“Hello! Is Anybody Out There?” Amplifying a Social Media Network within a Science Methods Course during COVID-19

Abstract

This article shares an elementary science methods course model design. The theoretical underpinnings of the course design integrated the six strands of learning science in informal science education (NRC, 2009). The course design included the three types of informal learning environments. The piece of the course design that was especially useful to teacher candidates during COVID-19 was the designed learning environments. The applicability of the designed learning environments helped teacher candidates to pivot during school building closures. Fortunately, this model provided teacher candidates a solid foundation for them to utilize prior science methods course experiences to fill a need during these unprecedented times. Teacher candidates 1) shared teacher pedagogical knowledge, 2) built on ideas from the methods course, and 3) asked questions for support using social media. Social media platforms have the capacity to help teacher candidates find resources in real-time if a properly scaffolded experience is provided in methods courses. Overall, the implications of the course design lend themselves to most all teacher education programs. However, this article is specific to the design of an elementary science methods courses. This science course model adds to the existing literature and attends a gap within the science education literature to support a diverse mix of needs due to the pandemic.
Keywords: Science methods courses, teacher preparation, teacher candidate, social media, designed learning environments, professional learning network, COVID-19

Introduction

How might science teacher educators best support future elementary educators? Due to COVID-19, teacher preparation programs are exploring instructional resources on a national scale. Investigating resources can assist in redesigning and improving science methods course content. Collecting and analyzing resources is an important way to support the mission of teacher education—empowering future teachers with tools they need in their classrooms; however, this overlooks an important aspect of course design—the learning environment, the mediums through which the course may be delivered. Specifically, science teacher educators may be envisioning a new online or hybrid model to deploy during the upcoming academic year, one that enables teaching across various learning environments due to an uncertain future. This article provides a course design model that is adaptable to needs of teaching in various types of learning environments.

Discerning “how teachers learn to engage in practices that successfully support student development and learning” (Darling-Hammond & Bransford, 2005, p. 25), and how to teach science in changing times calls for a “new” type of innovation during the pandemic. Fundamentally, science education reforms across the globe always strive to achieve high-quality elementary science teaching (NGSS Lead States, 2013). The current need for reform, due to COVID-19, needs to include non-traditional instruction, online learning, hybrid models, remote leaning, as well as staggered learning. Teacher educators play a critical role in implementing any science education reform (Bybee, 2014), and as a teacher educator preparing the next generation of science educators, I started modifying my coursework and assignments to meet the need of stay-at-home mandates, and have modeled and informed my students of the best practices, as I learned on the job.

Theoretical Underpinnings of Science Teaching and Learning

Studies continue to explore elements of science methods courses and field-experiences that impact elementary teachers' science teaching (Asim, 2016), self-efficacy (Palmer, 2006; Melber & Cox-Peterson, 2005) and the hope here is to provide a course design element that is adaptable to any science methods course. To address this unprecedented challenge, I present an elementary science methods course that was purposefully designed (long before COVID-19) to integrate the *Six Strands of Learning Science in Informal Science Education* (National Research Council [NRC], 2009). The NRC (2009) report outlines a six-strand framework for science learning goals that communicate the science-specific capabilities, coherent principles, pedagogical practices, and outcomes supported by informal learning environments. The course design was based on the six strands, referred to as the Informal Science Education model (ISE). The framework of the ISE (Informal Science Education) model is an appropriate framework because it collectively provides "rich accounts of dimensions of learning" (Rahm, 2014, p.397), aligned with current trends of science education (NGSS, 2013).

