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

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The Problem

There is a well-documented and nationally reported trend of declining interest, poor preparedness, 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 enrollments, decreasing financial and administrative support, and exclusion of the physically disabled.

Asking Students to Use Their Smartphones Instead of Telling Them to Put Their Arms Down

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 goals are to enhance interest in introductory geoscience courses by providing the kinetic and physical learning experience 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 “virtual” 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.

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 enjoyment 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 unboring, and to make world-class field trips accessible to all.

This is the start of an idea that is being developed. Plans are to create four additional modules covering major topics taught in introductory geoscience courses shown in the table to the right. We plan to test these modules in classes of educational institutions spanning a diversity of student backgrounds from community colleges to private universities.

Table of Additional Modules for “Grand Canyon Expedition”

<table>
<thead>
<tr>
<th>Module Title</th>
<th>Curriculum Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Canyon Surface Geology</td>
<td>Geologic Time</td>
</tr>
<tr>
<td>Grand Canyon Tectonics</td>
<td>Geologic Time</td>
</tr>
<tr>
<td>Grand Canyon Erosion</td>
<td>Geologic Time</td>
</tr>
<tr>
<td>Grand Canyon Water Balance</td>
<td>Geologic Time</td>
</tr>
</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 students 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.

Notes

I would like to thank the Center for Women and Gender at Utah State University for providing a travel grant for me to attend the 2012 American Geophysical Union Annual Fall Meeting.