

Proposal Selection Criteria

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1. Commitment to increasing student engagement and success via innovative curriculum design, use of technology, or pedagogy - Any curricular deliver modes may qualify for this program (face-to-face, hybrid, online).
 - a. My curriculum is ever evolving and constantly pushes the boundaries of innovation in the classroom
 - i. Currently - flipped classroom, daily learning guide, use of digital open resources, Learning Catalytics in class clicker software, Knewton Adaptive Learning through Mastering Physics, adoption of OneNote
 - ii. Going forward - Inventory of Mastery and the built in homework system, fine granularity dashboard reports of students engagement with resources for real-time assessment of the class standings and behaviors, Peer grading, AsyncSync, Annotation,
2. Application of best practices for student success and equity and inclusion - Outcomes should integrate diversity throughout any curricular changes or improvements.
 - a. Increased Active Engagement is shown to help underrepresented groups more
 - b. More flexibility in access of materials and ways of learning is shown to help underrepresented groups more
 - c. Open Resources help even the playing field for students that struggle financially
 - i. Our goal is to be saving OSU students \$70,000 a year on the textbook, starting in the fall then that increase to \$150,000 a year within two more years by providing a free online homework system
 - d. Learning Assistants are shown to improve DFW and student attitudes, I have clear evidence in my SET scores
 - e. Structured systems like my Daily Learning Guide and the Path to Mastery help students stay on task and have been shown to reduce drop-out rates
 - i. My research is beginning to show a common narrative: Slow and steady wins the race, cramming doesn't work, and the routine presented in my course curriculum helps ensure success. The grades in my classes have been increasing steadily while the rigor has maintained.
3. Sustainable outcomes - Benefiting colleges/units should demonstrate a commitment to sustaining efforts beyond the term of the endowed award.
 - a. The projects I'm working on are not only creating change that will last, they are also spreading to other classes and other departments.
 - i. The BoxSand site is setting it's sites on providing the physics introductory calculus-based sequence, a population of over 1500 students each year, open resources
 - ii. Pedar Nelsen in the Geo department is has been in talks with me about building their own BoxSand site so they could do cross course analysis of students engagement. He wants to put the entire undergraduate curriculum into the site so they can integrate concepts vertically throughout their curriculum but then also study student's access to the materials
 - b. If AsyncSync and the peer grading systems are built, I am confident they will be a huge success. This will be big news in the online learning world where active engagement and Peer Instruction could use alternative approaches to the lag in messaging boards. This could become the most valuable thing created out of the BoxSand research group.
 - c. The Math 111 reform group has used much of my system as a model to redesign their course
 - d. This project is what I am building my career on. I have no intention of it going away anytime soon.
 - e. The Lightboard lecture videos are intended to be a professional open resource video series. The videos are going to be put on YouTube and are intended to brand BoxSand and OSU with wider learning community. There is a real need for a college level set of lecture videos that not only deal with conceptual understanding but also rigorous mathematical formality.
4. Measurement and assessment of results and sharing lessons learned - Annual reports will be expected and should reflect appropriate data tracking of activities and their impacts on student success.
 - a. This project has a significant research side that intends to publish in peer reviewed journals on an annual basis.
 - b. I also intend to disseminate and brand BoxSand and OSU through podcast series, invited talks (AAPT for example), youtube channel, and possibly some other venues.
 - c. I have been in discussion with ecampus about their research fellowship and they are very interested in my project. The goal is to be a research fellow with them next year and use their support over next summer, meaning I can focus solely on research and not have to teach. This will most definitely help in the dissemination of my results.
 - d. I have at least two undergraduate students each year perform their thesis on our findings
 - i. The department has a large number of new graduate students interested in educational research and with limited faculty to support them, I'm likely to have graduate students soon.
 - ii. I have been collaborating with a PhD student Susan Fein, who is interested in the educational psychology aspect of this research. She is hoping do use BoxSand for her dissertation research.
 - e. I already have a load of data about how engagement correlates with success. I fully intend to expand that analysis to incorporate all the new projects undertaken.
 - i. Examples are how watching videos correlates with grades or even how changing that behavior improves on performance.
 - ii. I have really interesting SET and class grade data... waiting for my DFW analysis... I'm confident it will show improved grades, improved satisfaction/happiness, and less failures.
5. Alignment with OSU's Blueprint for Undergraduate Student Success.

