

Dimensions of Identity in Open Educational Settings

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ABSTRACT

Based on our deployments of Livenotes, a Tablet-based application for collaborative note-taking in open educational settings, we observe that communication breakdowns, potentially affecting learning, arise from imperfect knowledge about other users' identities. This leads us to argue that user identity is an under-explored topic in ubicomp. We show that the concept of identity needs to be expanded to include digital, social, and physical features. We conclude with preliminary design implications.

Keywords

identity, education, tablet computing, proximity, familiarity

INTRODUCTION

We study how people learn via distributed dialogue. Livenotes (LN) [1] is an application for collaborative note-taking and drawing in classrooms. Using LN, groups of 3-7 students are wirelessly connected to one another via their handheld tablets, such that students may exchange notes synchronously on a multi-user, multi-page whiteboard with peers from the same group. LN users are currently identified by being assigned unique ink colors and through logging in, with login names defaulting to machine names.

The most prevalent method for users to identify themselves to a computer is through logins, an explicit form of input. Nonetheless, traditional logins center heavily on the desktop model, assuming a single user who is bound to a given computer terminal for a substantial period of time. In contrast, Livenotes uses the “common pool” model, in which Tablet PCs do not have fixed users and can be easily swapped between users in a session. Pea and Rochelle [2] argued for device mobility in the education context. In this model, however, users can lose track of who is engaged in communication at a specific moment.

Ubicomp therefore becomes important as a way to address this problem. Abowd et al. [3] highlight the relevance of context, such as identity, to ubicomp, where applications accurately keep track of their users through implicit sensing, instead of relying on logins. We argue, however,

that ubicomp needs not only to focus on digital identity, but also on social and physical identities where educational and collaborative work settings are concerned.

OBSERVATIONS

We made observations while analyzing five multi-session deployments of LN in educational settings (at UC Berkeley and the University of Washington). The deployments were not in controlled settings [1], but in open contexts including a graduate seminar (STS), reading group (TSD), design studio (DMG1, DMG2) (Figure 1), and undergraduate lecture (CS). The data includes transcripts of the written conversations (~500 pages) and, in some cases (~12 hours), video and audio recordings.



Figure 1. Livenotes deployed in an architectural studio review session DMG1. Graduate students and faculty swapped, picked up, and set aside tablets at will.

In the deployments, we discovered a number of disruptions to small group dialogue, and we then explored the mechanisms that people develop to resolve these problems. In each deployment, groups were confused over who was making what inputs on the whiteboard at different points because users would drop out of the dialogue, swap Tablets, or come and go from the classroom. Group dialogue improved over time with greater familiarity with technology and user identity, provided that groups remained stable and did not swap Tablets freely. Still, break-downs occurred from time to time because of user identity issues. In a computer science lecture in April 2003, for example, group dialogue stopped when the group realized that a member had just entered the room, and

wondered “who is red?” They asked “red” to identify himself, resuming dialogue when he did so.

To avoid such communication break-downs, users can “challenge” one another and identify themselves throughout a session, particularly at the outset. Once, users even performed a “roll call” where people took the initiative to report who they are (e.g. red, “roll call”, red, “mark”, green “john”, blue, “jeremy”, green “hi”, as seen in a computer science lecture). Identities are established through a social process that everyone can witness and participate in. The group becomes more aware of each other.

Finally, we observed that group members developed a sense of user identity through non-explicit but physical means, such as associating Tablet use with screen activity, or gesturing to and looking at each other.

ANALYSIS

To explain how user identity is one important factor shaping collaborative group dialogue and how users resolve identity problems in the absence of cues provided by LN user interfaces, logins, or social processes like roll-calls, we developed a framework that extracts four dimensions of each educational setting that LN is deployed in. These dimensions are: physical stability (did people come and go, or change groups), temporal stability (did people stay with the tablet conversation), proximity (were people sitting near each other), and social familiarity (did users know each other previously). Each dimension affects how much group members are aware of each other. The higher the level of all dimensions, the more likely it is that groups will effectively resolve identity issues and generate sustained dialogue.

We did an initial analysis, to measure all five deployments in terms of the framework and created a relative scale to compare them along each dimension: see Table 1. This scale runs from low to high, based on our joint judgments of how much of each dimension each group appeared to have.

	Physical Stability	Temporal Stability	Proximity	Familiarity
STS	■	●	●	●
TSD	●	●	■	●
DMG1	○	○	●	●
DMG2	■	■	■	■
CS	■	●	○	●

legend: ■ high ● med ○ low

Table 1. Dimensions of each educational setting for the five deployments.

Deployments varied greatly in their dimensions and therefore the level of their distributed dialogue, measured by learning metrics such as: amount of dialogue, extent of participation by everyone, or the depth of ideas generated. Two architecture studio groups differed markedly in their dialogue rate and content because one group (DMG2) sat together and could see who the users were, while the other

group (DMG1) was more dispersed and swapped Tablets frequently. DMG2 had high scores on all dimensions. However, when people overcome the lack of identity knowledge through social, participative processes like a roll-call, they appear to engage in greater dialogue. Other variables such as personality and the classroom setting (lecture or studio) also affect the level of dialogue.

Developing this framework leads us to conclude that the concept of identity needs further development in ubicomp. In ubicomp literature, key distinctions between digital, social, and physical identities are usually not made.

DESIGN IMPLICATIONS

Potential design solutions for identity issues exist to aid ubicomp applications in open educational settings. These solutions can use our framework to determine how identity is being continuously influenced in conditions where people swap Tablets, drop out and re-enter dialogue, come and go from classrooms, or are mobile.

One solution has been proposed by Maniates [4]: the introduction of a “person” layer to the network protocol stack used in wireless, mobile systems, or routing messages by recipient instead of machine names. Another solution is to change the user interface to enable a roll-call feature to help people identify each other through social, participative means. Another is that user activity can be incorporated into the group awareness display, thus augmenting user login and ink color information. Data from other sources of input (Active Badges, computer video cameras, and microphones) can also be cross-referenced to help determine identity. Hence, there are computational ways of enhancing stability and familiarity, overcoming the challenges that open classroom settings and workplaces pose to discourse. All these solutions are co-existing and target social, physical, and digital identities jointly. We plan to investigate how the solutions can be integrated in future iterations of LN interface design and deployments.

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