

GigaPan Dialogues in Environmental Learning

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ABSTRACT

Using the GigaPan imaging and discussion platforms, two Pittsburgh-area schools have shared each others' environmental learning experiences, virtually exploring a mine drainage remediation facility and sharing water analysis experiences. In addition to enhancing the existing environmental science curriculum with new spaces, the project saw students grow in initiative taking, collaboration, reflection, and communications skills. Educators found that the experience added to their repertoire of classroom approaches and that student enthusiasm and facility with the technology fostered a collaborative relationship between student and teacher. Key cross-curricular connections were made as students from both schools reflected on an issue close to home: drilling of Marcellus Shale.

Keywords

Dialogue, environment, education, science learning, water

INTRODUCTION

In the fall of 2009, two Southwestern Pennsylvania schools embarked on a dialogue about water – water quality, conservation, remediation, and field study. Each school has access to and regular contact with an environmental learning center; using the GigaPan imaging and discussion platforms, secondary-level students were able to explore their partner school's study sites, seeing mine remediation evidence, hometown gas wells, and field work first hand.

The Environmental Learning project is part of GigaPan Dialogues, a collaboration between Carnegie Mellon University and the UNESCO International Bureau of Education. GigaPan Dialogues seeks to foster intercultural understanding and social tolerance through the creation and sharing of gigapixel imagery, increasing the opportunity for finding peaceful ways to resolve conflict. The initiative connects secondary-level students in the Brazil, Indonesia, South Africa, Switzerland, Trinidad and Tobago, and the United States. The Environmental Learning project is unique in this context as the partner schools are separated by only 30 miles; the opportunity for students to reflect on their region through the lens of a different community was one of the core objectives of the project.

The challenge set forth for educators at a workshop in 2009 was to select a topic of joint interest for exploration between partner schools, work together with students to define an "adventurous question" to focus each school's perspective on the exploration, take GigaPan panoramas in the local community to illustrate the topic, mark up the panoramas with background information and observations connecting to the adventurous question, and engage in dialogue with the partner school about all panoramas posted in the project. Ultimately, each student group should be able to find an answer to their adventurous question within the images, annotation, and discussion.

The purpose of the environmental learning collaboration between Falk Laboratory School and Burgettstown Area School District was to compare bodies of water that each school has direct contact with. Water quality, remediation, and conservation are real world issues that our students must be exposed to. Burgettstown students helped Falk students see remediation evidence through their gigapan of gravity flow ponds at the district's outdoor education center, while Falk students explained the location and water analysis activities of the annual fall trip to McKeever Environmental Learning Center in Sandy Lake, Pennsylvania. These activities included gathering data on the stream's chemistry, biology, and physicality to determine water quality. The issues around water have become especially poignant for the Burgettstown area since Marcellus Shale drilling uses water in the process and homeowners with wells near drill sites have experienced their wells drying up or the water quality being impacted.

The students and teachers in the project were pioneers in using gigapixel imagery and social media for science learning. As with any new initiative, particularly one incorporating a new technology, there were challenges to overcome – times when the equipment did not work as planned. By giving students the space to become the experts in the technology, teachers were able to foster a collaborative learning environment and saw their students shine as they took on increasing responsibility for the project and for their own learning.

THE PARTNERS

Burgettstown Area School District

The Burgettstown Area School District (BASD) educates approximately 1500 students in grades K-12. The campus has two buildings: the Burgettstown Area Elementary Center and the Burgettstown Area Middle/High School. The district is in a rural part of southwestern PA and is fairly equidistant to Pittsburgh, PA, Weirton, WV, and Steubenville, OH.

Participants

Three high school faculty members and a technology coach collaborated to implement the project at BASD. The Advanced Art teacher worked with the technology coach to help her develop an eye for the image; the technology coach did most of the photography since her schedule allowed most flexibility. The Spanish and Social Studies teachers set the rules and provided classroom time for annotating the images and engaging in dialogue. In total, nearly 200 ninth-grade students at BASD participated in the project, joined by 14 students from grades 10-12 in Spanish III.

The Adventurous Question

What do you believe is unique about our area? What are some pieces you would like to share with others?

Curricular Objectives

At BASD, our main goal was to further develop our students as global citizens and to help them develop appropriate skills for interacting online in a constructive way. Many of the proposed standards for world languages include an understanding of culture. We wanted our students to understand that other groups live differently than we do and that they may perceive things differently as well. In History, many standards also reflect the importance of culture. Additionally, history classes often use primary source documents and GigaPan images are authentic items that go beyond many others since the dialogue and snapshot components make the images interactive.

Learning Activities

Through classroom discussion, students decided where panoramas should be taken to address their adventurous question. In some school settings, taking the panorama is an integral part of the student experience. However, given the number of students involved and the need to leave campus to take the pictures, teachers took the pictures, providing less direct technology exposure but adding a student-led component to the process. Students discussed both their images and images posted by the partner school in Social Studies and Spanish class (conversing in Spanish) and were guided in standards for online discourse, including respectful phrasing and proper grammar and mechanics.

