ABSTRACT
My research explores how dynamic feedback from automated linguistic analysis of team conversation can improve teamwork behaviors in technology-mediated environments. I am undertaking this endeavor in three stages. First, I examined the prospect of linguistic analysis to capture effective teamwork behaviors. Second, I designed GroupMeter, a system that supports research into issues of feedback, language, and teamwork. Finally, I plan to empirically examine how feedback can stimulate reflection on and change team members' word choice. This work extends our understanding about the role of technology in augmenting teamwork beyond task-focused perspectives toward illuminating social and communicative aspects of teamwork.

TEAMWORK, LANGUAGE, AND FEEDBACK
Models of effective communication practices are abundant, but are often generic and abstract. For example, having critical team discussions rather than full agreements can be important for effective teamwork [4]. In any specific situation, however, how can team members make sure they are aptly analytical and critical, not converging to agreement too quickly? Providing teams with "best practices" is not enough; people must learn to apply the appropriate communicative behaviors in concrete situations.

I propose making team members aware of the language they use while communicating about their tasks. Dynamic feedback about language use can trigger reflection on members’ communicative behaviors that underlie general principles of effective collaboration and as such serve as a tool for training teamwork skills. For instance, showing people how often they use dissenting versus assenting language can help them interpret their behavior with both the general principle and the specific situation in mind.

Automated analysis of group communication can potentially reveal much about the collaborative process. Such analysis can be then visualized to provide social translucence [3], generating awareness and accountability toward the group as well as drawing attention to specific collaborative patterns. For example, visualizing participation and turn-taking patterns stimulates reflection [5], increasing awareness of dominant contributors [2]. Further, visualizing agreement can lead to more critical norms [4].

MY PHD RESEARCH
Most previous research on automated analysis of team conversation, including [2,3,5], focuses on high-level phenomena such as overall participation and turn-taking. However, other levels of collaborative behaviors may be indicated by finer-grained language features such as word choice, indi-
cating, for example, if someone is talking more about themselves or the group [7], if they often agree with others [4], etc. When people work together through CMC technologies, language use is a key visible feature—and tools that help people notice, reflect on, and improve their verbal behaviors are a promising research direction.

Investigating the potential of linguistic feedback to support teamwork conversations raises a number of questions: Can technology identify language features that correspond to teamwork behaviors? How do people interpret feedback visualizations based on automated linguistic analysis? Under what circumstances does increasing awareness of word choice make people change their language use? Can people simultaneously process real-time feedback and accomplish the team task?

Stage 1. Language features do appear to correspond to effective teamwork. In an experiment (N=104) teams interacted through a chatroom and provided peer feedback to each other on the SYMLOG interpersonal dimensions [1]. Using LIWC [7] to count frequencies of words in certain content categories (e.g., pronouns and emotion words), I found that highly-rated collaborators used different language than poor collaborators (e.g., more achievement words and less agreement words) [6]. Groups that participated in peer feedback procedures used different language, such as more 1st person pronouns. These findings support the potential value of language features as a source of feedback on teamwork behaviors.

Stage 2. Next, I designed GroupMeter, a research platform to help groups reflect on their teamwork behaviors and support research into how language, feedback, and teamwork interconnect. GroupMeter consists of a web-based synchronous chat client augmented with dynamic feedback visualizations of linguistic indicators continually extracted from the chatroom text (Figure 1). The framework is flexible, allowing researchers to vary the features chosen as well as the timing and visual presentation of feedback.

Stage 3. I am now using GroupMeter to address my research questions around how to effectively use linguistic feedback to enhance teamwork. Using observations, measures of language use, content analyses of team conversations, and user interviews, I am exploring whether people who receive feedback reflect on their team process and change their communicative behaviors. Preliminary findings suggest that feedback triggers reflection on and lead to some changes in team members’ language use.

I am planning additional studies to research questions about stimulating reflection and behavior change through linguistic feedback: should the feedback incorporate explicit norms or stay open for interpretation (e.g., should the system state if frequent agreements are good or bad)? Can people focus on the task, keeping peripheral awareness of their team process? How do people respond to different metaphoric visualizations?

EXPECTED BENEFITS
My research contributes to the domains of CMC, small group psychology, and groupware design. I look forward to a discussion with a multidisciplinary group of researchers who can provide me with guidance given their expertise in these areas. Furthermore, as a research platform, GroupMeter allows addressing many research questions about the interconnections between teamwork, language, and feedback. I appreciate discussion about what the key questions are and specific ways to address them. Finally, I am currently planning stage 3 of my PhD research, making this a particularly appropriate time for me to benefit from the DC. I feel I can contribute my experience and expertise to the consortium, and yet my work is still at a point where it can benefit from discussion.

REFERENCES

Figure 1. The GroupMeter chat interface with feedback visualized as a school of fish. In this design the fish’s location is set by linguistic features of each participant. The bubble trails represent earlier data points in the conversation.