Refereed Articles

A Model for Out-of-School Educator Professional Learning

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Abstract: Quality out-of-school time (OST) programs for youth are limited by a lack of professional learning opportunities for staff and volunteers that are based upon solid learning theory, affordable, and scalable for a diverse field. The Click2Science project is an innovative model for professional learning experiences that support staff and volunteers in providing high-quality science, technology, engineering, and math (STEM) learning opportunities for youth. This model of professional learning emphasizes the importance of visual, social, and experiential learning experiences with reflection and application to practice. The model leverages technology and in-person support in a cycle of professional development experiences. The experiences included in the professional development model allow staff and volunteers in OST programs to develop their instructional skills in ways that are embedded in the actual practices of their program. In this article, each part of the professional development cycle is analyzed using constructivist learning theories to encourage adult educators to replicate this model in other fields. A brief review of promising research about the effectiveness of the model concludes the description of this approach to professional development.

Keywords: blended learning, professional development, professional learning, STEM, out-of-school time, informal education

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Quality out-of-school time (OST) programs for youth are limited by a lack of professional learning opportunities for staff and volunteers. To be impactful in the diverse OST field, professional development must be based upon solid learning theory, and also be affordable and scalable. The Click2Science project developed a model for professional learning intentionally designed to meet the needs of OST programs. Click2Science supports staff and volunteers

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in developing the skills they need to provide high-quality science, technology, engineering, and math (STEM) learning opportunities for youth.

The Click2Science model of professional development expands the capacity of the OST field for STEM professional development by integrating learning technologies with instructor-led training using staff development guides that integrate visual, social, and experiential learning experiences with reflection and application to practice. The Click2Science model develops the instructional practices of OST staff and volunteers by focusing on developing concrete skills, one at a time, through a cycle of professional development experiences that are embedded in the actual practices of their program. The Click2Science skills support staff in three strategies for high-quality STEM learning experiences: (a) preparing for success in STEM, (b) supporting youth development through STEM, and (c) developing STEM practices and mind-set.

Blended learning models have been shown to improve staff learning, increase access to and flexibility of the learning experience for staff while being cost effective (Osguthorpe & Graham, 2003). This blended learning program has followed research-based models with wide success: in 2017, click2sciencepd.org surpassed 9,000 registered users and more than 800 people were trained virtually and in person. The free-to-use, online resources available at click2sciencepd.org provide easy access for OST programs across the United States and internationally.

Theoretical Framework

The Importance of Professional Development in OST

Professional development (PD) for full- or part-time staff and volunteers in OST educational programs is worthwhile and necessary, especially in STEM areas. Staff capacity has been identified as a significant barrier to providing high-quality STEM programming in OST (Afterschool Alliance, 2010; Chun & Harris, 2011). Many out-of-school learning programs are reluctant to support STEM due to lack of staff expertise or comfort with science content and lack of availability to training (Freeman, Dorph, & Chi, 2009). Impactful PD can help OST staff understand the skills they already possess, how to apply these skills to science activities, and help staff build and develop pedagogical expertise (Little, 2004; National Research Council, 2015).

Blended Learning Experiences

In this section, we elucidate the conceptual framework guiding the development of the Click2Science model of professional learning for OST educators. We begin by framing the needs of adult learners to construct their understanding and then articulate the four concepts that guide the design.

Click2Science began developing this model with the understanding that adult learners bring a unique reality to their learning experiences. According to Knowles (1980), adult learners (a) feel the need to apply their learning immediately, (b) use experiences as a source of knowledge, (c) value independence and self-direction in their learning, and (d) take control and ownership of their learning. Freeman and colleagues (2009) recommended that professional development experiences for OST staff include a focus on approaches, methods, and processes for teaching STEM that mirror the types of activities and experiences they use with the youth in their programs. These principles undergird our conceptual model for supporting OST learning environments through STEM.

Our framework is also informed by Dewey's (1915) conception that learning experiences are structured by the environment, the instructional design, and the materials used within them. Within this frame, the Click2Science model integrates a variety of learning experiences including the following:

1. Embedding experiential learning
2. Engaging in reflective practice
3. Supporting social learning

The following section illuminates how the Click2Science model integrates different learning experiences to meet the needs of adult learners.

