

Project Name

SUNY Co-laboratory on Immersive Virtual Environments for STEM Learning

Principal Investigator Peter Shea

Campus Albany, University at

Year of Project 2012

Tier Tier Three

Project Team

- Jianwei Zhang, University at Albany
- Alan Oliveira, University at Albany
- Dan Goodwin, University at Albany
- Mathias Vuille, University at Albany
- Jennifer Goodall, University at Albany
- Roberta Johnson, University at Albany
- Bina Ramamurthy, University Buffalo
- Edward Bever, Old Westbury
- Jim McElwaine, Purchase
- Larry Dugan, Finger Lakes CC
- Suzanne Hayes, Empire State College
- [Alexandra Pickett, SUNY Learning Network](#)
- Kim Scalzo, SUNY Center for Professional Development

Overview Summary

Development of an innovative academic program through which students and faculty across a range of disciplines and SUNY colleges collaborate to create engaging and pedagogically sound video games that enhance k-12 student interest and learning of STEM content.

Outcomes Summary

Recorded sessions include Anne Derryberry, Sean Duncan and a panel discussion on Games within SUNY. A

course plan is [available](#).

Project Abstract

Project Narrative

Among the most critical academic disciplines for success in a 21st century workforce are those involving Science, Technology, Engineering and Math (STEM). These fields are increasingly digital, networked and rapidly evolving. However, research indicates that U.S. students are becoming less engaged and falling significantly behind the rest of the world in STEM disciplines. Through this proposal, we will explore how faculty and students from diverse fields across SUNY - art, music, computer science, natural science, management, education and beyond, can collaborate on projects to conceive, design, and create guided, inquiry-based, immersive games that promote deep understanding of STEM content in k-12 settings. We believe that a focus on STEM will address significant state and national challenges and will help position the proposal for additional external funding.

Why games?

As the Federation of American Scientists concluded from its recent Summit on Educational Games: "The success of complex video games demonstrates that games can teach higher-order thinking skills such as strategic thinking, interpretative analysis, problem solving, plan formulation and execution, and adaptation to rapid change. These are the skills U.S. employers increasingly seek in workers and new workforce entrants. These are the skills more Americans must have to compete with lower cost knowledge workers in other nations." A growing research and development agenda has begun to emerge in this area (e.g. Barab, Gresalfi & Arici, 2009) and significant opportunity exists to improve the nature of teaching and learning across educational sectors through a coordinated effort.

Why an Interdisciplinary academic program?

This interdisciplinary approach involves development, application and assessment of innovative use of instructional technology to improve student engagement and learning across disciplines. Design and development of immersive environments for learning will be the central element of the project. Assessment of effectiveness will also be essential; a core component of the project will be to conduct iterative, designbased research to better understand the nature of learning in immersive virtual environments. Development of a SUNY-wide program also leverages "systemness" in that it utilizes and integrates the varied yet hidden pools of talent across SUNY. In bridging higher education and k-12 learning this project also promotes one of the important six big ideas of the SUNY strategic plan. Results to date indicate that the main weakness with similar efforts to develop video games for learning have been limited by an individual approach. For example, even National STEM Video Game Challenge winners are weak in visual appeal, pedagogy, game play, and design because they are the products of individuals or very small team efforts. Commercial video games are produced by larger teams benefiting from varied talents. Serious games for education need similar resources to develop into a more useful learning resource and/or viable product. One of the powers of SUNY is its breadth of existing academic programs and pools of faculty and students. Through this grant we will begin to identify and bring together the necessary resources and talent to achieve the goals of producing high quality educational games for STEM learning. Our initial plan is to investigate Climate Change (a topic of recent interest to NSF) as a theme and we include expertise in atmospheric science and science education on the team. The project will implement the Power of SUNY Innovative Instruction framework, including the SUNY Learning Commons and collaboration with SUNY Learning Network and SUNY Center for Professional Development. The project will be shared, participation solicited, and progress documented through the SUNY Learning Commons, the CPD, CIT, and SLN.

Why Guided Inquiry?

Guided-inquiry based models of teaching and learning demand critical and creative thinking through simulation of real-world problem solving. Past efforts employing guided-inquiry in technology-rich

environments have been very successful (e.g. Barab, Pettyjohn, Gresalfi, Volk,& Solomou, 2012; Barron & Bransford, 1993; Metcalf, Kamarainen, Dede, Grotzer, 2010; Zhang, 2010). And yet technologies that exists and are on the horizon are much more powerful and the possibilities for creating content-rich, sophisticated, and motivating experiences for STEM learning are higher and more achievable than ever before.

Logistics

As a highly experimental project involving cross-departmental and multi-campus collaboration we see this as the kind of "high risk" proposals the grant program targets. With more than a dozen collaborators representing education, computer science, natural science, art, music, game design, instructional design, and beyond we believe we can create a successful plan, pilot initial course work, and build a larger community needed to take this to scale in a subsequent phase. We also believe that these foundations will make the project a very attractive one for external support. We therefore believe that the cross-departmental and multi-campus collaboration reflected in this proposal warrants funding at the tier three level.

Conclusion

A comprehensive strategy and accompanying academic program for serious-educational game design in SUNY can leverage the Power of SUNY and online learning to help address widely acknowledged national needs, prepare students for a variety of contemporary and emerging careers, engage external communities, promote entrepreneurship, and position SUNY at the cutting edge in innovative instruction. This proposal lays the foundations for achieving these goals. Fully developed, we envision that this project also has the potential to place SUNY at the forefront of the learning sciences in research and development of nextgeneration immersive environments for learning.

Reports and Resources

- [Project website](#)
- [SUNY Online Summit](#)
- [Graduate level course syllabus](#)
- [Detailed course schedule](#)
- [Foundational presentation](#)
- [ID Meeting – CIT Poster](#)
- [SUNY Games: An IITG Panel Discussion](#)
- [Anne Derryberry: Badges: The “New Black,” or another “Black Hole”?](#)
- [Sean Duncan: Affinity Spaces: Connecting Online Learning To Everyday Life](#)
- Article in [UAlbany News](#)
- Article in [SUNY Blog](#)

Discipline Specific Pedagogy

- STEM

Instructional Design

- Gamification (Design)
- Online Education