**ABSTRACT**

This project seeks to meet the vision of the Next Generation Science Standards (NGSS) by studying the utility of a machine learning-based assessment system for supporting middle school science teachers in making instructional decisions based on automatically generated student reports (AutoRs). The assessments target three-dimensional (3D) science learning by requiring students to integrate scientific practices, crosscutting concepts, and disciplinary core ideas to make sense of phenomena or solve complex problems. Led by collaborators from University of Georgia, Michigan State University, University of Illinois at Chicago, and WestEd, the project team will develop computer scoring algorithms, a suite of AutoRs, and an array of pedagogical content knowledge supports (PCKSs). These products will assist middle school science teachers in attending to 3D assessments, making informative instructional moves, and eventually improving students’ 3D learning. The project will generate knowledge about teachers’ uses of 3D assessments and actualize the potential of automatically scored 3D assessments. As this project will involve teachers whose classrooms include diverse student populations, the collaborative team stands to further contribute by examining how automated reports can be designed to support equitable assessment practices.

The project will achieve the research goals in three phases. Phase I: Develop AutoRs. Machine scoring models for the 3D assessment tasks will be developed using existing data. To support teachers’ interpretation and use of automatic scores, the project team will develop AutoRs and examine how teachers make use of these initial reports. Based on observations and feedback from teachers, AutoRs will be refined using an iterative procedure so that teachers can use them with more efficiency and productivity. Phase II: Develop and test PCKSs. Findings from Phase I, the literature, and interviews with experienced teachers will be employed to develop PCKSs. The project will provide professional learning with teachers on how to use the AutoRs and PCKSs. The project will research how teachers use AutoRs and PCKSs to make immediate instructional decisions. The findings will be used to refine the PCKSs. Phase III: Classroom implementation. A quasi-experimental study will be conducted with a new group of teachers to explore the effectiveness and usability of AutoRs and PCKSs in terms of supporting teachers’ instructional decisions and students’ 3D learning. This project will create knowledge about and formulate a theory of how teachers interpret and attend to students’ performance on 3D assessments, providing critical information on how to support teachers’ responsive instructional decision making. The collaborative team will widely disseminate various products, such as 3D assessment scoring algorithms, AutoRs, PCKSs, and the corresponding professional development programs, and publications to facilitate 3D instruction and learning.