Integrating a Variety of Learning Experiences

The Click2Science resources are designed to integrate learning technologies and experiences to meet the needs and expectations of adult learners. Click2Science training experiences include 1- to 2-hr in-person trainings, self-directed web lessons with certifications, 15- to 45-min trainings (referred to as meetings), and 15- to 30-min coaching sessions. Supporting resources include videos of practice, synchronous and asynchronous webinars, weekly blogs, and support for regional trainers to offer training and coaching.

The experiential learning activities embedded in Click2Science engage adults as active participants in the learning process and model best practices in facilitating STEM learning. Experiential learning, or "the process whereby knowledge is created through the transformation of experience" (Kolb, 1984, p. 38), is recommended to support educators in learning STEM practices and reflecting on their learning (Bevan, Ryoo, & Shea, 2017; Freeman et al., 2009). In a Click2Science learning experience, staff and volunteers spend time practicing, observing, and discussing pedagogies that are immediately applicable in their role as a practitioner. For example, staff participate in an activity where they are tasked with building a structure that can withstand an "earthquake" (the shaking of golf balls in a tin pan). Staff each take on the role of an architect, structural engineer, and geologist to collaborate on building a structure out of Popsicle sticks, in different soil types, that can withstand the earthquake test. Staff experience an activity that offers youth opportunities to assume real career roles, as they learn about how soil composition affects structural integrity in the event of an earthquake. Staff reflect on the experience of having career roles built into a STEM activity and identify strategies to integrate role models and adapt other STEM activities to include career roles. Staff are then encouraged to practice using this type of instructional method with youth during their programs and share their experiences at subsequent professional development sessions. Sharing experiences and discussing pedagogies presents learning as a social and reflective process.

Professional Development Model

This section describes the enactment of the Click2Science model of professional development through a cycle of learning experiences (see Figure 1). Ausburn (2004) noted the importance of multiple instructional strategies to meet the multiple learning needs of adult learners. Each of the following professional development experiences is described in the context of a single-skill focus in the sections that follow (see Table 1 for a comparison of the key features of the professional development experiences).

Figure 1. Professional development approach.

Web lessons

Click2Science's self-directed web lessons are delivered via an online learning management system that provides for individualized progress through each lesson. Each lesson focuses on a single skill related to facilitating STEM learning, such as "Reflecting and Processing STEM Experiences." Learners have the independence to work online, at their own pace and during a time of their choosing, emphasizing self-direction and self-determination. Web lessons feature written content, videos of OST staff using a variety of reflection strategies with youth, downloadable handouts, and require periodic responses to open-ended questions to encourage engagement with the content. Staff complete an assessment at the end of the lesson to document their understanding. The Click2Science PD model begins the learning process with a web lesson that introduces participants to the skill targeted for improvement and provides a shared base of knowledge.

Table 1. Comparison of Click2Science Learning Environment for Each Professional Development Experience

Experience	Instructional design	Materials	Learning environment
Web lessons	• Readings • Videos • Quizzes	• Web-based platform • Videos of authentic practice	• Independent
Trainings	• Experiential • Video-based	• Hands-on STEM • Videos of authentic practice	• Social • Large-group • Collaborative
Meetings	• Reflective • Video-based	• Videos of authentic practice • Handouts	• Small group • Responsive to local needs and time constraints
Coaching	• Reflective • Video-based • Goal oriented	• Videos of authentic practice • Self-assessment	• One-on-one or very small

Note. STEM = science, technology, engineering, and math.

