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Youth appropriation of social media for collaborative and facilitated design-based learning ☆

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ABSTRACT

The purpose of this paper is to report on the ways that middle school age youth in the US appropriated a social networking forum (SNF) during an afterschool integrative STEM program, [The STEM Club]. SNFs are a form of social media created predominantly for social interaction and maintenance of relationships. In design-based learning environments, SNFs have the potential to facilitate the documentation of the design process from collaborative idea generation through testing and refinement. These records can be accessed from anytime and anywhere with Internet access, providing opportunities for youth to draw connections between classroom and afterschool environments. [The STEM Club] was designed intentionally to expose youth to scientific concepts related to electrical generation and energy transformations through collaborative design of lights powered through motion. Concurrently, facilitators encouraged youth to post to the SNF, Edmodo. All posts were analyzed using the theoretical framework of connected learning in which peer and instructor interactions mediated through SNFs might enhance learning. Results indicate that youth appropriated Edmodo to connect with others, articulate knowledge, and exchange design ideas. Facilitators played a strong role in encouraging youth to persist with design refinement through the use of Edmodo. Results suggest that youth are open to using SNFs to collaborate and provide updates on design processes, which is encouraging in terms of blending formal and informal STEM learning environments with social media.

1. Introduction

While the emphasis on integrative science, technology, engineering, and mathematics (STEM) education in the United States has focused predominantly on classroom instruction, it is increasingly common to see research centered on alternative venues for teaching STEM concepts to youth (Bell, Lewenstein, Shouse, & Feder, 2009; Hmelo, Holton, & Kolodner, 2000). Whereas there tends to be a distinct separation between formal and informal learning environments in the current literature, more attention is being given to studies that make attempts to bridge the boundaries between the two. [The STEM Club], the focal site of the current study, is one program that seeks to establish connections between classroom concepts and design-based projects conducted in an informal afterschool setting. Multiple iterations of [The STEM Club] have been implemented, with each program focusing on a different set of STEM related concepts and providing youth with a problem centered on saving a different animal species (Evans, Won, & Drape, 2014). The current study was centered on saving snails, salamanders, and other slimy creatures, and integrated concepts such as the generation and transformation of electricity through the design of lights powered through motion.

Social media technologies are a variety of networked tools that allow for and encourage collaboration, communication, and productivity among users (Dabbagh & Kitsantas, 2012). Under this

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broad definition, examples include social networking forums (SNFs) such as Facebook, Edmodo, and Twitter, blogging sites such as WordPress and Xanga, and video sharing sites such as Youtube and Vimeo among others. SNFs, investigated via the current study, are a subset of social media technologies that are focused primarily on the capacity for social interaction and the maintenance of relationships (Boyd & Ellison, 2008). This can be compared with other formats such as blogs and video sharing websites that allow for social interaction, but focus primarily on the ability to publish and comment on works. Despite their increasing popularity and use in educational settings, there is scant empirical evidence centered on the specific affordances and limitations of SNF integration into intentional learning settings (Tess, 2013). In this study, Edmodo, was integrated into the existing [STEM Club] routine to provide youth with opportunities to interact with learning materials, one another, and facilitators in an extension and expansion of the informal learning environment.

The use of SNFs has been recognized as familiar and well integrated into the peer culture of youth today making it an attractive area of research in the context of bridging formal and informal learning experiences. Vollum (2014) has discussed the relevance of SNF integration into K-12 health and physical fitness education through the encouragement of positive social interactions. Mao (2014) has also reported that SNFs provide opportunities for high school students to interact more effectively with peers and instructors via the online learning environment. Mao (2014) also notes that guidance may be necessary for students to truly take advantage of SNFs for learning rather than using it predominantly for leisure and recreational activities.

