Promising Practices In 4-H Science

4-H Science

July 2011

Professional Development in 4-H Science: Strategies to Improve Educators' Capacity

Lynn Schmitt-McQuitty & Martin H. Smith
University of California, Division of Agriculture and Natural Resources
4-H Youth Development Program

The Connection between 4-H Science and Effective Professional Development

Nonformal education programs like 4-H can play an important role in targeting improved science literacy among K-12 youth in the United States (Fenichel & Schweingruber, 2010). To be effective, however, these programs require educators who develop a level of competency with respect to science content, process skills, and effective pedagogy. Specific to the 4-H Youth Development Program, there is a documented need for professional development of 4-H staff and volunteers regarding science education (Schmitt-McQuitty, Carlos, & Smith, *in prep*.; Smith, 2008).

Professional Development in Science

Effective professional development in science education is best accomplished over extended periods of time, is contextualized, and involves participants reflecting on their practice and working collegially with other educators (Garet et al., 2001; Loucks-Horsley et al., 2003). However, most educator professional development in science involves periodic face-to-face workshops where skilled specialists demonstrate knowledge to less experienced individuals (Garet et al., 2001). Referred to as a *traditional* approach to professional development (Lambert et al., 2002), such episodic workshops are considered highly ineffective (Loucks-Horsley et al., 2003).

In contrast, Garet et al. (2001) and the National Academy of Sciences (Hilton, 2010) have outlined a number of *reform* approaches to the professional development of educators in science, including study groups, mentoring, and coaching that have a greater likelihood of effecting change in educators' practice. Specifically, these strategies share a variety of features that have been described by several authors as essential features of effective professional development in science:

- Duration: Professional development that is sustained over an extended period of time through multiple contacts.
- Coherence: The connection of professional development to existing curricula, broader goals of the educator, and goals of the program (e.g., 4-H Science).
- Learning communities in context: Situating professional development efforts within authentic contexts; making it "real" for the participants.
- Active learning: Engaging participants in developing knowledge through direct experience that relates to their roles as educators.
- Content knowledge focus: Broadening and deepening educators' science content knowledge.

Professional Development in Science for 4-H Staff

There are few published examples of 4-H staff development in science that can be considered *reform* approaches as described by Garet et al. (2001) and the National Academy of Sciences (Hilton, 2010). Most lack multiple touch points over time and are delivered by external facilitators outside the authentic learning contexts. Furthermore, much professional development in 4-H in the area of science is curriculum or program dependent, focusing on content as opposed to methods used for delivering information. However, recent literature does highlight some professional development strategies that are content area independent, utilize *reform*-oriented elements in their design, and could be transferred and replicated across different program areas (e.g., 4-H Science). Specific examples that may have implications for 4-H Science include:

- Garst et al. (2007) described an 8-day program delivered across three modules over a 1-year time period to help meet the professional development needs of new 4-H Extension faculty and staff. The focus of this program was to teach youth development competencies to new staff in a manner that was purposeful and scaffolded knowledge and skills over an extended period of time.
- Baughman et al. (2010) described the use of learning communities to increase the evaluation capacity and evaluation skills for 4-H staff. Outcomes showed that learning communities could be successful in this context and that they could be adapted to meet the needs of an organization and its learners. This strategy is a constructivist-based approach to professional development is that consistent with the reform approaches described by Garet et al. (2001) and Hilton (2010).

Additionally, since the initiation of the 4-H Science Mission Mandate, several 4-H guides and programs have emerged that would be categorized as *traditional* approaches to professional development as defined by Lambert et al. (2002); however, these models include highly relevant materials and could be adapted to use more *reform*-based strategies. Among these guides and programs are:

- Tools of the Trade II (Junge, Manglallan, Reilly, & Killian, 2010) uses a comprehensive 21½ -hour training for afterschool program frontline staff and youth workers on incorporating science, engineering, and technology (SET) into afterschool programming.
- 4-H Science 101 (Jamison & Walahoski, 2009), a four-hour program that targets 4-H Science goals and objectives, focuses on the delivery of 4-H science in a positive youth development context, and highlights elements of the 4-H Science Checklist to help ensure programmatic "readiness" as it relates to science content and processes.
- The Training Guide for the Power of the Wind (Clark, 2009) outlines a one-day workshop that is focused on specific science content relative to the Power of the Wind curriculum and also emphasizes teaching strategies and the 4-H Science Checklist.

