formal education, given their peculiar characteristics and capabilities that could support alternative forms of lifelong learning and informal education.

Additionally, it is necessary to have new technological solutions for mobile interfaces that allow the involved people to act in a collaborative way taking into account the self organization of the learning groups. This work seeks for a solution that minimizes the mobile phone interaction limitations, and that can assist the development of people’s daily informal education in a collaborative way.

Therefore, a reflection is presented in this work on how the mobile collaborative learning could contribute with the development of informal education. Based on this reflection, a proposal is presented for a prototype of a mobile computing environment. The proposed software application organizes the interaction of the users, so that they can develop ideas and discussions collaboratively to solve problems in their daily lives. Thus, it is expected to create a technological solution that allows the educational development in a mobile and collaborative way outside the school environment.

This work is structured as follows: Section 2 presents the literature review; section 3 makes a reflection on the use of the mobile devices and collaboration for the informal education; section 4 presents the computing environment based on the proposed approach and briefly discusses the
empirical results; finally, section 5 presents the conclusion and further works.

2. Literature Review

This section presents the informal education background, introduces the mobile collaborative learning, and shows the related works.

2.1 Informal Education

According to Jeffs & Smith [8] the informal education brings back elements of an education dated to more than 2500 years ago. In ancient Greece, education was generally made on the streets at events in which people learned from each other through dialogues and discussions. Some of these educational characteristics and procedures are present in today's informal education. Fisher et al. [9] points out that informal education can be seen as the knowledge of the common sense, personal or practical knowledge, largely developed through experiences. For Smith [10] informal education does not have lessons or plans to follow. The informal is done through situations and experiences, and this can occur at any place, different from formal education, which is strongly linked to institutions and classrooms. Besides, by not setting the time and location for the occurrence of activities, informal education is flexible for adapting the content of learning for each group in particular. Furthermore, Jeffs & Smith [8] clarify one can not say that informal education is better than formal education; it depends on the educational objectives, situations and of the context involved. It is also important to notice that according to Smith [10] the purpose of informal education is not different from any other form of education, it differs only in its scope and focus on aspects related to the common and everyday life. In addition to it, Glória [11] explains that informal education can be understood by multiple dimensions such as: (1) the learning and practice of exercises that enable individuals to organize into community goals, towards the solution of collective daily problems; (2) Learning the content of formal education in different forms and spaces with informal methodologies and (3) training of individuals to work through learning of skills and / or development of potential.

Informal education is related to a process of continuous learning, because we can learn all the time, every day and anywhere about a wide range of issues. In this sense, considering that this educational practice takes into account the learning that occurs on interactions and occupations emerged in the everyday life, it is possible to establish a relationship between informal education and mobile collaborative learning. This issue is explored in the next section.

2.2 Mobile Collaborative Learning

Learning can be seen like something socially built as the collaborative construction of knowledge. According to Dillenbourg [12] we can not set a precise or exhaustive definition for collaborative learning. To sum up, it is a situation in which two or more people learn or attempt to learn something together interacting in a collaborative way. It describes a situation in which particular forms of interaction among people are expected to occur, which would trigger learning mechanisms. Hence, a general concern is to develop ways to increase the probability in which some types of interaction occur. Furthermore, collaborative learning must include situations, interactions, processes and effects.

