

Analysis of an informal mobile learning activity based on activity theory

Ioanna Papadimitriou Nikolaos Tselios Vassilis Komis

University of Patras *University of Patras* *University of Patras*
iopapad@upatras.gr *nitse@ece.upatras.gr* *komis@upatras.gr*

Abstract

This paper presents a method of collecting and analyzing data for collaborative activities supported by mobile technologies. Collection and analysis of data was focused in studying all elements of an activity according to the Activity Theory. A variety of sources was combined in order to study the deployment of the activity. Results and problems that emerged during a case study in an actual museum setting are also presented. It is argued that this approach, with modifications proposed in this paper, can contribute in deeper understanding of the educational use of mobile technologies.

1. Introduction

An increasing use of mobile technologies to support learning has been reported during the past years. Studies have been deployed in order to investigate the effects of use of mobile technologies to support learning activities. A variety of methodologies, research objectives and questions have been introduced. The ubiquitous characteristics of mobile technologies often produce limitations in the effort for an in depth study of the learning procedure. In this paper, we present a methodology to collect and analyze data in the frame of an informal mobile learning activity. The methodology presented is based on the Activity Theory.

2. Research design and methodology

2.1. Objectives and research questions

The methodology presented in this paper was developed in the frame of a case study of a collaborative learning activity created for a local historical museum, the Museum of Solomos and Eminent Zakynthians, located in Zakynthos, Greece. Its main objective was to introduce students into a new form of interaction with the historical exhibits of the museum. 17 children (11 girls and 6 boys of 10 years of age) participated in the frame of a visit of their classroom to the museum. The students collaborated in groups of 4 and 5 members. The experimental procedure took place in one of the rooms of the museum. The scenario included data collection and manipulation in order to solve a given problem. The students were asked to collect and combine data extracted from the examined exhibits in order to identify a desired exhibit as described by the learning scenario. Support was also available by a facilitator (Tselios et al., 2007). The study focused on the use of the tools (technological and symbolic) involved and on the interaction of participants in the activity. The

research questions addressed were: (a) how the students collaborate and perform high level actions through low level operations? (b) What is the role of the facilitator of the activity? (c) Can we identify a pattern in student's actions throughout the activity?

2.2. Methodology

The activity was closely observed and monitored using a variety of instruments. Voice recorders were used to record dialogues among the participants and their activity was videotaped and screen capturing of the PDA took place. The Activity Theory model was adopted for the analysis of the collected data since in this case of museum education activity; knowledge construction is mediated by cultural tools in a social context. According to the Activity Theory an activity is consisted by low-level operations and goal-oriented actions (Kuuti, 1995; Waycott et al., 2005; Zurita and Nussbaum, 2006). The data collected were analyzed using the Collaboration Analysis Tool (CoIAT) environment. CoIAT supports a multilevel description and interpretation of collaborative activities through fusion of multiple data (Avouris et al., 2004). It provides researchers the ability to organize and synchronize data of different sources through "Projects" that are grouped in "Studies". In "Projects" data concerning specific subjects can be synchronized by setting appropriate time delay for each source and can be transcribed and analyzed in three different but connected levels. Activity data can be described and commented by entering suitable "Typologies" to the "Study". Appropriate Actors and Tools can also be determined by the researcher which confront to the requirements of the adopted analysis methodology.

In our case study dialogues, user actions with the applications and observations derived from the videos were transcribed in this first level of analysis (see Fig. 1).

