Schoolyard SITES: School-community Partnership to Learn about Teaching Locally-Relevant Citizen Science

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Introduction / Rationale

Currently K-12 science instruction is changing in the United States. As described in the *Framework* (National Research Council [NRC] 2012) and outlined in the *Next Generation Science Standards* (NGSS Lead States 2013), the new national K-12 science education recommendations emphasize active learning that engages students in the science practices while learning disciplinary content. Furthermore, a fundamental principle of the *NGSS* is that K-12 students engage in science learning that is relevant to their everyday lives, hence demanding real-world, problem-based learning (NRC, 2012). Research indicates that ongoing support and professional development (PD) helps teachers transform their instruction to reflect the vision of NGSS (Houseal et al., 2014; Miller et al., 2015).

Schoolyard SITES is a UNH research study that investigates a new PD model for elementary school teachers. The program partners teachers with Cooperative Extension science volunteers (ESVs) to create a community-based PD partnership that improves educators' use of locally-relevant, citizen science projects in the classroom. The model builds on the premise that both groups have expertise that can be shared and collaboratively developed.

Research

Primary Research Questions:

- What affective components do teachers and volunteers focus on while working on a successful interdisciplinary collaboration?
- What are the changes that are observed in elementary school teachers' self-efficacy teaching science and ability to integrate NGSS science practices through locally-relevant citizen science project?

