

Evaluating Google Earth in the Classroom

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ABSTRACT

Educators look for different ways of presenting material. Teachers present geography classes using various methods inside the classroom. PowerPoint lecture methods are used in many geography classrooms in order to affectively achieve lesson performance objectives. The platform allows instructors the ability to present visual as well as written material in order to convey concepts and ideas. Google Earth is another delivery method that instructors can use in a geography classroom. The Google Earth interface allows instructors to develop a class by identifying geographic locations and embedding pictures and other documents. By using this method the instructor is able to keep students attention by navigating to predetermined locations around the world as well as explore examples brought up by students in the class. This paper will provide results of my attempt to evaluate the use of Google Earth as an effective teaching method. This is accomplished using PowerPoint delivered classes as a standard. Two independent sets of students received instruction exclusively using one of the two methods, PowerPoint or Google Earth, over a period of classes. Students were then evaluated during the next class through a series of questions on their ability to recall the material of the previous lesson.

INTRODUCTION

“There is no subject of inquiry that yields so profound and perennial human interest as the story of the globe on which we dwell.” (Geikie, 1904)

Geography is the physical-social science which describes, maps, and seeks to explain the interrelations between man and his physical environment. (Thralls, 1958) A geographer looks at the world as sets of spatial connections across a full spectrum of disciplines and techniques. Given the aims of Geography teaching and its content, it is probably true to say that no subject lends itself to a great variety of techniques in the classroom. (IAAMSS, 1956) It is very necessary that a Geography teacher should have a clear idea in their mind not only of what

they will teach but of exactly how they should teach it at each stage of the course and at hand. Outside the field of direct observation the Geography teacher has to resort to symbolic representations of reality in order to enliven the imagination of students. (IAAMSS, 1956)

Geography is a dynamic subject. Teachers can reach out to news articles, the internet, books and other new publications and incorporate them into the classroom environment. The tools we use to teach must therefore be able to change and be dynamic as well. Media, in particular television and Internet resources, are the most sought out tool for learning about science. (Bell, 2009) The Geography teacher can tap into a stream of dynamic sources that can be displayed in the classroom. Teachers that use only one technique in their classrooms miss out on the vast opportunities to reach the full range of learners.

One tried and true display method is the map. Maps are a great source of visual learning. Some, such as MacKinder, have mentioned that the teacher should be able to “make maps speak.” (MacKinder, 1895). Maps have a certain power to draw on the emotion of the student. Maps also have the ability to “save the mind infinitude of words.” (MacKinder, 1895). The teacher can explain concepts and connections quickly and thoroughly by using the map.

Maps have been used for countless years in the classroom to enhance learning. Appeals to the senses, especially vision, are always of the highest importance in education, and more especially in such a subject as geography. Geikie explains that the “essential requisite is to awaken a genuine interest in the theme on the part of the pupils; to make them feel that they are not merely exercising their memory, but that they are called upon to cultivate their observation and judgment in gathering from the map all that is fitted to yield to them.” (Geikie, 1904)

There are difficulties associated with the use of and the procurement of the classroom maps. Maps large enough to see in classrooms are expensive. Political wall maps are outdated as soon as the world situation changes. No wall map can depict the day's weather or seismic activity. Many lessons would benefit from large scale maps that show specific areas for specific lessons. The access to spatial data at all levels is an immense enhancer in the classroom.

Visual displays of maps are nothing new. Teachers have displayed updated data by view graph, slide projector or via a computer and a projector. PowerPoint gives the teacher the ability to create a series of slides that can tell a story about regions or places by displaying a series of maps in combination with words. It has proved to be a great way to engage students and keep their interest. Among the studies of presentation graphics that exist to date, the majority emphasize that presentation graphics increase the interest level of the classroom experience. (Apperson 2002) In a studies by Szabo and Hastings (2000), Atkins-Sayre, Hopkins, Mohundro, and Sayre (1998) and Mantei, (2000), visual graphics proved attention getting and more interesting in the lecture setting.