The National Science Teaching Association (NSTA) and scholars conclude that some of the most important skills in science teaching and learning are the science process skills (McComas, 2014): observing, inferring, measuring, communicating, classifying, and experimenting. Learning is an active process, whether the context is a formal learning environment (such as a classroom), or an informal learning environment (like a playground) (NRC, 2004). The NSTA defines informal science learning environments encompassing places, such as aquariums, universities, museums, nature clubs, zoos, parks, playgrounds, libraries, websites, and students' homes (NSTA, 2012). The NRC (2010), discusses the science learning that occurs in informal contexts as out of school time. OST are categorized into three broad groups:

- informal environments (e.g., TV programs, newspapers, kitchens, and outdoors),
- designed environments (e.g., museums, planetariums, science centers, libraries, and zoos), and
- programs (e.g., science clubs, citizen science, science clubs, after-school activities, and 4-H programs).

The experiences that occur in OST environments are viewed as nonthreatening to the learners (Falk & Storksdieck, 2009; Melber & Cox-Peterson, 2005). These informal spaces are "engaging participants in multiple ways…encouraging participants to have direct interaction…providing multi-faceted portrayals of science…building on prior knowledge…and allowing participants considerable choice or control over their learning" (NRC, 2010, p.5). Learning in informal spaces has been seen repeatedly as a key element in promoting science interest, increasing motivation, increasing dialogue, and deepening science content knowledge (Kisiel, 2010; Falk & Dierking, 2000). Clearly, research provides support for the use informal learning environments and the creation the science methods course design fuses together traditional classroom experiences with informal learning environments.

A Science Methods Course Design that Leverages Online Learning

The use of designed learning environments via online learning became indispensable to meet the needs during the COVID-19 mandates. Designed learning environments provide learners with a variety of learning opportunities through active participation, rich in authentic learning experiences (Orion & Hofstein, 1994) and interaction. Designed learning environments (DLE) require learners to be actively engaged in order to learn; DLE can be better understood by further dividing them into 2 major categories :(a) bricks and mortar (e.g. museums, planetariums, zoos) and (b) online contexts (e.g. simulations, games, webinars). This science methods course model is focused and ties together all aspects of informal science education. All parts of the ISE model are interrelated and capture all three out of school environments (NRC, 2010): informal environments (outdoor spaces and playgrounds), designed environments (online simulations and social media), and programs (practice and clinical experiences). The ISE model was purposefully designed to give attention to the sequence and clustering of concepts and interrelated processes to enable its easy adaptation and modification for various teacher preparation programs (*Figure 1*).

