

# Process- and context-sensitive research on academic knowledge practices: Developing CASS-tools and methods

Hanni Muukkonen, Kai Hakkarainen, Kari Kosonen, Satu Jalonen, Department of Psychology, University of Helsinki PO Box 9 Siltavuorenpenger 20 D FIN-00014, Finland, [firstname.surname@helsinki.fi](mailto:firstname.surname@helsinki.fi)  
Annamari Heikkilä, Kirsti Lonka, Department of Applied Sciences of Education, University of Helsinki P.O. Box 9 FIN-00014, Finland, [firstname.surname@helsinki.fi](mailto:firstname.surname@helsinki.fi)  
Katariina Salmela-Aro, Department of Psychology, University of Jyväskylä P.O. Box 35 FIN-40014, Finland, [firstname.surname@psyka.jyu.fi](mailto:firstname.surname@psyka.jyu.fi)  
Juha Linnanen, Kari Salo, EVTEK University of Applied Sciences, Vanha Maantie 6, FIN-02650 Espoo, Finland, [firstname.surname@evtek.fi](mailto:firstname.surname@evtek.fi)

**Abstract:** The Contextual Activity Sampling System (CASS) methodology and CASS-Query tools have been developed for the investigation of learning and working practices. The CASS-methods and tools provide contextualized data that allow the analyzing and modeling of within-person changes across time. This paper describes a pilot study with 3G mobiles used by eight engineering students. Students answered questionnaires concerning their ongoing study projects, academic emotions, and collaboration, with a mobile phone five times a day for a period of two weeks (70 queries per person). Variation in their emotions were examined by time-series analysis. Students were also interviewed before and after the CASS-query period. Interview and query data were used to form a picture of the variation of daily routines, challenges, and reflections of one's own activities related to engagement in academic tasks or leisure. The study reports results regarding students' experiences of the CASS-methodology, emotional experiences during the two-week follow-up, their objects and activities related to personal study projects they undertook during this period.

## Aims

Traditional methods of learning research are usually individually oriented, focus on the participants' beliefs and other discursive entities rather than their practices as they occur. Therefore such methods provide a frozen picture of students' behavior rather than address sustained processes of individual and social transformation. The participants are often asked to provide retrospective global assessments (Reis & Gable, 2000) of their beliefs and conceptions of learning that are assumed to determine the nature of their concrete approaches to learning. There are few empirical studies linking students' predispositions to actual practices, other than studies where students have been asked to report how strongly they prefer various study strategies. Several learning researchers (e.g., Engeström, 1987; Marton and Trigwell, 2000; Säljö, 1997; Wegner, 1998), argue, by contrast, that social practices play a central role in learning and instruction. Further, Gale (2002) and Quinn (2004) point to the sociocultural explanations of students' difficulties in higher education. Overall, everyday institutional practices of working with knowledge-- taking courses, reading, writing, presenting, interacting with other students, as well as the structuring of activity in space and time, by the curriculum -- appear to be in a central position in determining also individual practices of learning. Evidently, these variables are interacting with students' personal dispositions. However, understanding of the contextualized factors of learning, which are cross-time, cross-situational, and multilayered, is currently rather primitive (Alexander, 2002). In short, research on sociocultural dynamics of learning and instruction appears to require transformation of available research tools.

One of the central aims of the present investigation is to develop and validate contextual tools for longitudinally analyzing transformation of university students' knowledge practices, i.e., processes, routines, or procedures of working with knowledge. Knowledge practices represent socially constituted, rather than merely individual activities (Hakkarainen et al, 2006). Background for methodological development is provided by the Ecological Momentary Assessment (EMA) (Bolger, Davis, & Rafaeli, 2003; Reis & Gable, 2000; Stone & Shiffman, 2002) and Experience Sampling Method (ESM) (Csikszentmihalyi & Larson, 1987) which provide methods of assessing participants' contextual activities, events, and personal experiences. Whereas ESM focused originally on capturing elusive flow experiences, EMA is more broadly oriented toward recording mundane and

routine everyday activities that constitute social practices. The participant is asked to assess only one situation in time and generalizations are made by researchers by aggregating observations or modelling changes across time.

## Developing and validating The Contextual Activity Sampling System (CASS)

The CASS-query tool is a Java-application for collecting process- and context-sensitive data. The system is implemented on 3G mobile devices (e.g., Nokia N93) with Symbian operating system, MP3, video, GPS, wlan. The CASS system provides generalizable tools in open-source terms (i.e., adaptable and free of charge) that can, in a flexible way, be tailored and elaborated for particular needs and requirements of researchers and users.

### Basic functionalities of the CASS-Query tool include:

- Administrator tool (XML-editor) enables the construction of queries, defining questions and types of responses (open text, Likert-scale, audio- or videorecording, picture) (figure 1).
- Queries are customizable to each user.
- The application connects to the Internet and downloads the intended query from the server.
- Responses are returned to server database.
- Data are transferrable to statistics software SPSS.