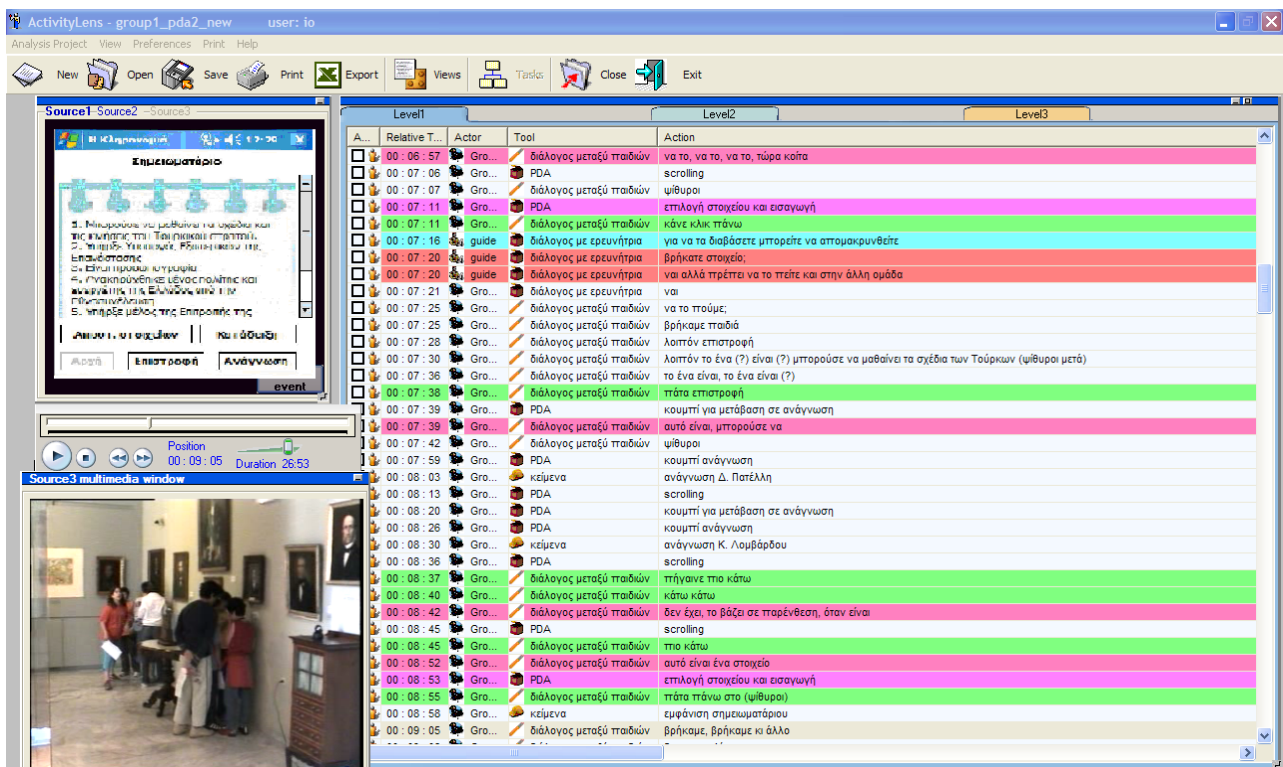


Figure 1 Data analysis environment

Typologies were defined in order to characterize these first level operations of subjects. The analytic tool which was created was influenced by a similar analytic tool used for studying collaborative modeling activities (Ergazaki et al., 2007). Some representative typologies adopted were “Reading of information”, “Clarifications concerning the use of the application”, “Clarifications concerning the object of the activity”, “Negotiation for the next action”, “Reading of Clues”, “Sending Clues”.

In a subsequent level of analysis, lower level operations were grouped in intended actions. Actions such as “Support”, “Data Search” and “Reasoning” were identified. The identification of these intended actions was achieved by the combination of the actions and dialogues that led us to identify three different goals guiding the participants. For example, reading of text was some times intended to find hints necessary for the solution of the problem while, in other instances of the activity, reading of text was intended to support reasoning: While reading information about an exhibit, in some occasions, they mentioned that they didn’t see a hint inside the information. In other occasions they referred to previously discovered hints and compared these hints to the information they read. In the first case participants aimed at finding data necessary for the solution of their problem. In the latter case the participants tried to reason about the information they were reading by using the hints they had already collected.

The third intended action that was identified throughout the procedure was support. This action consisted of episodes where support about the activity’ scenario or the use of the application and devices was requested or delivered accordingly. For example, a presentation of the activity and the use of devices took place in the beginning of the procedure. During the procedure, the participants asked the researcher about the way they can send hints to the other team or how they can save hints in the notepad provided by the application. Also support was also provided by students to other students during the procedure.

Analyzing data using this analytic tool gave us valuable insight about the interactions of the participants, the role of the facilitator and the patterns of the students’ actions. The role of the facilitator was to provide support throughout the activity. A pattern was identified in the participants’ actions. In the first part of the procedure participants focused on collecting data. In the second part participants focused on reasoning and asked for support at every stage of the procedure.

3. Discussion

In this paper we presented a methodology based on Activity Theory, used to study a mobile learning activity. Data collection aimed in the detailed monitoring of the procedure. As derived from our experience analyzing the learning outcome of the activity, the combination of different sources of data though can facilitate further study and deeper understanding of the tools’ usage and the students’ interaction with mobile technologies.

4. Acknowledgements

The research presented here is partially supported by the University of Patras in the frame of the “Karatheodoris” Research 713, entitled “Mobile Devices in Education”.

References

- Avouris, N., Komis, V., Margaritis, M., & Fiotakis, G. (2004). An environment for studying collaborative learning activities. *Journal of International Forum of Educational Technology & Society*, Special Issue on Technology – Enhanced Learning, 7(2), 34-41.
- Ergazaki, M., Zogza, V. & Komis, V. (2007). Analyzing Students' Shared Activity while Modeling a Biological Process in a Computer-Supported Educational Environment. *Journal of Computer Assisted Learning*, 23(2), April 2007, 158-168(11).
- Kuuti, K. (1995). Activity Theory as a potential framework for human-computer interaction research, in B. Nardi (Ed.), *Context and Consciousness: Activity Theory and Human Computer Interaction* (pp. 17-44). Cambridge: MIT Press.
- Tselios, N., Papadimitriou, I., Raptis, D., Yiannoutsou, N., Komis, V., & Avouris, N. (2007). Designing for Mobile Learning in Museums. In J. Lumsden (Ed.), *Handbook of Research on User Interface Design and Evaluation for Mobile Technology*, Idea Group Publishers (in press).
- Waycott, J., Jones, A. & Scanlon, E. (2005). PDAs as lifelong learning tools: an activity theory based analysis. *Learning, Media and Technology*, 30(2), 107-130.
- Zurita, G. & Nussbaum, M. (2007). A conceptual framework based on Activity Theory for Mobile CSCL. *British Journal of Educational Technology*, 38(2), March 2007, 211-235(25).