Human-centered Automation and Deliberately Limited Labels as Design Principles of Ambitious Learning Practices

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Ambitious learning practices are a natural way for CSCL scholars to conceptualize the relationship between technology and equity. However, these practices are fundamentally a political approach to thinking about pedagogy and require deep consideration of work that is explicitly sociopolitically-informed if they are to achieve their aims (Uttamchandani et al., 2020). Equity-oriented studies in the learning sciences, for instance, often rely on promoting heterogeneity and utilize qualitative methodologies for understanding and measuring learning (Uttamchandani, 2018). This task alone can be challenging in the CSCL context and and even more so when we factor in the role of AI in education. Because of their use of learning analytics, AI projects may rely on a "normed" model of a student and flag those that are deviant (Aguilar, 2018). Further, AI models tend to rely on quantifying and objectifying learning in order to function effectively. Separately from this tension is the fact that AI technologies have and continue to be used with minoritized communities in dangerous ways that make people wary of AI (for example, for privacy reasons) (e.g., Noble, 2018). In this paper, we explore how we began to navigate these tensions through two principles: (1) human-centered automation and (2) deliberately limited labels.

We explore these tensions in the process of designing an orchestration assistant (OA) to support teachers and students to collaboratively investigate phenomena in complex ecosystems while engaging with a problem-based learning scenario in a game-based learning environment, CRYSTAL ISLAND: ECOJOURNEYS. Because such environments require demanding facilitation approaches, the OA leverages a teacher dashboard, and extends the dashboard in ways that aim to support teachers in more successful classroom orchestration (Dillenbourg et al., 2018; van Leeuwen et al., 2019). The OA will provide teachers with real-time information about groups' participation, progress, and nature of their scientific discussion. It will have *prospective* tools to support teachers in lesson planning before class, *concurrent* tools to support real time classroom orchestration, and *retrospective* guidance to support teachers in reflecting on how class went.

AI technologies play a significant role in the design of the orchestration assistant. Machine learning techniques are deployed to create models of how students engage with the learning environment, and are the basis for understanding what information should be presented to a teacher (for example, because student activity is somehow unusual). In addition, recommender systems can help discover teacher preferences and patterns of use regarding group prompts or individual assistance. This in turn, can support teachers with varying teacher expertise and instructional background. Computer vision techniques are deployed to process students' gaze, facial expression, and body posture to further ascertain and triangulate information about students' engagement or participation. AI techniques provide a way for teachers to monitor multiple students at the same time, and support teachers in understanding their instructional practices by learning about their preferences and facilitation strategies.

In designing an orchestration assistant to support ambitious learning practices, several design considerations at the intersection of equity and AI emerged. We consistently reminded ourselves that the orchestration assistant is a *human-in-the-loop* technology, where human decision-makers are ultimately responsible for taking consequential pedagogical actions. We were animated by a *principle of human-centered automation.* While dramatic, we use this term to intentionally move against dominant discourses that envision the primary role of AI in the classroom as to automate things like giving feedback. While some automation is part of our design, a principle of human-centered automation allowed us to focus on what is not being automated: the decisions teachers make about what to say, to which groups of students, and when. Then, AI technology is designed to help support those decisions through giving teachers a comprehensive, yet tightly-focused and actionable amount of information about learners. The role of the AI, then, is truly to support a teacher but never to replace one, and any automated features should be about "freeing up" the teacher to make the kinds of consequential pedagogical decisions that only a teacher can given their professional vision (van Leeuwen et al., 2019), and that are necessary for successful ambitious learning practices. For example, the orchestration assistant provides the teacher with student information, but does not evaluate teachers' performance or reaction to that information. Instead, it provides teachers information about their facilitation strategies in relation to specific group profiles and requests that the teachers evaluate the effectiveness of these strategies.

We were also guided by a *principle of deliberately limited labels* to enable teachers to think and act expansively. While AI is often useful to sort and categorize students, we are cautious of how these groupings are typically labeled and how they frame and sometimes even diagnose learners. We are especially cautious about deficit framings that are routinely applied to students with disabilities, students of color, and other minoritized students. For example, while groups progress through the game at different rates, it was crucial to us that we did not label groups as "slow." Similar framings to avoid were labeling students as "bad collaborators" or "off-task." Instead, we considered the information teachers needed to know because they could contextualize that information, placing emphasis on descriptive but not diagnostic information. For example, teachers are given information about where each group is in the game, without interpretation from the AI labeling a group "behind." Rather, we focused on the extent that student participation in groups are relatively similar to one another. Then, the teacher is empowered to re-specify what is "normal" in their classroom, or even abandon this idea. This also has the advantage of helping balance between giving teachers too much raw data to be interpretable vs. over-interpreting such data.

The principles of human-centered automation and deliberately limited labels provide a path to continue thinking at the intersection of critical perspectives and AI technologies to design for ambitious learning practices.

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