BOARD # 290: Nurturing an Ecosystem for Transformation: Progress and Insights from the Transforming STEM Education using an Asset-Based Ecosystem Model Project at Cal State LA (Year 4)

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Introduction

HSIs share the important mission of diversifying the STEM workforce. Many STEM colleges at Very High-Hispanic Enrolling (VHHE) Hispanic-Serving Institutions (i.e., greater than 50%) HSIs are relatively non-selective and serve a large proportion of students from local communities who have been underserved and underprepared by their K-12 experiences, compared to the majority of students in Predominantly White Institutions (PWIs) or in more selective institutions. A recent report from the National Academies recommends seven practices and strategies that are important for minority-serving institutions to ensure they are not just minority-enrolling but instead actually address the needs of a marginalized student population [i]. The report makes it clear that Minority-Serving Institutions (MSIs) need to change their culture and structure to successfully serve underrepresented minority (URM) students. The seven considerations include the need for institutional responsiveness *to meet students where they are*; *develop supportive campus environments*; and *provide tailored academic and social supports*. In recent years, California State University, Los Angeles (Cal State LA), a Primarily Undergraduate Institution (PUI), has made significant efforts to enhance student success [ii-v]. However, these programs, while impactful on their participants, did not sufficiently change the fundamental operation of the department, college, or university system, nor did they significantly transform the quantitative outcomes for the students on the macroscale. The programs did succeed, however, in demonstrating the potential of culturally reflective, human-centered, and resource-rich approaches on supporting students for whom higher education systems in the U.S. were not designed. The Eco-STEM project, which is a natural progression of previous programs implemented in the College of Engineering, Computer Science, and Technology, aims to create structures and tools that transform the current factory-like educational system into an asset-based ecosystem that better meets the diverse needs of students, faculty, and staff. The following sections highlight the tools and strategies developed, and key lessons learned during its implementation.

The Eco-STEM Peer Observation Tool and Process (POTP)

The Peer Observation Tools and Process (POTP) [vi] were developed to foster reflective teaching practices and systemic change in STEM education by promoting asset-based classroom ecosystems[vii] This constitutes a systemic approach to transforming teaching evaluation by embedding equity-focused and growth-oriented practices into institutional culture. The Eco-STEM Peer Observation Tool and Process serve as mechanisms to evaluate and enhance teaching practices by focusing on three primary indicators of a healthy classroom ecosystem: **climate** (inclusive and supportive), **structure** (facilitating learning), and **vibrancy** (engaging with active participation). Each indicator is further broken into assessable principles (Figure 1), with observable behaviors aligned to the framework of community cultural wealth [viii]. The POTP includes the following features: (a) Customizable Focus: Faculty are observed on selected, specific observable behaviors (from a total of 55) to prioritize during observation, enabling faculty to focus on their assets and encouraging targeted growth; (b) Reflective Process: Pre- and post-observation meetings promote meaningful dialogue between the observer and the observee,

enabling the sharing of insights and resources from the Eco-STEM Resource Repository [viii] (c) Flexible Usage: The tool can be used for peer-to-peer observations or integrated into retention, tenure, and promotion (RTP) processes. Observers provide both quantitative ratings and - more importantly - qualitative feedback, fostering deeper pedagogical growth.

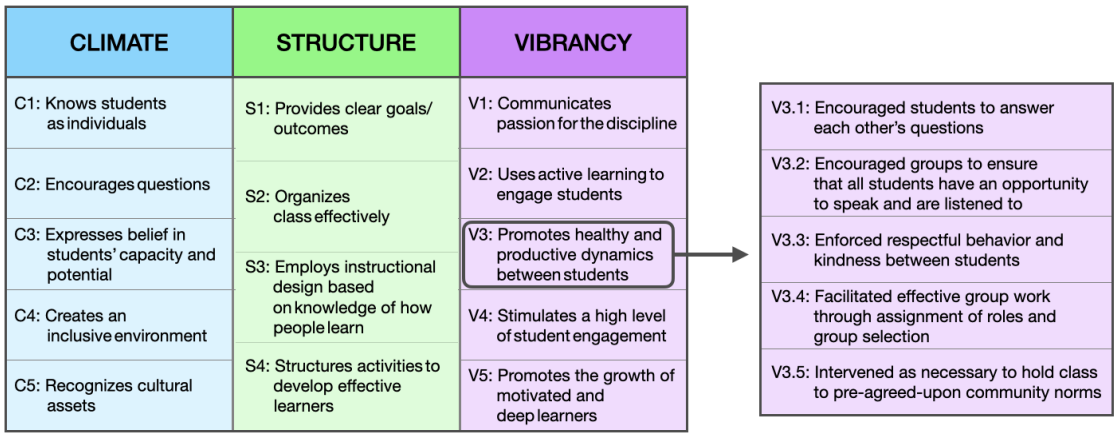

Figure 1: Overview of a healthy classroom educational ecosystem and example of the organizational structure of the Peer Observation Tool [vi]

