

Session Title:

Life Cycle of RITES Implementations: The Past, Present, and Future History of a Statewide Effort to Improve STEM Education

MSP Project Name:

The Rhode Island Technology Enhanced Science (RITES)

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Project Session**Strand 1****Summary:**

RITES provides supplemental Professional Development (PD) to 5th through 12th grade science teachers throughout Rhode Island that emphasizes the innovative use of technology and inquiry-based teaching. The premise is that our PD will result in more effective STEM teaching, which will in turn generate gains in student achievement. In addition to demonstrating RITES materials, this presentation chronicles the evolution of our supplemental PD from its inception as PD linked to New England Common Assessment Program (NECAP), to a vehicle for transitioning STEM curricula to an NGSS-based framework for improving student performance in RI and elsewhere. The presentation will document our efforts to maintain program fidelity in the light of unexpected challenges and opportunities related to an educational environment in flux.

Section 1: Questions framing the session:

The primary method for implementation of the Rhode Island Technology Enhanced Science project (RITES) is through the provision of professional development (PD) to 5th through 12th grade science teachers throughout Rhode Island that emphasizes the innovative use of technology and inquiry-based teaching strategies at key points in their curricula. The premise is that our PD will result in more effective STEM teaching in K-12 classrooms, which will in turn generate gains in student achievement and interest in STEM fields.

The choice of PD topics is based upon input from the K-12 community, such as which Grade Span Expectations (GSE's) teachers find most difficult to present in a science classroom. These choices are presented to resource team members, each team consisting

of a pair of K-12 STEM teachers and HE scientists who work closely together to develop appropriate short courses for science teachers. At the heart of the PD are *Investigations*, computer-based activities that allow students to explore science through the use of probes and modeling, and which capture student performance through embedded assessment tools. The investigations are freely accessible to all via the RITES portal: <http://concord.org/projects/rites>.

Some of the questions that guide the development of RITES investigations include:

1. Are the investigations, which cover a specific GSE (e.g., the rock cycle) the best use of class time?
2. Do student gains in inquiry skills, critical thinking and problem solving correlate with exposure to RITES investigations?
3. To what extent does the pairing of K-12 and HE teachers contribute to growth of the RITES partnership?
4. Assuming that the NGSS standards are implemented in RI and elsewhere, how efficiently can RITES investigations be aligned to them?
5. How should one modify the PD, in response to unexpected cutbacks in STEM resources (such as access to computers and bandwidth) throughout the state?
6. What is unique about the RITES model to create these materials? What are the advantages and disadvantages to this method?

Section 2: Conceptual framework:

During the proposal preparation we chose tentative topics for the investigations based upon feedback from RI Department of Education (RIDE), with additional input from teachers during the early stages of the project. It was immediately clear that of the sciences, teachers were least equipped to teach ESS subjects, and we modified our priorities for PD accordingly. Based on feedback from K-12 and HE teachers we made several changes to the manner in which investigations were developed and presented. These include:

1. Adjustment of the level of investigations, so as to be better aligned to the math and language skills of middle and high school students.
2. Shortening the length of the investigations, to better fit into class schedules.
3. Expanding the use of projector and paper mode for investigations, since many schools are not well equipped with computers and connectivity.
4. Inclusion of reliable pre-post tests for teachers to use in association with the RITES investigations

An overarching goal of RITES has always been the creation of a diverse, statewide community with a shared vision of the importance of the growth of a science and technology sophisticated citizenry. Towards this end RITES materials are designed for many stakeholders: for teachers, for their students, for partners and for RITES researchers. As such, they must balance many elements: content; science practices; formative reports; pre- and post-assessments; varied technology platforms; and data collection. RITES has completed four annual development phases, each one improving

existing elements and adding new ones, moving from a simple to a more complex model. While the investigations can appear quite traditional and limited in format, they are, in fact, highly evolved and effective. During the presentation we will provide NECAP data that documents the efficacy of investigations in terms of strengthening student's skills in critical thinking and problem solving.

The quality of the RITES materials would be irrelevant unless they were widely known and easily accessible. Thus a parallel effort has been the creation of a user-friendly portal that provides easy access to RITES materials, and is linked to other educational resources in the state.