A relatively new outlet for updated mapping and mapping products is the Geographic Information System or GIS. GIS, with its emphasis on digital information processing and analysis, can contribute greatly to unify various disciplines that focus on spatial elements and trends. (Patterson, 2007) The advent of GIS and computer displays of geographic data has reinvigorated the ancient field of cartography (Longley et al., 1999; NRC, 2002a). The GIS gives teachers new potential to express knowledge of Earth's surface. They can create maps that are specifically tailored to the lesson with data that is relevant. This empowers the teacher to display aspects of knowledge that were previously beyond the powers of traditional graphic

visualizations. The term geovisualization captures this new potential and is the focus of an active and growing research community (NRC, 1997)

The teacher can use GIS or GIS created products in the classroom to display data that was previously unavailable. For instance a college teacher could map out the hometowns of each student before day 1 of class and display the map on the first day. During introductions, the students can see where each other are from and develop an understanding of space and connections. GIS enables the teacher to support spatial thinking with enhanced speed, accuracy, and flexibility. (Downs, 2006)

Commercial companies have produced user friendly platforms for GIS data. Launched in 2005, Google Earth is one of those platforms. Google Earth is a “3D Interface to the Planet.” (Google, 2010) It has the ability to view landscapes in fairly realistic three dimensions, using a combination of digital elevation models, satellite imagery, and 3D building envelopes (in some selected cities). (Sheppard, 2007). It transforms what was map data into recognizable local perspective views which are not only more meaningful to many people. Google Earth can take the student beyond mere cognition, into an experiential world where they can expect other kinds of response: affective, evaluative, physiological, and potentially behavioral (Zube et al., 1982 and Sheppard, 2005). Google Earth is a formidable dynamic tool that helps strengthen geography curriculum at all levels of education. (Patterson, 2007)

Google Earth is a free software package available to anyone with a computer and an internet connection. It is an online resource available in the classroom and can be used by the student at home. Studies have demonstrated that the use of online resources has helped to improve student comprehension of major concepts and skills while also helping students gain confidence in their knowledge of geographic issues (Solem and Gersmehl 2005).

On their website for teachers, Google writes that the platform can help the teacher “bring a world of information alive for your students. You can use Google Earth demos to get your students excited about geography, and use different Google Earth layers to study economics, demographics, and transportation in specific contexts.” (Google, 2010) Other literature has said that Google Earth is easy to use and presents, in a visual geospatial context, a great deal of information that applies to topics that are addressed in geoscience courses and many other educational settings. (SCRC, 2010 and Sheppard, 2007)

There are advantages to teachers in communicating ideas and lessons via this engaging platform and making their findings more relevant to people's own experience. Potentially, data and lessons may be seen and understood by many more students than is currently the norm. (Sheppard, 2007) Some students have a hard time visualizing things in three dimensions. Teachers can use the virtual globe as an aid to teaching maps and their interpretation. (Lisle, 2006) The use of Google Earth not only supports spatial thinking but also helps develop critical analytical skills and prepare students to use more advanced features found in a true GIS. (Committee on the Support for the Thinking Spatially, 2006).

Teachers can create their own presentations by saving the information in Keyhole Markup Language (KMZ) data files. The KMZ format is simple to use and quick for any educator to master. Places and images can be saved as a series that they can “fly through” to present material. They can exclusively use the Google Earth platform as a delivery method or use it to support a more standard delivery method.

Much of the literature explains that integration of new technologies into the classroom is a good thing. (Barone, 2003, Apperson 2007, Longly et al, 2007, Bitner 2002 and Patterson 2007) Students tend to think with the current mainstream technology of the time. Bitner

mentions that “an often-overlooked but crucial determinant of whether technology succeeds or fails in the classroom is a less than obvious one...the teacher.” (Bitner, 2002) The teacher is a critical component in making the technology work in the classroom environment.

There are studies written that explain the usefulness of PowerPoint in the classroom (Szabo and Hastings, 2000, Lowery 1999, Rankin and Hoas, 2001 and Bartsch and Cohen, 2003). Each one of these studies looks at the effectiveness of PowerPoint and in some way evaluates the platform for delivering class material. Google Earth has not been evaluated as a teaching platform. This study looks at Google Earth as an effective tool as a delivery technique and compares material retention with that of a PowerPoint delivered class. The goal is to see if Google Earth meets or exceeds the retention rates currently achieved by traditional methods.