The emphasis is on providing formative feedback that fosters reflection and growth strategies, rather than on delivering a summative assessment for faculty evaluation, with the observee selecting the teaching behaviors that they want to be observed on. Thus, the use of the tool in evaluating teaching for retention, tenure, and promotion occurs when the teaching observation is assessed alongside the faculty's reflection on the observation report, which outlines strategies for continuous improvement.

The implementation of the new Eco-STEM peer observation at Cal State LA has been met with overwhelmingly positive feedback. Faculty appreciate the 55 behaviors of effective teaching as a useful guideline that helps them structure their teaching practices. The formative nature of the process, which grants observees greater agency to focus on their assets and backgrounds, has contributed to a less stressful peer observation experience. However, some faculty have raised concerns about its applicability for retention and tenure evaluations, due to its formative nature. It is important to emphasize that the focus of retention and tenure evaluations should remain on reflection and continuous improvement rather than on observation alone. Additionally, questions have emerged regarding whether allowing observees to select specific behaviors might limit the identification of other classroom issues. Nonetheless, we believe that the tool and process should remain flexible, ensuring that while individual growth is prioritized, additional feedback beyond the selected behaviors can still be incorporated to support faculty development.

Eco-STEM Healthy Educational Ecosystem Toolkit (HEET)

The Eco-STEM Healthy Educational Ecosystem Toolkit (HEET) is an open-source, wiki-style (written and edited by the educational community) resource designed to support the transformation of teaching and learning practices in STEM education [ix]. The toolkit provides evidence-based strategies and tools to create inclusive, engaging, and asset-based classroom environments, organized along the Eco-STEM project's three primary indicators of a healthy

classroom ecosystem: **climate** (inclusive and supportive), **structure** (facilitating learning), and **vibrancy** (engaging and active participation). By leveraging the POTP alongside the repository of teaching and pedagogical strategies provided in the HEET, educators can enhance their teaching effectiveness, strengthen their support for diverse student populations, and contribute to institutional change that promotes equity and excellence in STEM education.

Eco-STEM Faculty Fellows of Community of Practice (CoP)

The Eco-STEM Faculty Fellows Community of Practice (CoP)[x] is a yearlong program designed to support faculty in creating inclusive, culturally responsive teaching practices in STEM education. It includes nine half-day sessions—five in the fall and four in the spring—focused on fostering critical reflection, community building, peer-to-peer classroom observations, and participatory action research. During the fall semester, discussion topics center on social identities, community cultural wealth, inclusive pedagogy, and teaching identity. Fellows design a critical participatory action research teaching (ART) project with a focus of their choice, which they implement in the spring semester, supported by ongoing reflective dialogue and peer feedback. The CoP emphasizes community building through shared agreements, reflective dialogues, and feedback cycles. Faculty also engage in complementary, university-wide programs, such as Cal State LA's Center for Teaching and Learning's Inclusive Teaching Program and the Howard Hughes Medical Institute Inclusive Excellence & Equity Fellows Program[xi]. Fellows also employ the POTP and HEET for peer-to-peer classroom observations and reflection. This approach supports Fellows in implementing sustainable changes to their teaching, promoting equity and excellence in STEM education.

The Eco-STEM Faculty Fellow Community of Practice (CoP) at Cal State LA has proven to be a crucial foundation for the project's success. Faculty demonstrated a strong willingness to engage in difficult yet necessary conversations, with many expressing a need for more dedicated spaces to continue these discussions. The use of a reflective dialogues[xii] was essential in fostering an open and supportive environment, allowing faculty members to grow at their own pace.