Stahl et al. [13] points out that the collaborative learning involves individuals as group members, but also involves phenomena like the negotiation and sharing of meanings, including the construction and maintenance of shared conceptions of tasks, that are accomplished interactively in group processes. The basis of collaborative learning is in the interaction and exchange of information. Therefore technological mediums (hardware and software) that allow this interaction in an easier, simpler and more effective way can contribute to make this process more dynamic and effective. Collaborative learning through mobile devices has been investigated mainly because of the agility and mobility offered by these devices. Mobility has changed the contexts of learning and modes of collaboration, requiring different design approaches from those used in the traditional system developed to support teaching and learning. The major conclusion is that the learners’ creations, actions, sharing of experiences and reflections are key factors to be considered when one is designing mobile collaborative activities for learning [14]. According to Roschelle et al. [15], MCSCL is a rapidly growing field with its intellectual activity focused on discovering, describing, and documenting the effectiveness of specific designs of use of mobile devices for learning in a collaborative way. These technologies provide new opportunities to promote and enhance collaboration by engaging learners in a variety of activities across different places and contexts. A main challenge is to identify how to design and deploy mobile tools and services that could be used to support collaboration in different kinds of settings. These different settings provide innovative ways for people and devices to interact by enabling learning to take place beyond the walls of the classroom and the screen of a computer [14]. Finally, Zurita & Nussbaum [6] clarify that the MCSCL activities support transparently the collaborative work by strengthening the: (a) organization of the managed material; (b) social negotiation space of group members; (c) enabling students to collaborate in groups by communication among the group members through the wireless network, that supports the social face-to-face network; (d) coordination between the activity states; (e) possibility to mediate the interactivity; (f) encouraging the mobility of members. Also, mobile collaborative learning
activities manage and encourage tasks that include: monitoring real-time progress with respect to learning objectives and controlling interaction, negotiation, coordination and communication of the involved people.

2.3 Related Works

The related works in the literature, which focus on design of mobile collaborative learning activities, (e.g., [6], [15], [7] and [14]) include: the proposition of methods and solutions that aims to solve questions for formal education environments inside the classroom; the investigation on how to design these applications with an interaction-based design [16]; the analysis of user’s interaction [17]; and the approaches focused on specific fields and topics (e.g., [18] and [19]). The work of Breuer et al. [20] shows an approach to seamlessly integrate formal and informal learning, but the activities and the informal learning are still connected to the formal education inside the classroom. Other related works and approaches can be seen in [21], [22] and [23].

So, none of these works have explicitly pointed out a particular solution to design a mobile application for the development of informal education outside the school environment. Therefore, this subject should be investigated in a deeper way, so it could create new educational paradigms not yet explored in the literature and the proposal presented in this work is part of this scope of research. In the next section a reflection will be presented about a new perspective for the development of informal education, through the use of mobile collaborative learning.

3. Mobility and Collaboration: A New Perspective for the Development of Informal Education

Some studies try to answer where the education actually happens. Bentley [24] addresses the “lifelong education and for life” arguing that educational development can occur at any location or time during a lifetime. In this sense, the educational process is related to a process of continuous learning, because we can learn all the time, every day, anywhere and on a wide range of subjects. The use of mobile devices with appropriate software applications could support and intensify opportunities for learning since it can enable interaction anywhere and anytime; therefore it can be an option for the development of informal education.

The mobile learning can boost the development of informal education because it opens new possibilities for action and relationship of the individual with the world, and therefore allows interventions through interactions and collaboration. Hence, mobile devices could be used by users to share and discuss issues or questions related to situations that they experience in their day-to-day. Moreover, individuals in face of a new situation or problem are supposed to act in a more agile and flexible way if they share knowledge with others. The joining of these two forms of learning (mobile and collaborative) can provide a special condition for the occurrence of informal education, because they bring peculiar characteristics that can be best exploited through a properly designed mobile computational environment.

Thus it is argued that an open computing environment (in the sense that anyone can enjoy whatever the place) based on mobile devices can create opportunities for new interactions, and also allows the individual to propose topics of a wide range of subjects and situations that their daily lives enable. Consequently, users can take advantage of the environment through the free exploration of these ideas and doubts in the interaction with each other, allowing the generation of new knowledge, and contributing to their education and development as citizens. So, the computational proposal presented in this work foresees that the participants must have more possibilities and freedom to interact and propose collaborative discussions on topics related to the interests and practices of the groups. Additionally, the groups can self-organize without any formal moderation.

The next section presents a mobile prototype interface designed based on this approach.

4. Designing a Mobile Software Application for Informal Education

Due to the informal education heterogeneity, a simple and trivial computational design (i.e. based only on exchange of asynchronous messages by instant text messages) is not able to support efficiently the collaborative situations. Thus, the prototype designed in this work shows an organized set of design interfaces capable of supporting collaboration in synchronous and asynchronous ways. Additionally, we propose to this software environment a way to consolidate (highlight) the messages of interactive form in the synchronous collaborative process and a collaborative way to vote the situations (states) that are the developed collaborations at the mobile application. Figure 1 shows the general scheme of the proposed environment.