METHODOLOGY

In order to evaluate the effectiveness of Google Earth in the classroom, I developed a small case study. Over the course of a semester in a Climatology course, I choose five class periods that could be taught exclusively using Google Earth as the platform of class delivery. I created a KMZ file that contained all of the information for the class, ensuring that all material and student objectives for the class were covered. For each of these classes I also produced a PowerPoint slide show that contained the same information. In two different sections of students, I delivered the class during one section in PowerPoint while the other section received the class in Google Earth. Figure 1 shows an example of a PowerPoint slide and its Google Earth representation. The same ideas are displayed so that the objective of the class is not missed.



Figure 1 PowerPoint Slide (left) and the corresponding Google Earth Screen Capture (right)

During one semester I taught two sections of students in the same course. Class A had 20 students while class B had 17 students. Class A was taught using a series of PowerPoint slides. Class B was taught using Google Earth. I used the PowerPoint presentation as a guide for the creation of a KMZ file that I used to guide the class through the material. Figure 2 shows the contrast between the two delivery methods. To the left is a slide showing examples of



Figure 2 Climate classification in PowerPoint Slide (left) and Google Earth (right)

some of the climate classification the students read about. To the right is a screen capture of the first in a series of locations that I used to give examples of those same climate

classifications. I zoomed to a larger scale image to give them an understanding of the classification.

In order to assess the retention of the material, during the class following the lecture, I developed short non-graded quizzes of 10 questions. The feedback I received helped me to evaluate if the students being taught using Google Earth were gaining as much, less or more comprehension than those being taught by PowerPoint. At the end of the block of classes, I gave them a graded quiz that covered all of the material from this section. I also asked them to write in a reflection on how Google Earth fared as a delivery method.

The study does not come free of assumptions that induce some error. Since it is such a small sample size, I make the assumption that each section is a cross section of students with similar abilities. All students were juniors and seniors with at least a 2.0 Grade Point Average. At the end of the 40 lessons, Class A achieved a 79.5 average, while Class B attained an 82.6 average.

ANALYSIS

The Climatology course was broken into four blocks of classes: physical and dynamic climatology, regional climatology, climate variability and change and applied climatology. I chose the regional climatology block for the study. Regional climatology translates very well into the Google Earth platform. The classes in the block looked at the different climate classifications across the globe. We discussed tropical, wet/dry, arid, mid-latitude, polar and highland climate regions.

Preparation for the classes was the key to making the presentation interesting for the students. PowerPoint is a great platform to present Climatology. If done right, a PowerPoint

presentation can be engaging, interactive and visual. Screen captures of material from the internet, maps and other visual enhancers can be easily incorporated into the presentation. Google Earth is also a good platform for this section.

Once the teacher understands the process of creating KMZ files, Google Earth becomes an easy program in which to build a presentation. Teachers can identify and save locations around the globe by using placemarks. The placemark can be set to bring up an image at the precise location and scale that the teacher needs to convey a point in the lesson. The teacher can also add maps and overlay them on the globe surface using the image overlay function in Google. For instance, during each of the classes for this

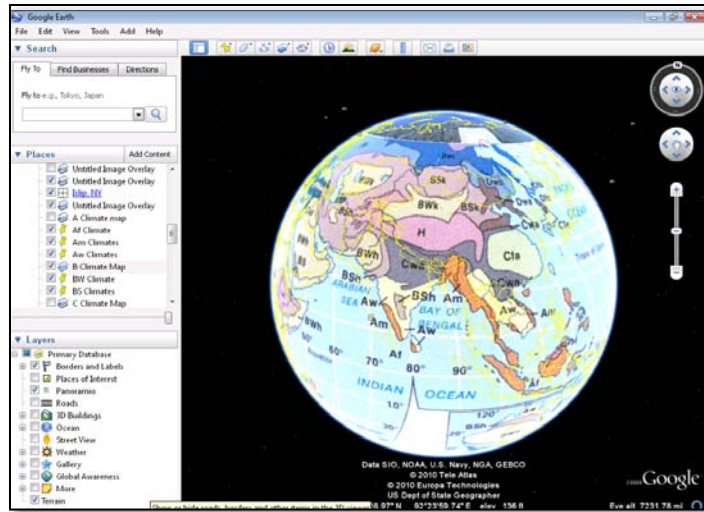


Figure 3 Maps can be molded to the virtual globe true to location.