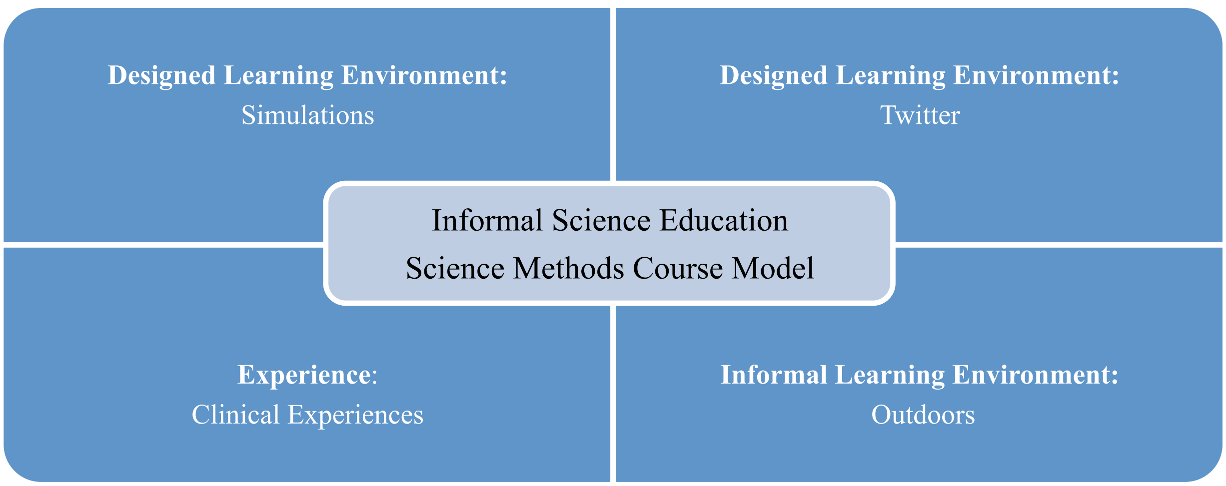


Figure 1. Subcategories of Informal Science Education

The science methods course schedule allocated equal numbers of class sessions for the formal classroom contexts and the informal education components. The science methods course used Project Wild to take learning outdoors, PhET Simulations to replace some hands-on experiments, and Twitter to extend learning beyond the classroom walls. Each teacher candidate (TC) also had a field placement in a classroom one day per week. The ISE design is adaptable and can meet the COVID-19 mandates.

Innovation

This model adds knowledge to the discipline by providing an elementary science methods course design which is currently lacking. Based on the performance of teacher candidates to pivot their teaching practices to online during these unprecedented times, this model has the potential to inform the redesigning of science methods courses during non-pandemic times.

During March, 2020, our institution instituted an elongated spring break, extending one week to two. After initially grappling with the situation and its impact on course plans, I examined how to better support our teacher candidates (TCs) – not only to complete the semester online and via distance, but also to feel empowered to become confident educators. I looked for ideas from experts in the field through reading blogposts and engaging in social media. While I was curating pedagogical strategies and online resources for our TCs, I turned to my own professional learning network (PLN) of science teacher educators through various social media platforms. My personalized PLN is comprised of people I have met at educational conferences, both practitioners in P12 schools and teacher educators/researchers at various teacher preparation programs. To my surprise, while I was strategizing as a teacher educator through leveraging social media, I stumbled upon posts on Facebook and Twitter from my own teacher candidates, also already leveraging these platforms. Their self-directed learning opportunities and sharing of knowledge was closely related to the experiences provided in the science methods course design that they were immersed in pre-social distancing requirements.

These teacher candidates socially constructed their own teacher pedagogical knowledge in a low-risk environment, through social media platforms (Lave & Wegner, 1991; Trust, Krutka & Carpenter, 2016). The TCs in the science methods course were previously involved in the #PSTPLN Twitter Challenge, https://www.smore.com/uj7df, as part of the designed learning environment's component of the course, a week of social-media-related activities specific to Twitter. The #PSTPLN was created by a community of teacher educators, and was implemented during Spring 2020 in February, prior to COVID-19 distance learning (Asim, Poyo, & Fecich, 2020). Its premise was to scaffold teacher candidates to leverage social media (Hsieh, 2017) and have a sense of belonging with the broader education community. TCs introduced themselves, participated in a Twitter chat, shared resources, identified people to follow on Twitter, etc.

In order to properly ease the TCs into this new designed learning environment, I included several components of the Twitter Challenge. Their comfort in using Twitter would allow our teacher candidates to have a network beyond the teacher preparation programs to help them with their own general teacher knowledge as well as specific to science pedagogical practice. For example, teacher candidates in this science methods course were required to participate in a Twitter chat. I requested that students in my science methods course to join a #NSTAChat during February 2020. During the #NSTAChat, a Twitter chat specific to science, participants would follow a discussion and participate in a conversation surrounding science. Though the #PSTPLN was to support TCs in a variety of content areas, this particular modification was made by me to focus on science teaching and learning. Long after the required participation in the Twitter Challenge during February 2020, to my surprise TCs from my science methods course were still voluntarily participating in using the Twitter platform for a variety of reasons during the pandemic.