Promising Practices: Professional Development of 4-H Volunteers in Science

There is a documented need to increase the number of professional development opportunities for 4-H volunteers, improve their design and delivery, and explore alternative models to traditional face-to-face trainings (Kaslon, Lodl, & Greve, 2005; Smith, Dasher, & Klingborg, 2005; Smith, 2008). Promising practices of professional development associated with improving volunteers' capacity as science educators that exhibit *reform*-based characteristics include:

- The use of the "Step-Up" Incremental Training Model whereby staff (Smith & Enfield, 2002) or adult volunteers (Smith, Meehan, Enfield, George, Young, 2004) train teens as cross-age teachers of inquiry-based science with younger 4-H members. This model utilizes multiple workshops where teens have an opportunity to apply and hone their skills incrementally over time.
- Offering undergraduate course credit through a formal college course was effective as a strategy to recruit and train volunteers to teach science to elementary-age children in after-school settings (Smith, Dasher, & Klingborg, 2005). Pedagogy and curriculum content were emphasized during classroom contact hours; volunteers' knowledge and skills were applied when implementing science activities with children enrolled at the after-school sites.
- Blending traditional face-to-face training with on-going training using asynchronous on-line training modules, synchronous Web-based meetings, and self-directed learning (Barker, Grandgenett, & Nugent, 2009).
- Using lesson study as a strategy to improve 4-H volunteer understanding and use of inquiry-based teaching strategies and science content (Smith, 2011). Lesson study is a constructivist-based professional development strategy that is consistent with the reform approaches described by Garet et al. (2001) and Hilton (2010).

The overarching goal of educator professional development in 4-H is improved learning of the youth audiences served. Therefore, effective professional development is key to the growth of 4-H volunteers who deliver these programs. Additionally, in order to succeed in making significant contributions toward improving youth science literacy in the U.S. through 4-H Science, it is critical to address the needs of 4-H volunteers through the development, adaptation, and use of effective professional development strategies.

References

Baughman, S., Arnold, M., Boyd, H. H., Franz, N. K., Mead, J. P., Rowe, E., Silliman, B. (2010) Evaluating for Impact: Professional Development Educational Content Delivery Through Learning Communities. *Journal of Extension*. Volume 48, Number 3.

Clark, K. (2009). Training Guide for the Power of the Wind. National 4-H Council.

Fenichel, M., & Schweingruber, H. A. (2010). *Surrounded by science: Learning science in informal environments*. Washington D. C.: The National Academies Press.

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., Yoon, K. S. (2001). What Makes Professional Development Effective? Results from a National Sample of Teachers. *American Educational Research Journal*, 38(4), 915-945.

Kaslon , L., Lodl, K., Greve. V. (2005). Online Leader Training for 4-H Volunteers: A Case Study of Action Research. *Journal of Extension*. Volume 43 Number 2

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. American *Educational Research Journal*, 38(4), 915-945.

Garst, B. A., Hunnings, J. R., Jamison, K., Hairston, J., Meadows, R. R. (2007). Development of a Comprehensive New 4-H Extension Agents Training Program Using a Multi-Module Approach and the 4-H Professional Research, Knowledge, and Competencies (4HPRKC) Taxonomy. *Journal of Extension*. Volume 45, Number 1.

Hilton, M. (2010). *Exploring the intersection of science education and 21st century skills: A workshop summary*. Washington, D.C.: The National Academies Press.

Jamison, K., Walahoski, J. 2009. 4-H Science 101: Development, Delivery and Assessment of 4-H Sceince Programs. National 4-H Council.

Loucks-Horsley, S., Love, N., Stiles, K., Mundry, S., & Hewson, P. (2003). *Designing professional development for teachers of science and mathematics* (2nd ed.). Thousand Oaks, CA, USA: Corwin Press.

Schmitt-McQuitty, Carlos, & Smith. Assessing the Readiness of 4-H Youth Development Professionals to Deliver 4-H Science. Unpublished manuscript.

Smith, M.H. (2008). Volunteer Development in 4-H: Constructivist Considerations to Improve Youth Science Literacy in Urban Areas. *Journal of Extension*. Volume 46, Number 4.

Smith, M. H., & Enfield, R. P. (2002). Training 4-H teen facilitators in inquiry-based science methods: The evaluation of a "step-up" incremental training model. *Journal of Exension*, 40(6).

Smith, M. H., Dasher, H. S., & Klingborg, D. J. (2005). A model for recruiting and training youth development volunteers in urban areas. *Journal of Extension*, 43(5).

Smith, M. H., Meehan, C. L., Enfield, R. P., George, J. L., & Young, J. C. (2004). Improving county-based science programs: Bringing out the science teacher in your volunteer leaders. *Journal of Extension*, 42(6).

Assistant Director, 4-H Mission to Market: Janet Golden, jgolden@fourhcouncil.edu, 301-961-2982
Graphic Design and Layout: Marc Larsen-Hallock, UC Davis, State 4-H Office