study, I started out by identifying where the region for the class was located across the globe. I “wrapped” a climate classification map over the virtual globe (Figure 3) and was able to manipulate it in class. I was able to interact with the students by having them tell me where

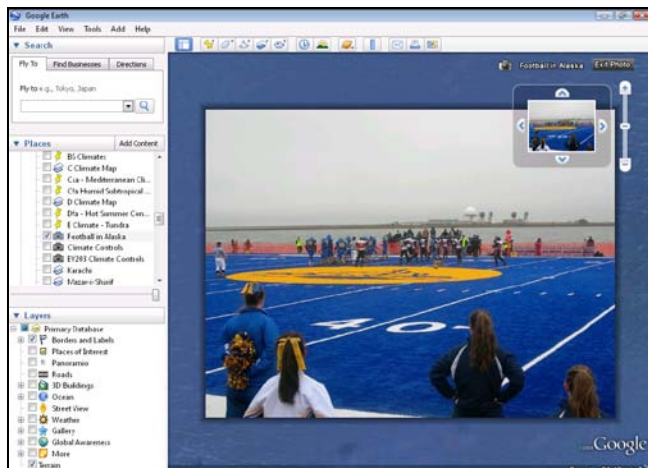


Figure 4 Pictures bring interest to the lecture.

internet or one of the many pictures in Google’s Panoramio cache can be used. Figure 4 shows

different climate classifications were located then I would “fly” to those places to confirm or deny their suspicions. The teacher can also add text or a slide into the interface if there is a need to bring out a specific fact or definition. Personal,

an embedded picture of the northern most football field in the world used in a lecture to help the students relate activities and climate. Teachers can geolocate (place a picture on the map where the picture was taken in the real world) their pictures in the virtual globe.

Based on all these different applications, preparation time can be greater than other methods, at least at first. Like any other platform for lecture delivery, it takes time to master certain features and applications. For example, many teachers are very versed in PowerPoint, but when a new version gets released, it takes some time to learn the new features making presentation creation slower. The challenge for the teacher using Google Earth is to find examples in the world that relate the material from the reading assignment to the student and make it flow in class. There is an art that must be mastered as well as a flow that must be maintained.

Although Google Earth presents the teacher some challenges, there are definite advantages. Google Earth's greatest advantage lies in its dynamic nature. The presentation moves from place to place, scale to scale, map to remote sensed images to pictures. Students are engaged because they don't know where they are going next. The teacher can also incorporate things that are relative to the student. The teacher can bring fly to areas near hometowns, campus, or in the State the school is located. This draws in the students and increases their interest (see Figure 5).