Although initially it was unclear whether pairing of K-12 and HE teachers for PD development would strengthen the partnership, in retrospect it was a wise choice, as strong bonds of trust and collegiality have developed between the K-12 and HE communities in Rhode Island through their joint work on RITES materials. The relationships that developed between resource team pairs is one key foundation of the RITES partnership, writ large.

Rhode Island is one of the leaders in committing to adoption of the NGSS standards, and roughly half of the 36 members of the state leadership team (which has responsibility for guiding the implementation of NGSS within the state) are members of the RITES community. This includes three of the five RITES co-PIs, one of who, Peter McLaren, is a member of the NGSS writing team and is the current President of the Council of State Science Supervisors. Together with RIDE and our RITES partners we are developing procedures for transforming our PD in general, and investigations in particular, to be compliant with NGSS. Moreover, as the NGSS are adopted elsewhere, we plan to make them readily available along with a template for creating new NGSS compliant investigations.

Section 3: Explanatory framework:

- As we have created and tweaked our PD and investigations over the last five years we have learned much, not only about how to create strong materials for STEM classes, but also about how to create authentic partnerships between K-12 teachers and HE instructors. The previous section describes some of these lessons.
- The most significant finding in the development of RITES materials is that the collaborative process is key to their success. There are multiple layers of collaboration, both in engagement and in leadership. To note some: between higher education STEM faculty and secondary science teachers; between district personnel, school leaders and classroom teachers; between partners; between staff and stakeholders.
- Another finding is that accessibility and usability of materials in the classroom has to remain the primary objective. All other users and uses have to fit around this. RITES has maintained a constant two-way communication with teachers that, by its actions, demonstrates that they and their students come first and foremost in RITES. We have

changed materials each year so that they can fit into each district's [currently 25] curriculum, schedule and contracts. The trust that this commitment has built is an essential part of our success.

- RITES also finds that the interconnectivity of the core components of the materials -- content; inquiry/ practices; technology; and collaboration -- created a synergy that made a qualitative difference in the process and products. This interconnectivity has been identified by all stakeholders as uniquely RITES and it should be continued in future iterations.
- We assess the success of the PD with a variety of instruments. For teachers who participate in RITES PD we collect: 1) satisfaction data; 2) pre-and-post data on content; and 3) Modified Reformed Teaching Observation Protocol (RTOP) data. For students, we collect: 1) embedded assessment results, for online investigation use; 2) pre- and post-data on content; and, 3) data from partner districts on their performance on the New England Common Assessment Program (NECAP). The results on all measures are very encouraging. Not surprisingly, teachers value the PD, and increasingly are requesting an expansion of the program. Most importantly, we are beginning to see statistically significant gains in RITES-student achievement on the science inquiry NECAP scores when compared to non-RITES students.

Section 4: Discussion:

- Based upon teacher and district approval of our PD and the learning gains of students, we plan to continue our successful program of producing supplemental materials. We are also preparing to modify our PD to support the NGSS, as it is made public.
- Successful completion of RITES will provide not only a proven PD model that is consistent with current research and best practices, it will provide other MSP's with a template they can use to adapt our materials or prepare their own. In particular, RITES believes that its materials are adaptable to many environments and curricula beyond the state of Rhode Island. Thus through this session RITES encourages other MSP's to consider how our efforts can be adapted to their programs.

Section 5: How will you structure this session? What is your plan for participant interaction?

- We plan to present our material as a PowerPoint, in which several of the authors will participate. A provisional agenda for the 45 minute presentation is:
 1. 5 minutes. Introduction to RITES
 2. 15 minutes. Overview of Investigations online, with guided inquiry, as time permits
 3. 10 minutes. Summary of challenges, breakthroughs, and lessons learned
 4. 15 minutes. Discussion, the amount and nature of which to be determined by audience interest
- Note: The RITES investigations are accessible from the RITES portal at

<http://rites-investigations.concord.org/>.

- Participants are encouraged to visit them prior or during the session.
- More information about RITES may be found at the RITES website.
<http://www.ritesproject.net/>