Blue Print Highlights

Assumptions

1. Adapting to Changing Demographics
 - a. Data driven course curriculum design allows for changing demo
 - b. Reinventing textbook related resources

- c. Media positive approach - Lightboard videos
- 2. Evidence-Based Decision Making
 - a. BoxSand is Educational Data Mining for the purpose of using what works to drive content delivery and course design

Learning Goals for Graduates

- 1. Critical Thinking
 - a. Active Engagement and Peer Instruction are key methods in teaching problem solving and critical thinking in the sciences
 - i. AsyncSync will enable AE and PI in an online environment
- 2. Collaboration
 - a. My flipped classroom approach, combined with constant group work in recitation and labs, means my students collaborate continuously
- 3. Communication
 - a. Peer Instruction requires students to continually work on communication while they collaborate discuss
- 4. Social Responsibility and Sustainability
 - a. Open Resources provide equity by removing a financial barrier to learning

Educational Experience

- 1. Capstone Experience
 - a. Project BoxSand provides thesis research for 2 or more physics undergrads each year
 - b. Development of functionality on the BoxSand site and new technology such as AsyncSync provides Senior capstone projects for CS majors

Plan of Action

- 1. Support and Encourage Curricular Redesign with Integrated Adaptive and Personalized Learning and High Impact Practices
 - a. One of Project BoxSand's fundamental tenants is to create an organic adaptable resource
 - b. The homework system that is being built into BoxSand will have a primitive adaptive learning system in the form of an inventory of mastery and multiple ways to satisfy the requirements for mastery
 - c. The advanced Adaptive Learning System may be built into the BoxSand site or may include collaborations with groups such as the Open Learning Initiative (OLI)
 - d. Flipped classroom design is a High Impact Practice
 - e. AsyncSync could be a very high impact practice for all online learning
 - f. Learning Assistants are High Impact
- 2. Invest in Tools and Resources to Support Data-Informed Decision-Making
 - a. BoxSand
- 3. Provide Ongoing Support for Faculty Success

Best Practices: High Impact Practices

- 1. Collaborative Assignments and Projects
 - a. Flipped class structure with AE and PI enables constant collaboration between students
 - b. AsyncSync plans to bring PI to online learning
 - c. Peer grading not only allows for human based evaluation and partial credit but also is a form of collaborative learning
- 2. Undergraduate Research
 - a. BoxSand Educational Data Mining (EDM) for physics majors
 - b. Software tool design and programming for CS capstone projects
- 3. Diversity/Global Learning
 - a. AE helps underrepresented groups more than traditional
 - b. Open Resources help level the playing ground for financially struggling students
 - c. Open Resources mean anyone from anywhere can learn from the same resources we use to teach our students - ultimate accessibility
- 4. Community-Based Learning
 - a. Wiki approach to educational resources and learning
 - b. Asyncsync
 - c. Annotation capabilities on BoxSand will allow a new type of collaborative learning
- 5. Capstone Courses and Projects
 - a. BoxSand EDM thesis for physics majors
 - b. Resource creation for student content developers with possibility of authorship
 - c. Software tool design and programming for CS capstone projects

Servicing Underrepresented Students

- 1. Interactions with Faculty and Peers about Substantive Matters
 - a. Peer Instruction, group work in lab and recitation
 - b. Project BoxSand curriculum development group provides opportunities for interactions
 - c. Learning Assistants and Supplemental Instruction
 - d. oSUPREMed - physics MCAT prep group I lead each year
- 2. Experiences with Diversity
 - a. Group work, Peer Instruction, AsyncSync all enable different backgrounds to come together and experience learning together

Actions for Eliminating Achievement Gaps

1. Curriculum Re-Design
 - a. Massive re-design efforts already underway in the intro physics sequence
 - b. New ideas for implementation include AsyncSync, annotation, Peer grading, Gamification
2. Experiential Learning
 - a. Undergraduate Research
 - i. See above about Research connections
 - b. Leadership
 - i. Learning Assistants
3. Advising Interventions
 - a. After statistical relevance has been achieved in Project BoxSand, and the correlation data mining illuminates key impact factors, predictive modeling and early warning systems can be implemented at the granularity of behavior in an individual class. The hope is warning signs by week 2 or 3 could be used for interventions
4. Capstone Experiences
 - a. See above ... already addressed

Student Success Metrics

1. DFW Rates
 - a. Also add GPA and SET

Ingredients for Success

1. Alignment and Coordination
 - a. Collaboration and Partnerships
 - i. Lightboard - math and biology
 - ii. ARF - all of science and engineering
 - iii. CS - senior capstone projects
 - iv. Pedar Nelson - geo
 - v. LBCC and UW at Bothell
 - b. Prioritization with Evidence-based Decisions
 - i. Active Engagement, Peer Instruction,
 - c. Assessment and continuous improvement
2. Minimize the Possibility that a student will "opt out"
 - a. Integration of High Impact Practices (HIPs)
 - b. Integrated Technology - a systems approach

Challenges and Opportunities

1. Develop an Evidence Based Decision-Making Culture
2. Integrated Advising services and integrated technology
3. Curriculum Design and Re-design: Focus on Baccalaureate Core