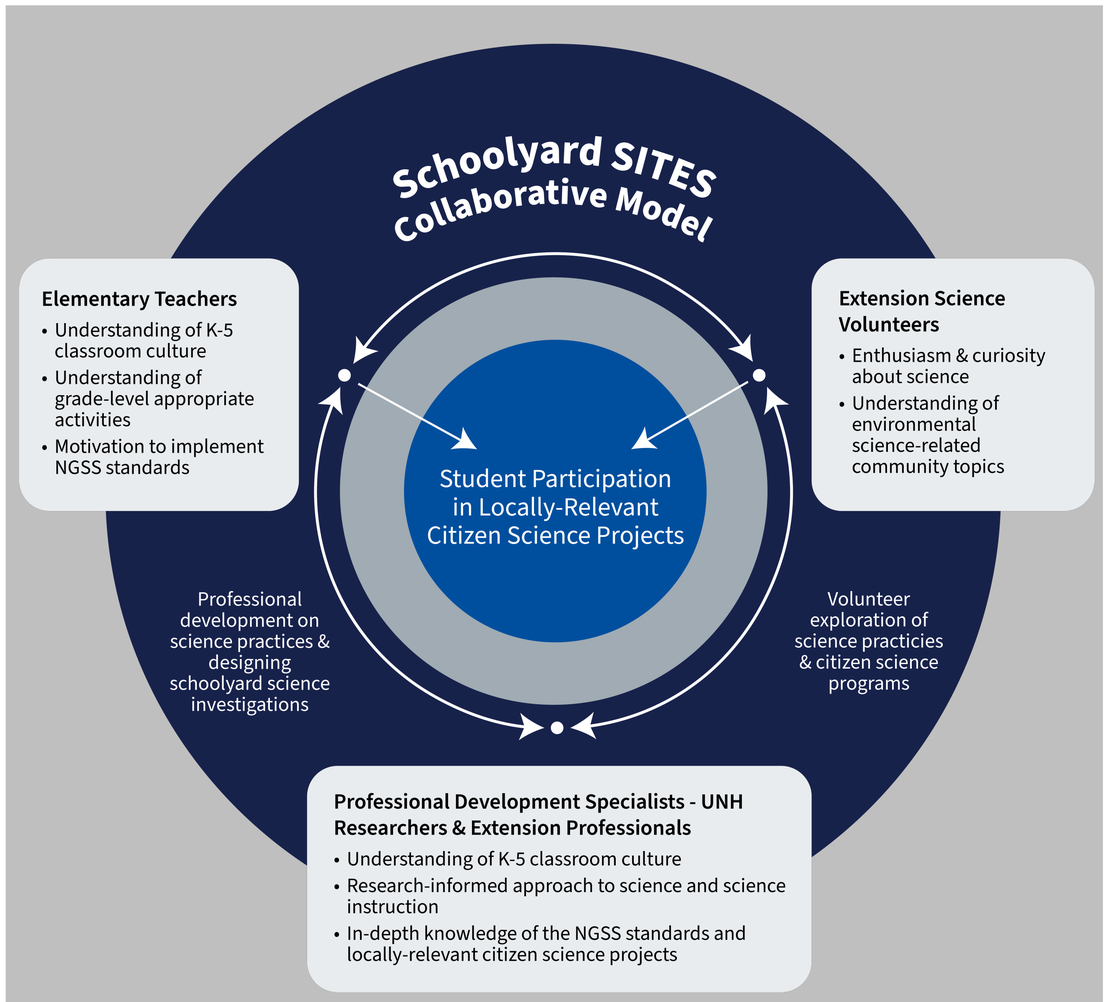
Methods

Collaboration: In order to observe and analyze collaboration between the ESVs and teachers we used the method proposed by Stokols et al. (2003a, 2003b).

1. We designed and administered a pre/post survey that focused on understanding the collaborative process between the teacher and volunteer.
2. We also designed and conducted semi-structured interviews that were complimentary to the surveys.

Self-Efficacy: For the purposes of researching teacher self-efficacy we used the *science teaching efficacy and belief instrument* (STEBI) (Riggs & Enochs 1990; Stohlman, Moore, & Roehrig, 2012). The pre-post survey had approximately 25 – 30 items, and each item prompted a response from the teachers on whether they *strongly agree, agree,* are *uncertain, disagree* or *strongly disagree* with the item statement.

NGSS: Along with surveys and interviews we also collected the curriculum unit plans that the teachers and ESV partners designed collaboratively. We analyzed the units for elements of NGSS-aligned instruction.



Example of co-designed Curriculum

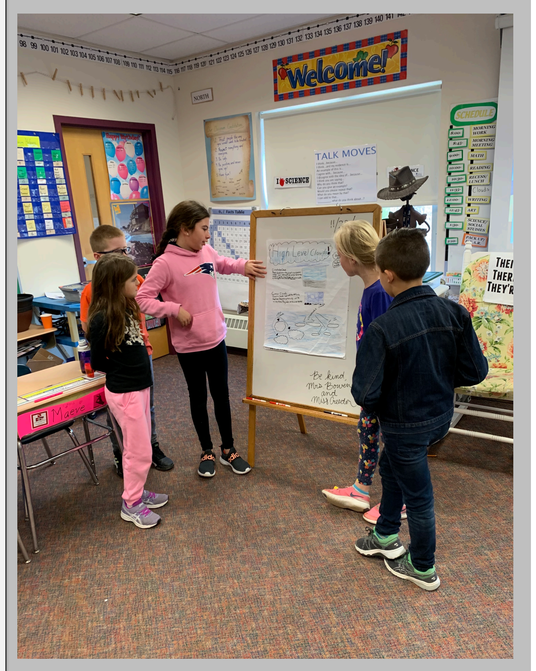
Energy and Atmosphere designed by 4th grade teachers and Extension science volunteer partner

NGSS PE: 4-PS3-2 Observations to provide evidence that energy can be transferred from place to place

SEPs:
- Asking Questions
- Planning and Carrying out Investigations
- Analyzing and Interpreting Data
- Engaging in Argument from Evidence

Student Generated Scientific Questions:
Does the level of the cloud affect the energy in the solar panel?
Does cloud opacity affect how much energy can be absorbed by a solar panel?

Citizen Science Connection: GLOBE Atmosphere –cloud protocol



Findings, Discussion and Conclusion

Collaboration: Teachers (n = 12) and volunteers (n=7) reported that they have seen a new pathway to building teacher-community partnerships and that the partnership was a worthwhile endeavor (Figure 1).