The process of developing collaboration can begin by inserting a new group, or choosing a group that already exists. The groups have a vital role within the environment, because they organize the various subjects that can be related to informal education into specific areas.
Theses groups are created by users, and any user can take part in any group. Collaborators of a same group are users with interests in common, like a community of learning; it means that a group is related to a specific area of the formal or non-formal knowledge. In these groups the topics and collaborations can be organized in a structured way. In the groups the users can add several topics that will form "subgroups", and inside of the topics new collaborations can be added; it is a particular solution for the informal education perspective and all is made by the self-organization of the users.

According to the scheme presented in Figure 1, collaborations occur in the environment by sending synchronous (chat) and asynchronous messages (commentaries). The users collaborate to consolidate the collaboration, which gives emphasis to specific messages, and it also occurs in the situation that provides a way for users to choose the status of the collaborations.

During the collaborations participants can send synchronous messages as in an instant chat, Figure 3a illustrates this situation. All the messages are sent with a specific “objective” and have a label like ‘doubt’, ‘question’, ‘conclusion’, ‘answer’, among others that may be defined by the own users following their needs of expression.

The participants can also select which synchronous messages should be "consolidated" during the chat, generating an interface similar to Figure 3b. These consolidated messages are important because they will describe a summary of all the synchronous interaction with the most important messages selected by the users in a specific issue. At the consolidation interface, the messages are organized by their types (labels), for example, ‘doubt’, ‘question’, and ‘conclusion’. Other users of the environment can also see this summary (Figure 3b illustrates this interface).

The occurrence of communication via asynchronous messages - as shown in Figure 3c - is a way to add new information to synchronous collaboration developed or under development. This type of communication will be especially useful in two situations:

1) When the theme of collaboration takes several days to be resolved, in which there is a need for several rounds of synchronous interaction (online chat). In this case the commentaries (asynchronous messages) can be a way to divulge possible solutions at any time between the online conversations. These commentaries can then be discussed in a new round of synchronous collaboration, thus the discussions of the chat (synchronous messages) can be articulated with the commentaries (asynchronous messages).

2) In case of a relevant idea of a user who was not involved in the collaboration after it has finished, the commentaries are a way for these users to register their idea so that other people of the environment can see them. As illustrated in Figure 3d, another proposed way for supporting the collaborative environment is to define possible "states" for the developed collaborations. Collaborators can vote on the basis of information from the collaboration (synchronous and asynchronous messages) to classify the status of the collaboration; e.g.: ‘resolved’, ‘pending’, ‘not conclusive’, among others that may be defined by the users themselves. This is an important functionality because this interface takes into account the opinions from the users.
This state or situation refers to what has been discussed in a collaboration session (determined subject proposed by one user), so a situation would be, for example, the impossibility of conclusion or resolution. That is, the participants of the collaboration interacted with each other and exchanged messages, but they did not reach a definitive conclusion about the problem in question. The prototype brings the opportunity to present different final situations to a collaboration session. The objective is to have a number of situations selected by the users of the application, presenting in this way different points of view from the same collaboration, enabling users to check if that collaboration has generated interesting results or not (see Figure 3d).

Figure 3a illustrates the interface with an example of synchronous message exchange in which users establish a communication (chat) from a defined issue – in this case “Nature and Profits” - and specify his/her “speech” as being of the type: ‘question’, ‘answer’, ‘solution’, ‘doubt’, etc. Figure 3b shows an example of consolidated messages from the collaboration developed in Figure 3a. Figure 3c illustrates an interface of commentaries, in which users sent asynchronous messages to a collaboration named "Problems with Java". Finally Figure 3d shows the vote results made by the users for the collaboration entitled "Problems with Java".

Besides these aspects, the environment encourages autonomy by providing resources for the self-organization through the collaboration sessions. Users can launch themes for discussion; can be involved in the resolution of a problem, can choose the relevant solutions, and can point out the status of the collaborations. Thus, the environment does not foresee the existence of a group’s mediator, so mechanisms have been developed that enable all users to organize the proposed subjects by the creation of groups, topics and collaborations necessary for the organization of the information at the mobile software.