Trainings

Trainings are in-person learning opportunities designed to support multiple learners (10-30 at a time) to engage in social, experiential activities together to deepen their understanding of a particular STEM facilitation skill. Experiential learning allows participants to engage directly in the kinds of inquiry-focused activities that are the heart of the new vision for science education in the United States (National Research Council, 2012). Trainings are designed for groups of staff and/or volunteers, and they serve to encourage social learning and rich discussion. A Click2Science training tends to include 30 to 45 min of a hands-on, STEM activity designed for OST settings, 25 min of social learning activities, and 15 min of application to practice. For example, staff participate in a self-reflection where they identify the ways they facilitate youth reflection in their programs and gather ideas from other staff. Then, staff watch a video of authentic practice related to the skill and discuss successes and opportunities in the authentic practice. Following this discussion, staff participate in an engineering design challenge to design a paper structure that is strong enough to support a heavy object. This hands-on, experiential activity is led by a volunteer from each small group of staff who practices and models using reflective questions. Following the hands-on activity, staff participate in whole group and small group discussions around the reflective process and the reflection pedagogies modeled during the activity. To conclude the training, staff then brainstorm reflection questions to use during activities in their programs.

Trainings, meetings, coaching sessions, and web lessons all include videos of real-life OST learning environments specifically produced to show practitioners' STEM facilitation skills. Viewing videos of real-life practice was shown to be effective in deepening reflection and pedagogical understanding in STEM teachers by helping them "learn to notice" effective teaching (van Es, Cashen, Barnhart, & Auger, 2017). The Click2Science library of over 70 professional practice videos allows practitioners of all levels of experience to watch and reflect on pedagogies from a multitude of OST situations. These videos also encourage practitioners to reflect on their own practices and adopt practices that will improve their facilitation.

Practice

The most essential goal of the Click2Science professional learning model is that participants incorporate new ideas into their instructional practice. Between professional learning situations, participants are expected to extend and apply their learning by facilitating STEM lessons with youth. This application is an important moment of transfer (Bransford, Brown, & Cocking, 2000) that allows professionals an opportunity to alter their practice to include the new learning. Allowing opportunities for practice and continued reflection helps adult learners apply their learning immediately, connects them to their community, and deepens their learning (e.g., Mundry, 2005).

Meetings

Meeting resources are designed for professional learning situations that include staff at one location, such as the staff of a local Boys and Girls Club. Onsite professional development with colleagues has been shown to be an effective arrangement for professional learning (Garet, Porter, Desimone, Birman, & Yoon, 2001). Meetings are short, "refresher" elements of the professional development model to encourage participants to review key ideas from the training experience and reflect on how they have applied them in practice. The meeting structure encourages staff and volunteers to dig deeper and discuss strategies with their colleagues. These 15- to 45-min professional development experiences are discussion-based and also feature the video-based learning modules to encourage reflective critique. For example, a meeting builds on the initial reflection strategies and skills learned in the training (described in the "Training" section). During the meeting, staff watch a video-based learning module featuring a strategy called "plussing" that helps youth give constructive feedback about others' work. Staff then practice using table tents as a reflection strategy to implement in their programs. These resources can be used in an in-person staff meeting or adapted for virtual meetings. Both in-person and virtual experiences are designed to integrate social, experiential, and visual learning experiences by allowing group discussion, direct engagement with materials, and the viewing of videos.

Coaching

Coaches play an important role in helping educators advance their practice (Burkhauser & Metz, 2009) in the Click2Science professional development model. During a coaching session, participants engage in small group or one-on-one discussions with a trainer/coach that target individual development of a skill. Coaching sessions begin with observation of a video (van Es et al., 2017) or a targeted skill-based reflection. Participants work with their coach to develop a plan and goals for their own growth. Throughout the coaching process, we encourage coaches to remain supportive and helpful, not evaluative. For example, staff watch a video-based learning module featuring additional strategies for youth reflection during STEM and develop a SMART (i.e., Specific, Measurable, Achievable, Relevant, and Timely) goal to focus on continuing to improve their use of reflection strategies throughout STEM activities. Coaching sessions last about 15 min and are targeted to practitioners' needs. Many Click2Science coaching sessions entail planning ways to use the pedagogical skill in the upcoming activities the practitioner has planned in their setting. This allows coaching sessions to be relevant and impactful on a personalized level.

