



CHEMISTRY DIDACTICS

Close encounters with creative chemical thinking: An outreach presentation using movie clips about the elemental composition of aliens and extraterrestrial minerals



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Abstract To introduce more chemistry into a middle and high school bioengineering camp experience, we developed an educational and entertaining presentation that examines the chemistry in movies about aliens and minerals from outer space. Our goal was to help the campers to think creatively about the bioengineering projects they are doing and about its chemistry. After watching each movie clip, we explain whether the chemistry in the clip is real or fake, and then describe the real chemistry that inspired it. The chemical touchstone for the presentation is the periodic table. First, the campers learn that aliens in five movies are composed of the same elements as those found on Earth, although some do not have the same biochemistry. The second half of the talk is about the utility of extraterrestrial minerals of known composition. The campers learn that moviemakers speculate that people of the future might visit other celestial bodies to collect scarce minerals with known properties. The topics of alien biochemistry and extraterrestrial minerals are not often taught in the classroom. The pairing works well, however, for chemical outreach because it shows students how to bring divergent thoughts together to solve problems and, therefore, encourages creative chemical thinking.

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PALABRAS CLAVE

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Nivel medio superior;
Programa de
extensión;
Aprendizaje basado
en multimedia;
Tabla periódica

Encuentros cercanos con el pensamiento creativo química: un presentación de extensión uso de clips de película acerca de la composición elemental de los extraterrestres y extraterrestres minerales

Resumen Para introducir más química en una experiencia de campamento de bioingeniería para estudiantes de escuela intermedia y secundaria, hemos desarrollado una presentación educativa y entretenida que examina la química en las películas sobre extraterrestres y minerales del espacio exterior. Nuestro objetivo era ayudar a los campistas a pensar creativamente acerca de los proyectos de bioingeniería que están haciendo y sobre su química. Después de ver cada cinta de video explicamos si la química presentada en el clip es real o falsa y luego se describe la verdadera química que la inspiró. El punto de referencia de la química para la presentación es la tabla periódica. En primer lugar, los campistas aprenden que los extraterrestres en cinco películas se componen de los mismos elementos a los encontrados en la Tierra, aunque algunos no tienen la misma bioquímica. La segunda mitad de la charla es sobre la utilidad de los minerales extraterrestres de composición conocida. Los campistas aprenden que los cineastas especulan que la gente del futuro podría visitar otros cuerpos celestes para recoger minerales escasos con propiedades conocidas. Los temas de la bioquímica alienígena y minerales extraterrestres no se enseñan a menudo en el salón de clases. Sin embargo, la utilización conjunta funciona bien, para la divulgación de la química, ya que muestra a los estudiantes cómo se pueden usar pensamientos divergentes juntos para resolver problemas, estimulando de esta manera el pensamiento creativo en química.

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Introduction

Outreach to the public is critical to the success of chemistry departments. It can increase the public's understanding of important issues and number of students who become chemistry majors, while raising the profile of chemistry faculty within the community. The mechanisms for achieving these informal chemical experiences include public demonstrations, classroom visits, summer science camps, topical research workshops, and topical research lectures. All of these are close encounters with chemistry and each balances entertainment with education in a different way.

Most outreach opportunities involve "magic of chemistry" demonstrations, because the public enjoys watching them almost as much as the faculty and their assistants enjoy doing them (Flynn, 2005; Harpp, Fenster, & Schwarcz, 2011; O'Brien, 1991). The object is to educate while entertaining, with the scales tipped toward the latter. The audience gets to watch colors change rapidly, smell the smoke of inefficient combustion, and feel the sonic boom of explosions. They watch an expert or assistant initiate each demonstration deliberately and, hopefully, safely while explaining what is happening on the theoretical level. The take-home message for everyone is that there is more than meets the eye to these spectacular and reproducible phenomena and, with more studying, you can explain these things to other people.

Science camps and the workshops are focused on education far more than they are on entertainment (Exstrom & Mosher, 2000; Flynn, Johnson, & Penn, 2007; Robbins & Schoenfish, 2005; Sheridan, Szczepankiewicz, Mekelburg,

& Schwabel, 2011). Their typical goal is to increase participant's interest in taking more chemistry courses in high school and college, both of which should raise the number of chemistry majors. Campers get a deeper scientific experience because they carry out more preparations, perform more separations, and use more sensitive instruments of analysis. The complexity of these activities makes it necessary to target a particular audience to ensure sufficient enrollment, and to recruit and train assistants to optimize the experience.

To introduce more chemistry into the camper learning experience, we developed a presentation using movie clips and explanations that is both fun and educational. Our goal was to help the campers integrate the things they were learning at the camp with the chemistry they had seen in everyday life, namely in the movies. We have previously reported that an effective way to arouse interest in learning chemistry was to show a movie clip and then explain the chemistry presented therein (Griep & Mikasen, 2013; Griep, Frey, & Mikasen, 2012). Here, we report the results of a talk based on alien biochemistry and extraterrestrial minerals in the movies that was presented in the evening to summer science camps focused on molecular biology.

Methodology

Before this informal chemistry project could be launched, three aspects had to be planned. The first was to choose the target audience. The second aspect was to design a presentation especially for the target audience. The third part was to devise a tool to assess the audience's response to the presentation.

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