Discussion and Implications

I was aware of my own teacher candidates' names and Twitter handles through my personal use of Twitter and monitoring hashtags. I took a random sample of their Tweets related to education between March 15th, 2020 and May 5th, 2020 to further analyze and understand the use my TCs. These dates are during the COVID-19 shutdown of in-person instruction for our university, and when local state mandates had been in effect for closing P12 schools. The purpose of looking at TCs' practices was to inform my own practice, and my own curiosity. Some of the TCs continued to use the hashtag #PSTPLN, and others did not. The samples I share here are ones that explicitly used the #PSTPLN hashtag, thus showing a connection, and a sense of community, from the earlier embedded activity within the science methods course. Teacher candidates shared online resources related not only to science, but also to other content areas, since all the students enrolled in the science methods course were either elementary education or special education majors. This evidence indicates that TCs are motivated to share and help one another. Another theme within the Tweets were regarding attending webinars to deepen teaching pedagogical knowledge.

All of these images of Tweets are during COVID-19 after the course-required assignments related to the Twitter Challenge had been completed and submitted in February

2020. Students built on ideas from the science methods course and shared what they were trying out with their own children at home during non-traditional instruction.

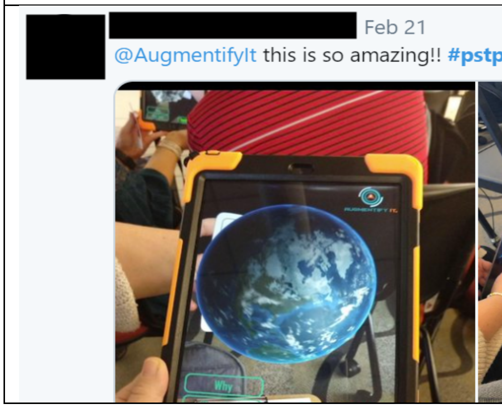
Pre-COVID	During COVID-19
	

Figure 2. Tweets Pre-COVID-19 in a methods class session and during COVID-19 about using AugmentifyIt cards with children at home.

Harnessing social networking technology to extend learning beyond the classroom was a way to continue learning and sharing knowledge. Interestingly, TCs also used this platform a place to ask questions.

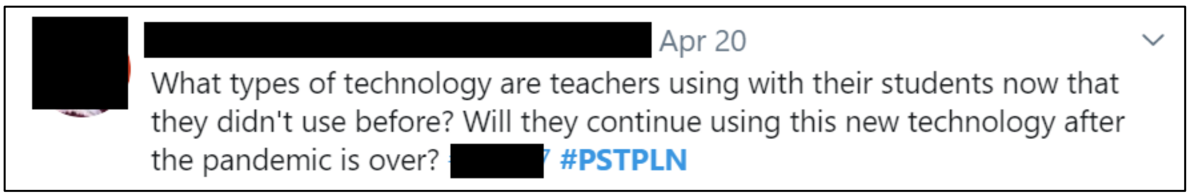


Figure 3. Tweet during COVID-19 about seeking response about teaching relate to the pandemic.

There are several important implications for science methods instructors and teacher education preparation programs at large. Science teacher educators must provide experiences to TCs that will empower them to navigate unchartered waters in both pandemic and non-pandemic times. As a teacher educator, I desire to provide continuous support and mentoring to TCs as they confront unique situations during clinical experiences, student teaching, and post-graduation. Through leveraging social media, I—and my science educators around the world—are able to do this in real-time. It's a personal comfort for TCs to know that these many professionals in the field of education are by their side. It is well known that personal, new, and positive experiences gained during science methods courses help support self-efficacy (Palmer, 2006; Menon & Sadler, 2017). More opportunities are needed for TCs to be involved in spaces, both in-person and online, where they can continue to grow their own support systems and professional learning networks. Opportunities for reflective practice by teacher educators are vital for us to continually provide what best meets the needs and demands of our TCs and our profession, in real-time. Leveraging designed learning environments such social media platforms (ex. Facebook and Twitter), webinars, as well as remote learning tools will be instrumental to empower our educators during stay-at-home orders and to better enable learning across different learning environments, science education, and other different disciplines.

Note: Throughout the manuscript, names and Twitter handles of the showcased Tweets, as well as the common course hashtag, are hidden in an effort to help protect students' anonymity.

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