

Chapter 38

The Sun Earth Moon System

Connecting Science and Informal Learning

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ABSTRACT

This chapter focuses on the issues pertaining to informal science learning through public outreach and the utilization of established and evolving web technologies. The Sun Earth Moon System (SEMs) is a website that integrates webcasting with Web 2.0 features to increase public awareness and interest in natural sciences as well as to dispel the stereotype that science is boring. The SEMs website provides live video webcasts of solar and lunar eclipses and planet transits streamed from various locations around the world as part of a Web-based public outreach program. The SEMs project aims to offer the general public a realistic experience and evoke the spirit of excitement felt by being a part of a global community witnessing rare astronomical events. The purpose of the chapter is to explore webcasting and design strategies, such as the incorporation of social media elements, that can assist in the development of a science-oriented educational website.

INTRODUCTION

The scientific community has long been concerned with the gap between advances in natural sciences, particularly in physics and astronomy, and the level of public awareness and involvement (Baxter, 1989; Dunlop 1999; Sadler, 1987). As science continues to expand the boundaries of human knowledge, this disconnection is somewhat expected. However, if

after going through the education system young generations do not acquire knowledge of the basic scientific concepts, the knowledge gap will continue to widen. Contrary, if young people are equipped with the underlying scientific principles, it is easier for them to stay connected with the growth of scientific knowledge throughout their lives (Richardson & Wolfe, 2001). Therefore, scientists should not only focus on research but also on bridging the gap between science and public knowledge of science by means of informal science education (Falk,

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Donovan, & Woods, 2001; Hofstein & Rosenfeld, 1996; Hurd, 1997; Sonneret & Holton, 2002). The scientific community is currently looking for innovative ways of encouraging informal science learning (Rennie & Stocklmayer, 2003).

Informal education (or *learning*) can be defined as “voluntary educational activities outside traditional educational context” (Wolfe, 2001, p. 92). Besides the setting, the term relates to “the process (without an instructor or self-directed), and the audience other than students” (Ucko & Ellenbogen, 2008, p. 241). Recognizing the power of informal learning, the National Science Foundation (NSF) in 1984 created the Informal Science Education (ISE) program. According to NSF (2001):

Informal learning is voluntary, self-directed, lifelong, and motivated mainly by intrinsic interests, curiosity, exploration, fantasy, task completion, and social interaction. Informal learning can be linear or non-linear and often is self-paced and visual- or object-oriented. It provides an experiential base and motivation for further activity and learning.

NSF encourages “projects that develop and implement informal learning experiences designed to increase interest, engagement, and understanding of science, technology, engineering, and mathematics (STEM) by individuals of all ages and backgrounds, as well as projects that advance knowledge and practice of informal science education.”¹ The National Science Teachers Association (NSTA) in 1999 adopted a position statement with strong support for informal science education: “A growing body of research documents the power of informal learning experiences to spark curiosity and engage interest in the sciences during school years and throughout a lifetime.”²

Researchers (Wolfe, 2001) highlight the fact that the web is “well suited to drawing children into brief, voluntary, interactive learning experiences” (p. 93). Since learning is a cumulative process, both children and adults can benefit from a variety of educational opportunities available on

the Internet (Linn, Davis, & Bell, 2004), including webcasts. *Webcasting* refers to the delivery of audio and video content over the web (Miles, 1998). Ha and Ganahl (2007) point out that “there are many different applications of webcasting in both the nonprofit and the commercial sector” (p. 3-4) where the web is used as a delivery medium for informational, instructional, marketing, and entertainment purposes. This chapter focuses on the application of webcasting as a tool for informal science education and public outreach.

At the University of North Dakota (UND), the Computer Science and Physics Departments have jointly developed a webcast-based outreach project called the “Sun Earth Moon Systems” (SEMs).³ The SEMs project aims to increase public interest in natural sciences and extraterrestrial mechanics and to dispel the widespread stereotype that science is boring by raising awareness about unique celestial events. The overall mission of the project is to “help the public take the first step towards understanding astronomy and celestial mechanics.”⁴

As an informal science learning environment, the SEMs website is organized around live video webcasts of solar and lunar eclipses, as well as planet transits. Scientists can determine beforehand from what geographical location these spectacular celestial events can be best observed. A UND scientific team⁵ travels to a pre-determined location, sets up equipment for a live webcast, and shares the event with SEMs visitors in real time. To date, the solar and lunar eclipses and planet transits, which are basically unknown to the general public, have been broadcasted from India, Panama, Spain, Turkey, French Guiana, Italy, China, and several locations within the United States.⁶

The purpose of the present chapter is to identify successful strategies for the implementation of a web-based public outreach project designed to promote public interest in natural sciences through the creation of an educational webcasting site.

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