Grand Canyon as a Universally Accessible Virtual Field Trip for Intro Geoscience Classes Using Geo-Referenced Mobile Game Technology

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**Grand Canyon as a Universally Accessible Virtual Field Trip for Intro Geoscience Classes Using Geo-referenced Mobile Game Technology**

**Natalie Burszyn, Joel Pederson & Brett Shelton**

**THE PROBLEM**

There is a well-documented and nationally reported trend of declining interest, poor preparation, and lack of diversity within U.S. students pursuing geoscience and other STEM disciplines. We suggest that a primary contributing factor to this problem is that introductory geoscience courses simply fail to inspire (i.e. they are boring). Our experience leads us to believe that the hands-on, contextualized learning of field excursions are often the most impactful component of lower division geoscience classes. However, field trips are becoming increasingly more difficult to run due to logistics and liability, high-entrance, decreasing financial and administrative support, and exclusion of the physically disabled.

**ASKING STUDENTS TO USE THEIR SMARTPHONES INSTEAD OF TELLING THEM TO PUT THEM AWAY**

Recent research suggests that virtual field trips can be used to simulate this contextualized physical learning through the use of mobile devices—technologies that exist in most students’ hands already. Our primary goal is to enhance interest in introductory geoscience courses by providing the kinetic and physical learning experiences of field trips through geo-referenced educational mobile games and test the hypothesis that these experiences can be effectively simulated through virtual field trips. We are doing this by developing “serious” games for mobile devices that deliver introductory geology material in a fun and interactive manner. Our new teaching strategy will enhance undergraduate student learning in the geosciences, be accessible to students of diverse backgrounds and physical abilities, and be easily incorporated into higher education programs and curricula at institutions globally.

**TESTING THE WATERS**

Historical Geology and Physical Geology students (n=27) at Utah State University volunteered to play the prototype game module and complete anonymous evaluation surveys in the summer and fall of 2012. Students ranked the degree of fun and difficulty of the game, the content learned, and what features they liked or disliked.

**DISCUSSION AND FUTURE PLANS**

The results of these early assessments are positive, both in regard to the improvement of students’ understanding of key concepts and their engagement of learning with mobile technology. This is a positive first step in developing innovative teaching that utilizes powerful tools students are already intimate with in order to make first-year STEM courses more powerful tools students are already intimate with in order to make first-year STEM courses more fun and engaging. The surveys show that students are ready and willing to use mobile technology for educational purposes.

**TABLE OF ADDITIONAL MODULES FOR “GRAND CANYON EXPEDITION”**

<table>
<thead>
<tr>
<th>Module Title</th>
<th>Key Concepts Learned</th>
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<tr>
<td>Water Balance</td>
<td>- Water cycle</td>
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<tr>
<td>Hillslope &amp; River Processes</td>
<td>- Erosion and deposition</td>
</tr>
<tr>
<td>Earth Deformation</td>
<td>- Plate tectonics</td>
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<tr>
<td>Tectonics &amp; Plate Boundaries</td>
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<td>Historical Geology</td>
<td>- Ancient climates</td>
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<tr>
<td>Physical Geology</td>
<td>- Rock mechanics</td>
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</tbody>
</table>

**SURVEY SAYS**

In both classes, participants were somewhat familiar with the geologic concepts presented in the game, as the pre-game survey results show. However, results indicate that students across the board gained greater comprehension of the concepts through game play. In addition, students found the pilot module fun to play as well as relevant to their class material. Importantly, they found it quite easy to play. This allows a student to concentrate on the content of the game instead of how to play it. Student comments on the surveys indicate that they enjoyed the mobile “exploration” nature of the game as well as experiencing photographs of actual geologic features rather than traditional textbook cartoons.