PhD Thesis Defense:
Orchestrating Combined Collaborative and Individual Learning In the Classroom
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In the classroom, teachers make use of different combinations of social planes (e.g., individual, collaborative) to support learning. However, little is known about the complementary strengths of individual and collaborative learning or how to combine them so that they are more effective than either social plane alone. One roadblock to this investigation is an ability to orchestrate, or manage, more complex, but theoretically effective, combinations of collaborative and individual learning in the classroom. Current orchestration tools do not support a wide range of combinations of collaborative and individual learning activities in a flexible manner. To fully investigate the combinations of collaborative and individual learning, orchestration tools need to be developed that can support the researcher in a way that can be integrated into the classroom by accounting for teachers' values.

My thesis work addresses two related goals. First, my work addresses the questions: Do collaborative and individual learning have complementary strengths and is a combination of the two social planes better than either alone? In my work, I developed an intelligent tutoring system (ITS) to support collaborative and individual learning. Through three studies, using this ITS, with over 500 4th and 5th grade students, I demonstrate that a collaborative ITS can be used to effectively support learning with elementary school students and that a combination of collaborative and individual learning is more effective than either alone. However, my studies did not find any support for complementary strengths and many other combinations of social planes are left to investigate. Additionally, during my experiments, I encountered challenges in orchestration that, along with the need to research more complex combinations of collaborative and individual learning, informed the next steps of my research.

The second question my thesis work addresses is: How does an orchestration tool that supports researchers in exploring this space need to be designed to align with teachers' values for easy integration in the classroom? Specifically, I aimed to support fluid transitions between social planes where students do not all have to be working in sync, which is not currently supported in existing orchestration tools. To support the orchestration tool design, I present a framework that structures the space that a researcher can explore when combining individual and collaborative learning. The framework can act as the set of requirements to be met in the orchestration tool from the point of the researcher as well as a lens to analyze and design combined social plane activities. As a first step towards supporting fluid transitions as laid out in the framework, I present a set of statistical models that extend domain-level individual modeling into the space of collaborative environments. Finally, I developed an orchestration prototype built around my framework that can be used as a research tool to further explore combined collaborative and individual spaces. To develop the tool to be successful within the classroom, I worked with teachers through a co-design process and validation of the prototype to incorporate their values into the tool.

Find document at: **http://tinyurl.com/JenniferOlsenThesis**