Eco-STEM Educational Ecosystem Health Survey (EEHS)

The Eco-STEM EEHS [xiii] was developed to provide a quantitative measure of the progress of the Eco-STEM project in improving the health of the educational ecosystem. It features a large set of independent variables pertaining to demographic information for participants (who include students, faculty, staff, and administration/management), like gender identity, racial/ethnic identity, and household income, as well as less common demographic identifiers such as legal status, length of commute, frequency of commuting to campus, childcare responsibilities, and more. Dependent variables were taken from validated questionnaires in educational literature to probe six aspects of a healthy educational ecosystem: classroom comfort, faculty understanding, belongingness, thriving, mindfulness, and motivation. The Survey was piloted in Spring 2022 to both the engineering and science colleges at Cal State LA, yielding 520 total student responses in English and Spanish. Initial results testing for significant differences across student groups showed that measures of ecosystem health scored relatively low across student groups, with the exception of motivation. Some significant differences emerged by demographic, e.g., students without stable housing reported worse ecosystem health than those with access to housing, DACA/undocumented students reported poor ecosystem health, and white students - only 5% of students at Cal State LA - reported higher levels of ecosystem health than all other racial/ethnic

groups. Results were also notably poor for students who identified as LGBTQ+, demonstrating that establishing robust support structures for LGBTQ+ students at Cal State LA is essential to fostering their academic success and long-term achievement.

Student Opinion Survey

The Eco-STEM Student Opinion Survey (SOS) is a set of surveys proposed to replace the existing student feedback surveys institutionally given to students at the end of each course[xiv]. The SOS includes a Demographic Survey, Values Survey (given to students in their first semester to gauge their educational priorities, and Experience Survey (given at the end of each semester for each class). Notably, the Demographic Survey allows previously invisible context to be made apparent: life conditions that bear significantly on student experience and ability to thrive in the classroom [xii]. The Values and Experiences Surveys contain items based on behaviors taken from the POTP, gauging attitudes surrounding the educational ecosystem constructs of *climate, structure*, and *vibrancy*. Some examples of survey items are shown in Table 1.

Proposed Construct	**Values Survey Item**	**Experiences Survey Item**
	In your classes, how important is it that your professor...	Indicate your agreement with each of the following statements about the class environment.
Climate	...knows who you are?	My professor knows who I am.
	...helps you feel comfortable asking questions and making comments in class?	I felt comfortable asking questions and making comments in class.
Structure	...clearly explains what you are expected to learn in the class?	I understand what I was expected to learn in the class.
	...clearly explains the work to be done on all assignments/activities?	Work to be done on all assignments/activities was clearly explained.
Vibrancy	...is excited about the subject and shares this excitement with the class?	I can tell my professor was excited about teaching the class.
	...uses in-class problem solving, and other interactive approaches?	In class, we used interactive approaches beyond just traditional lecture to learn the material.

Table 1: A sample of survey items in the Eco-STEM SOS.

The SOS has been piloted with undergraduate engineering students and yielded 116 responses. Validation of student responses showed that the surveys moderately captured the ecosystem constructs. Overall, the SOS provides students with a strong method to report their experiences in the classroom, as well as the context necessary to consider factors outside the classroom that affect their education.

Conclusion

Over the past four years, the Eco-STEM project has developed and implemented innovative tools and strategies—including the Eco-STEM Peer Observation Tool and Process (POTP), the Healthy Educational Ecosystem Toolkit (HEET), the Faculty Fellow Community of Practice (CoP) curriculum, the Educational Ecosystem Health Survey (EEHS), and the Student Opinion

Survey (SOS)—each designed to shift institutional culture toward a more inclusive, supportive, and responsive educational ecosystem. Key insights from this initiative highlight the importance of faculty communities that focus on reflective dialogues. Faculty have responded positively to the new peer observation process, emphasizing its value in reducing stress, fostering professional growth, and promoting professional growth. Early findings from the EEHS and SOS suggest that while institutional transformation is underway, challenges persist, particularly in ensuring equitable experiences across diverse student populations. Notably, disparities in classroom climate, sense of belonging, and overall educational experience indicate the need for continued focus on holistic support structures for students, particularly those facing systemic barriers such as housing instability and undocumented status. As the project moves forward, sustaining and scaling these efforts will require institutional commitment, faculty buy-in, and iterative refinement of the tools and processes developed. By embedding equity and inclusivity into institutional policies and practices, the Eco-STEM project aims to create lasting change that not only enhances student success at Cal State LA but also serves as a model for transformation at other HSIs and Minority-Serving Institutions.

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