Assessment

Because our goals at BASD were difficult to measure, we checked in with our students throughout the project to see what they felt about the experience and what we could do to improve. They responded that they liked seeing what others shared and wrote, and they were now looking at our environment in a different way. They exceeded our expectations by taking over their learning and by the end of the project, they were dividing up the work among themselves and collaborating with each other on how best to respond.

Falk Laboratory School

Falk Laboratory School is a K-8 private school with enrollment of 275 located in the Oakland neighborhood of the city of Pittsburgh. It is also directly affiliated with the University of Pittsburgh School of Education.

Participants

Two middle school Science teachers were involved, as well as 34 eighth grade students. Most students had already worked with the GigaPan hardware in Technology class, and the Technology teacher was a source of support for the students and teachers although not directly involved in the Environmental Learning project.

The Adventurous Question

What can we learn from comparing the body of water we study with the ponds at the Burgettstown outdoor education center?

Curricular Objectives

4. The curricular objectives that Falk teachers desired their students to achieve were to 1) experience the gigapan in a content area, 2) observe and question the Burgettstown students about the water quality of the Ponds, and 3) answer questions about our trip to McKeever Environmental Learning Center.

Learning Activities

Falk 8th graders were required to complete a number of data collection activities as part of the stream analysis during our McKeever trip. While they were working, their teacher decided where to take the gigapans. These students have also experienced the GigaPan for a number of years as part of their Technology class, so technology exposure was not a focus for them on this trip. The Science teacher wanted to include the stream, its banks, and as many students working as possible. Upon return from the trip, the students saw the pictures, decided which to include, and wrote the descriptions. After posting the pictures, students interacted with the Burgettstown students during class over several days, observing and questioning the Burgettstown panoramas and responding to questions about their own panoramas.

Assessment

Teachers witnessed learning based on the questions the 8th graders posed and how they answered Burgettstown's inquiries. The gigapan project added to the teacher's repertoire of instructional techniques. As a result, the students were exposed to the gigapan in a content area outside of their technology class.

UNESCO-IBE and the Global Connection Project of Carnegie Mellon University

The main purpose of UNESCO, according to its Constitution, is to contribute to peace and security by promoting the collaboration of nations through education, science and culture, in order to further universal respect for justice, the rule of law, human rights and fundamental freedoms for the peoples of the world, regardless of race, sex, language or religion. The main mission of the International Bureau of Education (IBE) is to act as UNESCO's Center specialized in contents, methods and structure of education. It builds networks to share expertise on curriculum development in all regions of the world and aims to introduce modern approaches in curriculum design and implementation, improve practical skills and promote informed dialogue at regional and international levels.

Global Connection is a joint project of Carnegie Mellon University, NASA, Google, and National Geographic. The project's long-term goal is to help us learn about and meet our neighbors across this globe, and learn about our planet itself. The team is motivated by the desire to encourage global citizenship and understanding by connecting people, places and events through the utilization, exploration and sharing of dynamically viewable images. The Global Connection Project develops software tools and technologies to increase the power of images to connect, inform, and inspire people to become engaged and responsible global citizens.

In partnering, Carnegie Mellon and UNESCO-IBE seek to bring Internet and Communications Technologies (ICTs) and 21st century skills to youth around in the context and service of intercultural understanding, active guided pedagogies, and the principles of Learning to Live Together.¹

THE GIGAPAN EDUCATION FRAMEWORK

Schools participating in GigaPan Dialogues form one of the many educational communities using the private website education.gigapan.org. Access to this website is open by application to students and teachers, and access to the individual projects these students are working on is further limited to a particular group of schools. Multiple layers of protection ensure that no unauthorized users can comment on students' panoramas or read their comments. Students also have no need to leave the protected environment to explore and discuss panoramas in the project.

Each project has a project page on education.gigapan.org, containing a project description, list of participants, and panorama thumbnails. Clicking on a panorama thumbnail leads to a panorama detail page, with the panorama and description at the top and the dialogue scrolling beneath it. Threaded dialogues are headed by snapshots, and each observation, question, or response shows a picture representing the person that posted it – either an actual photograph or an avatar selected by the user. Much of the functionality is similar to what is found on www.gigapan.org, but the presentation is designed to focus dialogue in the context of a particular project/topic and community.

Examples of panoramas and dialogue from the Environmental Learning Project follow.

BURGETTSTOWN AREA SCHOOL DISTRICT OUTDOOR EDUCATION CENTER

BASD, October 2009

The Burgettstown Area School District Outdoor Education Center was developed to provide an area in which students and members of the community can observe and appreciate the diversity of their environment. Utilizing stripped and underground areas, the center showcases remediation of abandoned mine discharge and provides an opportunity for visitors to explore that process.



How exactly does the pipe between the ponds work?



A pump is put into the mine water where it pumps water into the first pond and the pipe transfers to the second pond so the water is not as contaminated.



What kinds of plants live in/around ponds?



The plants that live in/around the ponds are flowering rush, burr reed, reed mace, bog bean, yellow flag, and mug sedge.



