Orchestrating the Combination of Collaborative and Individual Learning with Intelligent Tutoring Systems in the Classroom

Multiple social planes (i.e., individual, collaborative, whole class) are often used within the same learning activity in the classroom. However, the presence of multiple social planes does not automatically guarantee a more productive learning experience for students. It is important to adapt to student needs in a way that aligns students’ social interactions with the goals of the learning phase. In my work, I focus on when it is productive for students to be working individually or collaboratively and how this is best supported in the classroom. Although some current computer supported collaborative learning systems support using collaborative and individual learning, most are non-adaptive and require advance specification of collaborative and individual phases for the entire class. To orchestrate the adaptive use of collaborative and individual learning within the classroom, both the student goals and the teacher goals need to be supported. Current orchestration systems support multiple social planes at the class level and do not support teachers and students in an adaptive classroom where students may encounter collaborative and individual phases of the learning activity at different times.

In my prior work, I studied the complementary strengths of collaborative and individual learning, which is still an open question. To investigate this question, I ran multiple studies both in and out of the classroom with elementary school students working on a fractions intelligent tutoring system (ITS) that was extended to support collaborative problem solving. My prior work showed that elementary school students could be effectively supported through collaborative ITSs and that a combination of collaborative and individual learning may be more beneficial to students than either one alone. These results suggest that there is benefit to adapting collaborative and individual learning to student characteristics.

In order to encourage classroom adoption of a system that supports the adaptation of collaborative and individual learning to student characteristics, support is needed for teachers in addition to students. My proposed work focuses on how I can provide teacher support in terms of real-time classroom management that can align with teacher goals through an orchestration system that allows for the adaptation of collaborative and individual learning to student needs. Within an orchestration system, there is a delicate balance between system automation (which may ignore the teacher goals) and teacher autonomy (which may cause too much cognitive load). Specifically, for my proposed work, I will conduct a requirements analysis with teachers to develop an understanding of the support that teachers need from an orchestration system to support their goals while minimizing cognitive load. Additionally, I will develop and test a prototype of an orchestration system that supports adaptive use of collaborative and individual learning. This work will make a contribution to existing literature by advancing our knowledge of how collaborative and individual learning can be adapted to support student learning. In addition, the work will make a contribution to the literature through helping teachers with an orchestration system that supports an adaptive use of collaborative and individual learning.