Evaluation

After completing the Click2Science model, program leaders should evaluate their progress. Guskey (2002) recommends evaluation occur on five levels: (a) initial reaction, (b) knowledge and skills gained, (c) organization support and change, (d) application to practice, and (e) youth outcomes. There are a number of measurement tools available for OST programs to evaluate the impact of their professional development on these levels (for a comprehensive list see Brosi, 2011). Click2Science is developing tools to evaluate this model's effect on the quality of STEM facilitation and pedagogy. The retrospective instruments use Likert-type scales to measure perceived increase in self-confidence in using the skills during STEM learning experiences with youth. Open-ended questions ask participants to describe the successes and challenges they anticipate in using these skills when they facilitate STEM activities with youth. The goal of this instrument is to measure the knowledge gained and potential for transfer of learning (Guskey, 2002) from Click2Science professional development.

Discussion and Implications

In a small pilot study, the Click2Science model and professional development resources improved the STEM facilitation abilities of a small sample ($N = 12$) of frontline staff from programs around the United States. Hawley, Stevens, Pense, and Perez (2017) conducted a triangulated evaluation study that included focus group data from trainers and staff, pre–post observation data, and youth survey data. The pre–post observation scores increased over time in 11 of the 12 indicators of quality STEM learning experiences (Hawley et al., 2017). Leaders and staff also cited the training experiences as being "great" because they had the opportunity to "practice what we learned, got feedback, and suggestions" and were "provided with the actual skills" to facilitate quality STEM learning experiences (Hawley et al., 2017). Youth survey data were also collected at the end of the professional development cycle and demonstrated that youth "participants taught by frontline staff trained using the Click2Science model hold positive perceptions of broad science-related aspects" (Hawley et al., 2017, p. 62). The triangulated findings from this pilot evaluation study provide promising support for the model's ability to impact staff practices, as supported by the empirical data and comments from trainers and staff. Click2Science is currently beginning a study with a larger sample and additional data points to determine changes in staff practice and knowledge over time, and increase empirical support for this blended, professional learning model.

The unique blended learning experiences framework and professional learning model described in this article have applications beyond the field of informal education. Adult learners require ongoing professional development experiences to stay abreast of new knowledge and practices, improve their skills and abilities, and support organizational growth. Fields outside of education can consider applying a similar blended learning framework to their professional development offerings to improve their workforce. With the effectiveness of training established through research (e.g., Arthur, Bennett, Edens, & Bell, 2003), organizations are continually looking for cost-effective, flexible solutions to improve their employee's skills and abilities and the organization's bottom line. Click2Science offers one such model. Specifically, the authors recommend four specific design features to make professional learning experiences for adults scalable and effective: (a) a cycle of professional development experiences, (b) the opportunity to share and reflect with peers, (c) immediate opportunities for practice, and (d) developing a learning community (Owston, Wideman, Murphy, & Lupshenyuk, 2008). As previously described, the authors designed each of the elements of the Click2Science program (meetings, trainings, coaching sessions, and continued practice) to include these well-researched elements of adult learning within a blended environment that leverages technology to increase flexibility and reduce the costs of professional development. Using the examples provided in the elements of the Click2Science program, all adult educators can replicate this program to meet their organizational professional development goals.

Conclusion

The Click2Science professional development model is the first of its kind to be theoretically grounded and intentionally designed for OST professionals. Click2Science offers an approach that is grounded in social learning theory while allowing for professionals to learn with video, interactive discussion, and scenarios of real-life practice. Learning experiences are self-directed or social, experientially focused, and applicable to everyday practice. These resources were created to improve the quality of STEM facilitation in OST programs with a model that is affordable and scalable. In all, Click2Science targets 16 STEM facilitation skills with several training, meeting, and coaching agendas for each skill. This model includes attention to how the materials, learning environment, and instruction are woven together in ways that support professionals in making connections to deepen their practice. The authors believe that this conceptual framework, with its roots in learning theory, will support adult learners across contexts.

Given the growing need for STEM professionals and the shrinking of other work sectors (Fayer, Lacey, & Watson, 2017), it is important that education professionals at all levels expand their expertise to support STEM learning. Click2Science and its library of professional development videos and agendas offer an innovative system of support for helping practitioners in OST learning environments gain important knowledge and strategies for STEM instruction.

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The author(s) received the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Noyce Foundation (STEM Next) under Grant Number 88661.

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