Session Number: **51**

Abstract Name: **Assessing Institutional Transformation and Sustainability: Lessons Learned from the ICLCS Projectt**

MSP Project: Institute for Chemistry Literacy through Computational Science

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1. Questions(s) or issue(s) for dialogue at Learning Network Conference session:

What are the indicators of meaningful institutional change in personnel, practices, and policies associated with MSP implementation? On a university campus? Among core partner districts, schools and classrooms? Among those external to the partnership including state and regional agencies, business and industry, and other important stakeholder groups?

What strategies and structures are effective in sustaining good practice and promoting continued progress in the areas of MSP work? On a university campus? Among core partner districts, schools and classrooms? Among those external to the partnership including state and regional agencies, business and industry, and other important stakeholder groups?

What metrics, indicators, instruments, and evaluation techniques can be used to validly assess changes in institutional transformation and sustainability over time and across contexts and stakeholder groups?

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2. Context of the work within the STEM education literature and within your MSP project:

The ICLCS MSP is in its fourth year of implementation on the Illinois campus. It engages three cohorts (approximately 120 high school chemistry teachers) of teachers who represent 93 rural school districts throughout the state of Illinois. The primary goal of the ICLCS project is to increase teachers' chemistry content knowledge and use of computational tools (including visualization) to improve Chemistry teaching and learning in the participating schools. The ICLCS evaluation utilizes a Educative, Values-ENgaged, (EVEN) approach (Greene, DeStefano, Burgon and Hall, 2006). During the initial years of the project, the evaluation focused upon assessing changes in chemistry content knowledge among participating teachers and their high school students and documenting the growth and the impact of an electronically facilitated (Moodle) professional learning community on teacher confidence, instructional effectiveness and satisfaction (Henry, Murray, Hogrebe, and Dabb, Marcia, in press; Murray, Henry, and Hogrebe, 2009) Using the standardized ACS assessments, significant differences were seen between ICLCS teachers and their students and a matched comparison group of non-participating teachers and their students Murray, Henry, and Hogrebe, 2009. Analysis of Moodle postings and other examples of teacher interactions indicated that the professional learning community was heavily utilized and greatly valued by these rural chemistry teachers as a source of chemistry content knowledge, pedagogical content knowledge and professional support (Sendlinger, DeCoste, Dunning, Dummitt, Jakobsson, Mattson, and Wiziecki, 2008). In the final two years of the project, the evaluation has expanded to include the assessment of institutional impact and sustainability of the MSP work on

the University of Illinois, among core partner districts, schools and classrooms and external to the partnership including state and regional agencies, business and industry, and other important stakeholder groups (Hamos, Bergin, Maki, Perez, Prival, Rainey, Rowell, and VanderPutten, 2009). Activity has focused upon developing and assessing meaningful and measurable indicators of institutional change and sustainability across the various levels of stakeholders mentioned above (Teragrid Highlights, Fall 2008).

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3. Claim(s) or hypothesis(es) examined in the work (anticipating that veteran projects will have claims, newer projects will have hypotheses):

This presentation will examine the feasibility and utility of developing a conceptual framework and set of indicators, metrics, and instruments for assessing institutional transformation and sustainability of MSP work over time and across various stakeholder groups.

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4. Evaluation and/or research design, data collection and analysis:

The ICLCS evaluation utilizes the Educative, Values-ENgaged (EVEN) approach which defines high quality, STEM educational programs at those operating at the intersection of cutting edge scientific content, effective pedagogy and sensitivity to diversity and equity. The evaluation is multimethod and multilevel, using both qualitative and quantitative means to assess impact of MSP on teacher chemistry content knowledge, instructional practice (emphasizing use of computation) in partnering schools and on the Illinois campus, and leadership; student chemistry achievement, and institutional transformation/sustainability across various internal and external stakeholders. Within the EVEN approach, key stakeholders developed a logic model of institutional transformation and sustainability including indicators, metrics and instruments. Examples indicators include:

- Extent to which visualization tools developed through ICLCS are integrated into chemistry syllabi and coursework of
    - Participating teachers/schools/districts
    - Non-participating teachers/schools/districts (local, Illinois, regional, national, international) and other entities (e.g. professional associations)
    - University of Illinois undergraduate chemistry courses.
- Extent to which visualization tools developed by ICLCS are integrated into syllabus and coursework in other content areas:
    - Participating teachers/schools/districts
    - Non-participating teachers/schools/districts (local, Illinois, regional, national, international)
    - University of Illinois undergraduate chemistry courses.
- Extent to which the ICLCS blended model of professional development (content development, computation, face to face and technologically facilitated professional learning communities) is adopted or adapted as an effective model of outreach and professional development by:
    - Other units/projects at University of Illinois
    - Other agencies and institutions within Illinois and nationally

- Extent to which ICLCS has generated other projects or initiatives to extend or enhance its impact:
    - On the Illinois Campus
    - Among core partners
    - Locally, statewide, regionally, nationally, and internationally.
- Extent to which ICLCS faculty and staff, participating teachers, and core partners serve provide leadership (policy development, professional development, consultation, grant writing, etc.) at local, state, regional and national levels.

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5. Key insights (retrospective for veteran projects, prospective for newer projects) that have value for the Learning Network:

Gauging institutional change takes looking beyond the typical policy and programmatic changes especially in small rural school districts or large, decentralized research universities. Though challenging, it is possible to reliably and meaningfully define and measure institutional transformation and sustainability. Involving multiple stakeholders in the specification of a thoughtful logic model and accompanying indicators of relevant and feasible institutional impact builds consensus and focuses project activities to those that are most likely to produce lasting change at the institutional level. Mechanisms to continuously monitor progress on multiple stakeholders require regular surveying of core partners and developing robust means of assessing adoption of ICLCS components outside by external groups. Monitoring and discussing institutional transformation and sustainability within the leadership team throughout the life of the MSP, but especially in the latter half of implementation, can increase the likelihood that project staff will recognize and take advantage of opportunities to institutionalize and disseminate the MSP work. In the ICLCS project, indicators of institutional transformation have included:

K-12 Districts

- Administrators inviting ICLCS Fellow to head tech grant proposals or other entrepreneurial activities;
- Administrators asking Fellows to lead or participate in technology, curriculum or strategic planning committees;
- Partner districts making significant investments in technology to support curricular changes;
- Fellows training other teachers informally and formally; within and across districts;

Higher Ed

- Organic Chemistry class using WebMO for 700 students/semester;
- Key Chemistry faculty revamping the way chemical bonding is taught in all chemistry courses;
- Integrating visualization modules into the introductory chemistry course at Illinois
- Influencing chemistry education at local community college;
    - ICLCS fellow has taken a faculty position
    - Integration of visualization modules in course
    - Participation in grant proposals

- Integration of modules into pre-service Teacher Preparation
- Science undergrads, graduate students and Medical Scholars are supplementing their formal learning with internships working with computational tools.

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