The theoretical framework adopted for the current study is the connected learning theory of Ito et al. (2013). Connected learning is described as the intersection among the personal interest, academics, and peer culture. Specifically, learning takes place when the individual is able to explore areas of interest in a peer supported environment. The social interactions available to learners are important in providing opportunities for sharing ideas, asking questions, and collaboration. This provides opportunities for learners to draw connections between concepts learned in the classroom and ideas that they have explored out of interest. Connected learning is particularly appropriate as a framework to view [The STEM Club] due to its focus on the blending of formal and informal learning. For example, peer culture can incorporate not only members of the same age group, but also more knowledgeable others such as parents, teachers, and members of online communities that might support the development of the learner. The appropriation of Edmodo into [The STEM Club] experience was intended to provide a way to extend the learning environment beyond the afterschool sessions, providing additional opportunities for interaction.

[The STEM Club] aims to engage youth and spark interest through the presentation of a global problem involving different animal species. This challenge sparks interest in youth, who are encouraged to solve the problem through the designs that they create collaboratively. As youth interact, explore their resources, and iteratively design and redesign their motion-powered lights, they are encouraged to make use of Edmodo, to log their progress, communicate with others, and share resources. Youth have been found to display varying depths of engagement while using Edmodo in previous iterations of [The STEM Club] (Evans et al., 2014). While some interactions are more casual, such as joking around with friends, others are more strongly related to [The STEM Club] curriculum, with the use of new vocabulary and understandings.

The various factors that play into youth interactions with Edmodo as a result of [The STEM Club] make connected learning theory with its blending of interest, academics, and peer culture an appropriate theoretical framework for further study. For example the integration of SNFs provides the opportunity for youth to use technologies common and enjoyable within their peer culture for the purpose of engaging in design-based learning and the articulation of academic concepts. While the concepts introduced in [The STEM Club] may be initially challenging for youth to understand, the presence of supportive facilitators might play an important role in guiding youth through their design creation, construction, and testing. The integration of SNFs may play an interesting role in providing avenues for youth to interact with one another and facilitators, promoting idea generation and experimentation.

1.1. Research questions

Based upon the current literature, this study seeks to answer the following research questions:

1. How do youth leverage SNFs as a part of the iterative design process in an informal learning environment?
2. How do youth utilize SNFs for the purpose of collaborative design?
3. How does facilitator interaction through Edmodo aid in progression of the design process?

1.2. Informal, design-based learning and social networking forums

Informal learning has been described as learning that happens in environments that invoke minimal amounts of structure in terms of instructor, content, and resources (Heo, Jo, Lim, Lee, & Suh, 2013). Informal learning happens willingly, and is customizable to the individual learner's interests and motivations. Nevertheless, while informal learning could be interest driven and highly engaging, it is also unstructured making it difficult to determine whether informal learning experiences are meaningful to youth. Perhaps as a result, bridging the gap between what is learned in formal classroom settings and informal learning experiences presents an attractive area of research (Greene, Lee, Constance, & Hynes, 2013; Shernoff & Vandell, 2007).

Activities centered on design-based learning are one method intended to bridge the gap between formal and informal learning. Design-based learning is composed of two features: (1) the conceptual aspect of learning that requires knowledge seeking and idea formation, and (2) the material aspect of learning that involves the creation of prototypes, models, and end products (Seitamaa-Hakkarainen, 2011). The incorporation of authentic learning contexts in which learners are encouraged to solve loosely defined, but relevant problems encourages the development of reasoning skills and domain knowledge. Integrating learning technologies such as SNFs into design-based learning activities could encourage youth to connect formal and informal learning experiences.

Vartiainen, Liljestrom, and Enkenberg (2012) have proposed an instructional model for design-oriented pedagogy that is meant to bridge the boundaries between formal and informal learning. The model aligns well with many aspects of [The STEM Club], proposing that learning through design is a process comprised of four main steps. Step one involves articulation of the learning phenomenon in which learners are presented with a specific problem that they must solve through the design process. Step two is the design of the learning object, in this case, the motion-powered lights. Designing the learning object involves exploration of the resources that need to be included, as well as planning out the design and structure of the object. Step three is the data collection for the learning object, which equates to testing and experimentation with the design elements. Finally, step four is the actual construction of the learning object. Youth at [The STEM Club] are encouraged to engage in a fifth step: redesign. After constructing and evaluating the learning object, changes are made to improve