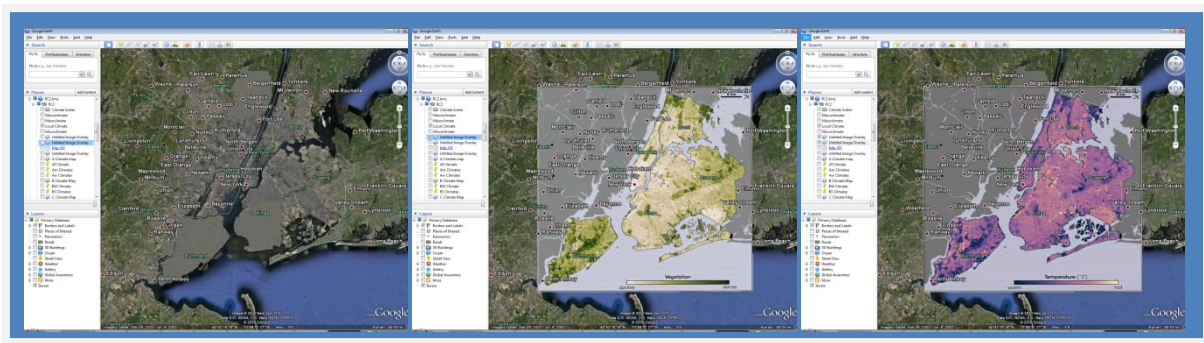


Figure 5. A series of screen captures that show a progression of geo-referenced images of New York City (NYC). The overlays show vegetation cover and corresponding average temperatures. Students that attend college near NYC can easily relate to these images and thus better understand the affect of vegetation and the urban heat island on climate.

Google Earth gives the teacher the ability to alter course at any time. If a student asks a question about a location not built into the presentation, the teacher can easily go there if it will contribute to the discussion. The student then becomes an interactive part of the lecture. Giving control of the lecture to students is scary for some teachers. Teachers must be confident and competent enough to be able to deviate off a predetermined path and integrate information and locations in the moment. This takes more preparation because a complete understanding of the material is a necessity.

The manipulation of Google Earth during a lecture can present some possible issues. Google Earth requires the teacher to be near the computer, thus limiting those who like to walk around while lecturing. At this time there is no way to advance to the next location from a distance via a clicker device. Because of the interactive nature, it is hard to have someone else control the platform. The teacher must get into the classroom before class and run through the locations prior to delivering the lecture. This preloads the placemarks and stores the images in temporary files that come up quick and clear. If the teacher runs through the locations without doing this they run the risk of a slow lecture with many delays.

The assessments of the classes provided some interesting results. The results did not prove either delivery method, Google Earth or PowerPoint, to be better than the other (Table 1.) Once again Class A received PowerPoint and Class B received the class in Google Earth.

Class	Class Averages		Lowest Grade		Highest Grade	
	A	B	A	B	A	B
Climate Classification	68%	64%	40%	20%	90%	90%
Tropical and Wet/Dry Climates	66%	68%	40%	30%	100%	100%
Tropical Deserts	82%	78%	60%	60%	100%	100%
Mid-latitude Climates	66%	74%	38%	52%	88%	98%
Polar and Highland Climates						

Table 1. Results of student assessments.

For the Climate Classification, the Tropical and Wet/Dry Climates, and the Tropical Deserts classes I administered the ten question quiz that tested material exclusively from the previous class. PowerPoint retention was overall slightly higher, but not significantly. For the Mid-Latitude Climates and Polar Highland Climates, I administered a quiz on the last lesson for the block and it covered all five classes. Class B scored higher on the quiz.

Overall, the class averages on the assessments are relatively close on all events. I show the highest and lowest grades on each event to give a perspective of range of responses I received. Even when taking out the outliers, the averages remain close to those in the chart. Although this is a study with only a few data points, the evidence points out that Google Earth is at least as effective as PowerPoint for covering class objectives during classroom lessons.

Google Earth received very positive remarks from Class B. When asked to write a reflection on the classes using the platform, most of the students liked receiving the class through this delivery system. More than one student wrote that they “liked the change of pace.” Others enjoyed the interactive nature, especially when they made suggestions and I navigated to those locations. Positives also included the pictures that were embedded, the 3D nature of terrain, the time lapse function in Google Earth and many enjoyed seeing the maps overlaid on the virtual globe. There were some negative remarks from a few students. Some did not like the time it took to get from one place to another, some prefer PowerPoint because that is what they are used to, and some said they got more comfortable with class as the classes progressed.

CONCLUSION

Google Earth has a place in the classroom. Delivering a class exclusively with Google Earth is effective at presenting the material that will cover the objectives of the class. There is nothing to say that a combination of different techniques during one lecture period is wrong. In fact I believe that it a great way to go. Students want to learn. Some of the methods teachers use in class will work with some students and not with others. If teachers focus on the important things and combine methods to teach those things, more of the students will get an opportunity to learn.

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