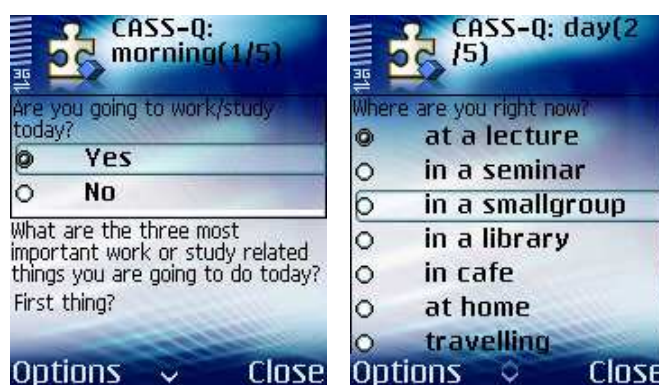


Figure 1. Screenshots from the CASS-query tool.

A *pilot study* was carried out with eight third-year students at EVTEK in November 2006. The students were interviewed individually after and before the pilot. They were introduced to the CASS data-collection procedure, queries, and mobile phone in an introductory session; a feedback session was held after the pilot. The actual pilot consisted of 14 days, during which the students were asked to answer to five queries each day. A daily set of questionnaires included morning query, three identical day queries and an evening query. The time spent in the morning and evening was approx. 5-7 minutes per query and for the day 2-3 minutes per query.

Examples of issues addressed were the objects (What are the personal projects defined as papers, exams, work, hobbies), self-efficacy and flow (How absorbed are you in what you do?, How competent do you feel?), stress (see Elo et al., 2003) (Do you feel stress?), affects (e.g., enthusiastic, nervous), social context (where, with whom), social sharing (Are you interacting with someone else?), obstacles and constraints (what hampers or restrains your activities). In analyzing the data, we will apply multi-level models, such as the time-series models adapted to repeated measures data.

## Findings

The students in the pilot study considered the tool very easy to use, they became accustomed after two or three queries. The pilot study provided evidence that the sampling was able to show both within-person and between-person variation in the affect and motivation questions. We discovered, e.g., very different rhythms (some study from 8-4, while others start in the afternoon and continue late into the night), range in the number

and type of personal study projects, type of constraints they experiences, and types of networks students were active in.

### **Theoretical and educational significance**

It appears that the contextualized CASS-sampling provides investigators a novel type of information on learning and working practices. In future, a combined use of both within person (time-series) and cross-sectional (between groups) analyses appears feasible to extend understanding of knowledge practices beyond single individuals (Schmitz, 1990).

### **References**

- Alexander, P.A. (2002). In the year 2020: envisioning the possibilities for educational psychology. *Educational Psychologist*, 39, 149-156.
- Bolger, N., Davis, A., Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology*, 54, 579-616.
- Csikszentmihalyi, M. & Larson, R. (1987) Validity and reliability of the Experience-sampling method. *The Journal of the Nervous and Mental Disease*, 175, 526-536.
- Elo, A-L., Leppänen, A., & Jahkola A. (2003). Validity of a single-item measure of stress symptoms. *Scandinavian Journal of Work Environment Health*, 29(6), 444-451.
- Engeström, Y. (1987). *Learning by expanding*. Helsinki: Orienta-Konsultit.
- Gale, T. (2002). Degrees of difficulty: an ecological account of learning in Australian higher education. *Studies in Higher Education*, 27, 65-78.
- Hakkarainen, K., Ilomäki, L., Paavola, S., Muukkonen, H., Toiviainen, H., Markkanen, H., and Richter, C. (2006). Design Principles and Practices for the Knowledge Practices Laboratory (KP-Lab) project. In W. Nejdl and K. Tochtermann (Eds.), *Innovative Approaches for Learning and Knowledge Sharing. Proceedings of the first European Conference on Technology- Enhanced Learning, EC-TEL. Lecture Notes in Computer Science* (pp. 603-608). Berlin, Germany: Springer.
- Marton, F & Trigwell, K. (2000). *Variatio est mater studiorum*. *Higher Education Research*, 19, 380-395.
- Quinn, J. (2004). Understanding working-class “drop-out” from higher education through sociocultural lens: cultural narratives and local contexts. *International Studies in Sociology of Education*, 14, 57-74.
- Reis, H. T., Gable, S. L. (2000). Event sampling and other methods for studying daily experience. In H. T. Reis & C. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 190-222). New York: Cambridge University Press.
- Schmitz, B. (1990). Univariate and multivariate time-series models: the analysis of intraindividual variability and intraindividual relationships. In A. von Eye (Ed.) *Statistical methods in longitudinal research*, Vol. II (pp. 351-386). San Diego, CA: Academic Press.
- Säljö, R. (1997). Talk as data and practice - a critical look at phenomenographic inquiry and the appeal to experience. *Higher Education Research and Development*, 16, 173-190.
- Wenger, W. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge: Cambridge University Press.