What chemicals are actually polluting the water?



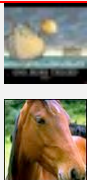
Acid mine discharge is the main cause for pollution of the water.

For this panorama, facts about the outdoor education center and the remediation process were posted by BASD and the image and description were presented to Falk students in Science class. Falk students were challenged to write multilevel questions about the ponds, and BASD students responded, with follow-up dialogue emerging in some cases. Preparatory and follow-up discussion in the classroom grounded Falk students' understanding of the problem of abandoned mine drainage and techniques for remediation. BASD students deepened their understanding by reflecting on and responding to Falk students' questions. In exploring the panorama of the ponds, students were able to take unique, individual journeys through the image, referring to the explanatory text and engaging in discourse with peers. Learning both from teachers and from peers contributes to authentic learning, and helped students identify with the issue as both a subject of academic study and a real problem close to home, with real solutions that they can be a part of.

MCCUTCHEON RUN WATER ANALYSIS

Falk Laboratory School, October 2009

This panorama shows Falk 8th graders looking for aquatic macroinvertebrates in McCutcheon Run, at McKeever Environmental Learning Center in Sandy Lake, Pennsylvania. Students from BASD showed great interested in the purpose, equipment, methods, and results of their experiments.



What is the tool that has mesh between two lengths of wood used for?

That is a kick-net, and we used it to catch the bugs we kicked up from the bottom of the stream.



What is the kid collecting on the white sheet?



All those kids are looking for bugs on the kick-nets. We used the white shower curtains to help us see the bugs on the kick-nets.



Aquatic macro invertebrates (bugs). The white sheet was used to see the bugs that were caught using the kick net.



What is the significance of the aquatic macroinvertebrates?



Much knowledge can be gleaned about a certain body of water from studying the aquatic macroinvertebrates that reside there. When there are many different types of macroinvertebrates, the body of water is biologically diverse, which demonstrates that the stream is healthy. You see, different species can tolerate different levels of pollution. So when many species are supported, it can be assumed that there are little pollutive substances present within the water.

This was the last of five panoramas posted in the project, and growth in sophistication in both dialogue and image exploration are evident. There is more variety in placement of the snapshots, and in zoom level – students investigated the panorama in depth, taking advantage of the high resolution to examine and ask about bugs, moss, and plant life.

CONCLUSION

In the Environmental Learning project, the GigaPan imaging and online dialogue framework has been an effective tool for enhancing the classroom experience in a formal learning setting. Through the process of identifying, capturing, discussing, sharing, and reflecting on high-resolution panoramas, students and teachers have developed 21st century skills, communications skills, and perspective taking, in addition to the primary goal of Science learning. They have made the connection that science is something that young people can do from the water analysis panorama and discussion. By exploring the difference in water quality in the ponds, they have seen the relevance of Science to identifying and attacking real-world problems, and may make the further connection to future careers.

There were five panoramas taken in the Environmental Learning project, with 107 snapshots and 253 comments (averaging 2.4 comments per snapshot). Students showed growth in sophistication of dialogue, and developed their skills in using the online framework, taking advantage of the high resolution of the panoramas to explore in detail. Recommendations from participants on improving the experience include firmer scheduling, increased student ownership over the taking of panoramas, and better communication of partner activity. These recommendations will be incorporated in GigaPan Dialogues for 2011.

This partnership connected two communities that are geographically close but very different in character. Burgettstown is a rural community, while the majority of Falk families are connected with the local universities and live in the city. There would ordinarily be little opportunity for the two student groups to interact. We believe that the impact this project has on the students involved will be long-lasting and will grow in strength, particularly as the exploration and drilling of Marcellus Shale becomes a critical issue in our region. Urban students who will hear the topic discussed in abstract terms have explored *on their own terms* images taken in their peers' back yard. They will be able to identify with the issue as having impact on water quality and availability of people they have talked to. They may be able to appreciate how the economic situation can affect the priority we place on protecting the environment. Learning takes place as much in the serendipitous discovery as in the one presented by the photographer. In a panorama of a gas well, a student found a truck and asked if it was for hauling away gas; the response – “Those are actually practice trucks for students that want to learn how to drive 18 wheelers for a commercial driver's license” – gives tremendous insight into the community and helps to situate the panorama not just in visual context but in human terms.

ACKNOWLEDGEMENTS

The project benefited greatly from the support and vision of the BASD and Falk school administrations, in particular Amy Rush and Wendell McConnaha, and could not have happened without faculty collaborators Barbara Bianco, Kelly Cadarette, Heather Dengel, and John Sargent. The authors are also grateful to colleagues at Carnegie Mellon's CREATE Lab and UNESCO-IBE for advice and support. Special thanks to the UNESCO Associated Schools Project Network (ASPnet) for bringing the project to its international network of schools.

The GigaPan Dialogues project is made possible by the generous support of The Benedum Foundation and The Pittsburgh Foundation, and of Carnegie Mellon's Global Connection Project.

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