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RESEARCH STATEMENT

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Dialogue-based approaches to teaching and learning are essential if students are to develop complex understandings of concepts, ideas, and issues. My research during the doctoral period focuses on academic talk in classrooms. It aims to understand how talk shapes teaching and learning and can promote academically productive talk. I participated in my supervisor's professional development projects that help teachers better orchestrate classroom discourse. My doctoral project focuses on developing productive peer talk during collaborative problem solving. In the future, I will keep exploring the essential role of academic discourse in teaching and learning and developing technology-enhanced approaches to facilitate academically productive discourse.

Motivation and Background

My doctoral work was largely influenced by my supervisor's research on "dialogic teaching", a kind of pedagogy that requires a teacher to engage students in thoughtful teacher-led classroom discussions with the aim of deepening their individual reasoning and encouraging their engagement with each other's ideas. I assisted two large projects that teach teachers how to orchestrate effective classroom talk and uses a learning analytical tool that helps them reflect on whether they give students space to say more, listen to one another, reason and think together in their classrooms. We shared our project outcomes in top conferences as posters, and my supervisor has also published major findings in top journals.

Exploratory Studies

Building on my supervisor's research on teacher-student discourse, my doctoral project focuses on student-student discourse and aims to facilitate academically productive peer talk in collaborative problem solving. Before my doctoral intervention program, I first explored how elementary school students spontaneously discuss with each other to solve a problem together in authentic classroom settings. I gave the same three mathematical problems to around fifty groups of four and observed their collaborative discussion process. Some exploratory findings have been published in prestigious journals.

The first piece of work analyzed how pupils access the conversational floor in group discussion and how their turn-taking approaches may affect collaborative interaction and outcomes. I adopted quantitative analysis approaches and found that dialogue tends to be more equitable when students actively usurp or claim a conversational floor rather than wait to receive the floor offered by other members.

The second piece of work explores group thinking in collaborative problem solving and I am the sole author. I proposed a construct named “group thinking sustainability” to characterize a group’s capacity to consecutively engage in high-order collective thinking and adopted mixed-method approaches to further investigate the impact of group thinking sustainability on group outcomes. This work also suggested a three-level scaffolding (i.e., turn-taking, productive talk, and knowledge construction), which teachers can use to support sustainable group thinking in collaborative peer talk.

The third piece of work investigated the trajectories of idea emergence and how they diversified group outcomes in collaborative problem solving from the perspective of complex dynamic systems. I adopted visual and qualitative analysis approaches and found that new ideas emergent in group discussion tended to attract local utterances as attractors in complex dynamic systems and student academic status could shape the structure of idea evolution by affecting the functioning of regulative feedback loops in discussion.

Doctoral Project

Building on the above work, my doctoral thesis designed a technology-supported participatory visual learning analytical approach to help primary school students develop productive peer talk, in the context of dialogic collaborative problem solving, and evaluated its efficacy in comparison to traditional practice-based learning. This is a semester-long peer talk intervention program in a form of an independent course, *Mathematics Dialogue and Thinking*. I am the teacher of both intervention and comparison classes. My thesis has four major contributions to the field of learning sciences, computer-supported collaborative learning and learning analytics.

First, it is the first effort to apply the dialogism theory to the context of collaborative problem solving and coins the term “dialogic collaborative problem solving” (DCPS). It theoretically frames the goals of effective DCPS and how to talk with peers to fulfill these goals. Second, it developed the first participatory visual learning analytical tool of its kind that aims to develop young learners’ skills to use productive peer talk moves by engaging them in its three-step affordances: code → visualize → reflect. Third, it proposes an innovative methodological design that embeds a design-based research approach in an experiment to satisfy the double goals of research: to evaluate the efficacy of a design, and to progressively improve it in the field. Fourth, it helps deepen our understanding concerning the trajectory of learning and employing productive peer talk moves, as well as how productive peer talk promotes participation equity and improves group reasoning ability.

I have framed the design and usability of the essential tool in my doctoral program as a journal article and published it in a top journal of the learning sciences (Hu et al., 2022). I have also extracted and submitted four other journal articles from my thesis concerning the literature review of productive peer talk (Hu & Chen, under revision), theoretical framework of DCPS (Hu & Chen, under review), the improvement of participation equity (Hu et al., under review), and the improvement of group thinking (Hu et al., under review). I am

currently working on a manuscript with my primary and co-supervisors that reported and discussed my overall doctoral work on peer talk intervention and aims to submit it to Journal of the Learning Sciences, a flagship journal of the International Society of the Learning Sciences.

Future Research

First, I am going to build on my doctoral work and further investigate emergent research topics in the intervention program based on my doctoral dataset. For example, I will zoom in to investigate special cases in dialogic collaborative problem solving such as silent members, emergent leaders or facilitators, or difficult students, and I will consider how to give them additional adaptive support. I would like to further compare the changes of self-, co- and socially shared regulations in two classes and analyze how the intervention may facilitate individual and group metacognitions. I am also interested in how the perspective of complex dynamic systems could inform our understanding and analysis of group dynamics.

Second, I am going to locate appropriate funding opportunities and propose new projects to advance my doctoral research. The first project will revise my current experimental design by adding one “business as usual” class and two intervention classes with simplified intervention designs. I will cut down some intervention elements that the comparison class pupils spontaneously learnt in repeated practice to further explore what in my doctoral peer talk intervention program matters most. This project aims at an advanced and more generalizable version of the course on the explicit learning of productive peer talk. The second project will develop the current peer talk learning tool into a participatory visual learning analytical platform where students can share and comment on their group discussion videos, transcripts and visualizations, thereby building a dialogue culture and enhancing their collaborative problem solving competence. This project aims at an autonomous peer talk learning community that values sharing, fun, and dialogue.

In brief, my research during the doctoral period mainly focuses on understanding group talk in collaborative problem solving and promoting academically productive peer talk through a participatory visual learning analytical approach. In the longer term, my broad research interest includes dialogic education, visual learning analytics, computer supported collaborative learning and complexity in education. In the future, I would like to continue exploring the role of academic discourse in teaching and learning and how technologies could support dialogic education.