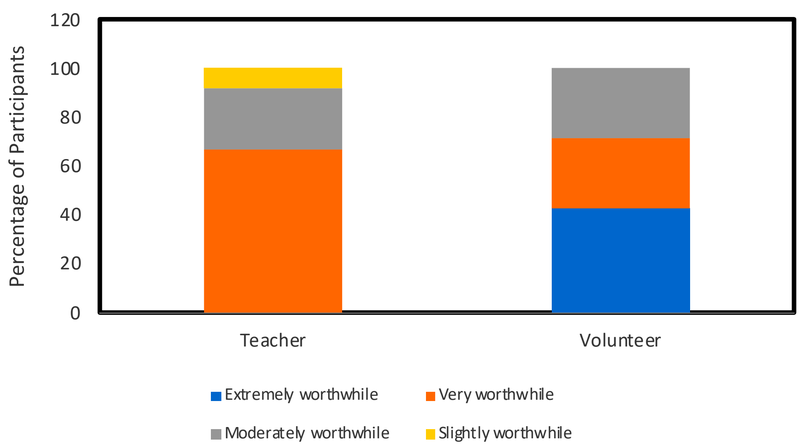


Figure 1: Percent of teachers (n=12) and volunteers (n=7) who found the partnership worthwhile.

Findings, Discussion and Conclusion (con't)

Affective Components of the Collaboration: Teachers and volunteers were able to describe in-detail several of the affective elements associated with their collaboration..

- Teachers particularly valued the volunteers' scientific knowledge and background. When describing *benefits* of the collaboration 92% of the responses focused on volunteers' scientific knowledge or resources.
- Both teachers (33%) and volunteers (57%) identified the co-learning made possible during the partnership as an additional *benefit*.

I benefited from the teachers all the time and just learning how they work with the children and their management skills when it came to the children and how they would present things to the children, and what worked, what didn't… I think they learned a lot about trees, and leaves,... I think they learned a lot about nature, habitat through me, I hope. -volunteer

Self-Efficacy Teaching Science: On average, teachers felt more able to successfully teach elementary science after participating in the Schoolyard SITES program The average self-efficacy score increased from 50.8 to 54.8 (Fig. 2; t-Critical two-tail = 2.20, p = 0.06, n=12).

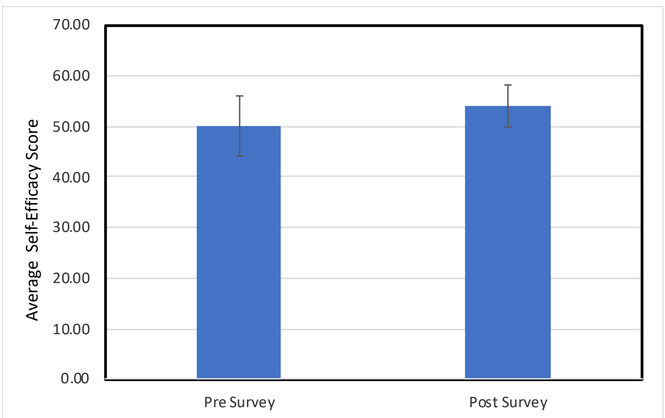


Figure 2. Teacher (n = 12) pre- and post self-efficacy scores with standard deviations.

NGSS-Aligned Instruction: We have observed an overall increase in NGSS practices in the classroom. The top science practices reported were students' asking scientific questions, carrying out investigations, analyzing and interpreting data, and engaging in scientific argumentation and communication. All participating teachers (n=12) reported moderate or very improved integration of NGSS science practices after the Schoolyard SITES program. (Figure 3).

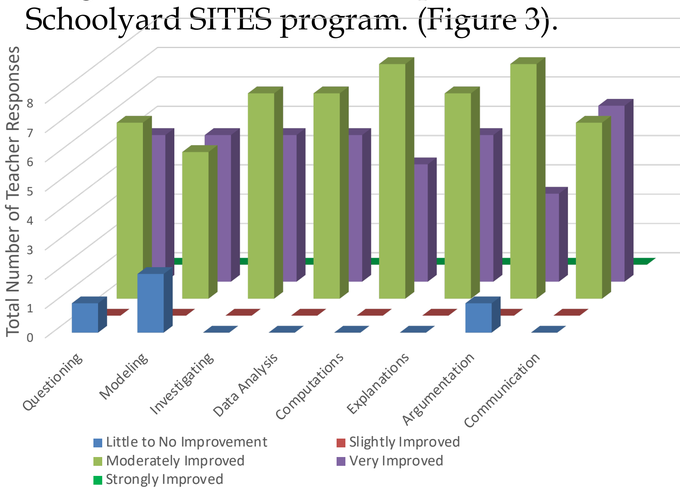


Figure 3: Teacher responses to the question: *to what extent did your ability to integrate each of the NGSS practices in your classroom improve?*

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References (QR Code):