University of Pittsburgh | School of Computing and Information

Proposal Defense

Doctor of Philosophy in Computer Science

"**Modeling and Supporting Middle School Mathematics Collaboration Across Different Learning Platforms**" by **Ishrat Ahmed**

Date: March 25, 2021
Time: 11:30am – 2:00pm
Place: https://pitt.co1.qualtrics.com/jfe/form/SV_42ulYqxbbOuzSGW

Committee:

- Erin Walker, Associate Professor, School of Computing and Information, University of Pittsburgh
- Diane Litman, Professor, Department of Computer Science, University of Pittsburgh
- Jacob Biehl, Associate Professor, School of Computing and Information, University of Pittsburgh
- Yoav Bergner, Assistant Professor, Learning Sciences and Educational Technology, New York University

Abstract:

Adaptive collaborative learning support (ACLS) aims to design efficacious support that models students' domain skills and collaboration. Technology has changed the way students collaborate in formal learning environments, providing them with multiple opportunities to interact across digital spaces with different characteristics, e.g., asynchronous vs. synchronous, public forums vs. private conversations with peers. Students often need help to collaborate effectively. Their individual characteristics may interact with different platforms' affordances and their collaboration partners' characteristics, requiring different kinds of support for different students in different platforms. While many ACLS focus on a single learning platform, there is a need to explore student collaboration in multiple learning platforms and design a new learning technology that facilitates student collaboration across these platforms. To achieve this, we have developed a collaborative learning environment, UbiCoS (Ubiquitous Collaboration Support), encompassing three different platforms: a discussion-based synchronous environment, a question-answer based asynchronous environment, and a virtual teachable agent. The particular collaborative skill we are interested in is help-giving, as giving help to others encourages the students to reorganize and clarify content, reflect on the misconceptions, and fill gaps in their knowledge.

We deployed UbiCoS in a middle school classroom and conducted three cycles of a design-based research study to support help-giving across the different platforms. We investigated how the same students collaborated on the three platforms and identified factors that influenced their help-giving. We used the data to build a preliminary participation model where individual characteristics and platform properties intersect, which can then be used to design collaborative support that takes both of them into account. In this proposal, we propose to iterate on the model by including the students' history and on the adaptive support by using automatic detection of students' participation. This thesis's main contribution is threefold: 1) The design of a collaborative learning environment across multiple platforms instead of a self-contained environment, 2) The adaptation of traditional ITS to model student collaboration using individual and platform characteristics, and 3) The provision of cross-platform personalized support facilitating student collaboration.