4.1 Discussing the Proposed Approach and the Analysis with Potential Users

In the proposed approach agility and mobility are viable through mobile devices which promote opportunities for situated and collaborative learning that occurs throughout life, anytime and anywhere. Learning experiences are encouraged in a process of communication and collaboration permedated by issues or questions related to situations experienced in people’s lives. The prototype allows people to build ‘communities of learning’ which can discuss problems in a little structured way, with the freedom to propose questions and solutions, interact and express, and with decisions and solutions built through a collective consensus whatever the issue.

The mobile software was not thought to a specific application or to support a specific theme. A lot of real-world educational applications could be instantiate to any area. As an example we could think on healthcare professionals that take care of people at home and need fast answer to problem and they do not have access to computer at that time. They could create a ‘community’ using this software to collaborate and to exchange ideas about problems that could appear on time of working and be resolved quickly using mobile collaboration. Other example in another context, users could collaborate to solve problems regarding to how to fix mechanical problem at car engines.

Concerning the empirical analysis, a brief qualitative evaluation of the proposal and prototype with potential target users has been done. At this moment the goal was not to verify issues of device connectivity and location aware information, however we intended to analyse characteristics and functionalities of the software. The analysis has been conducted with the participation of IT professionals, computer science students, healthcare professionals and high school students. The participants have had contact with the prototype and answered the questions about their impression over the proposal. The questions elaborated were: (1) If you face a problem, would you use the proposed application to discuss the solution? If yes, in which situation; (2) What topics would you be more inclined to discuss? (3) Would you collaborate with other people through the application to solve a problem proposed by someone? If yes, in which situation; (4) Would you use multimedia messages during the collaboration? (5) What difficulties could you point out in using the application in your daily life? (6) How long and how often would you use it in your daily life? and (7) Do you think that you could improve (learning to
develop better) the performance of your tasks with this application? After analyzing the answers, we can indicate that users mainly would use the application in emergency situations, for example, when (s)he had no access to a computer, and also in working field situations or in occasions of daily life like such as during traffic time. They could discuss about several topics such as news, health, hobbies, technology, or on topics of everyday and professional context, generally in situations that needed help. Most of users indicated that they would collaborate with other users on the application, especially in areas that they had knowledge. About the multimedia messages, all participants pointed out that they would use some form of multimedia messages, mainly due to the flexibility offered by these messages. The difficulties that could prevent users to use the application are mainly due to: the small screen of mobile devices, the difficulty of interaction (data entry), operation cost and low speed connection. Additionally, users have indicated that they would use the application especially when they had to solve a problem in unusual places and times, but they would not frequently use the application, as they could use personal computers in normal situations. Most users clarified in a positive way that a proposal with this approach could improve their performance in development of learning activities related to informal education. Looking to these results, we think that with this approach we can improve both tangible and intangible educational benefits for users, because they will be actively collaborating and learning without time, place and issue constraints. Finally the use of the collaboration and mobility for the development of the informal education seems like a valid educational approach. It enables users to begin discussions about what they are experiencing in one moment about any issue, and also to participate in existing groups to share ideas and opinions. So, users can collaborate on a joint process of learning, in which the goal is mainly the intellectual evolution of the involved collectivity. To sum up, users could benefit from collaboration and flexibility through the use of mobile devices.

5. Conclusion

Recent researches aim to maximize the possibilities of learning of people in their daily lives outside the classroom; they investigate mainly how the learning process could occur regardless of subject, place or time. In this context, this work has presented a technological proposal for the development of the informal education based on mobile and collaborative learning. The paper presented a reflection about this new perspective. Based on it, a prototype was implemented with the aim to illustrate the proposed approach for the design of mobile software.

Based on the results obtained in the prototype interface and the analysis with potential users, the proposal was pointed out as a likely starting point for the development of the informal education with the mobile collaborative learning. It aims to add educational value to those involved at any place or time in a collaborative session. Moreover, this work emphasizes flexible ways to develop a collaboration session in a mobile phone application exploring the autonomy of the involved users with focus on informal education.

As a future work, a deeper investigation of the approach from a practical point of view is suggested. The research and analysis of real case studies should point out improvements in the interface design and new application features. The use on a large scale should also provide what the concrete educational results of the proposed approach are.

References


