students from other sciences as part of their general education requirement. A large majority of the students surveyed indicated that GEOpod enhanced their learning of a concept or phenomenon in a significant way. This strong response was impressive considering that the students were exposed to GEOpod for such a short time in a single course. Students' open-ended responses revealed their enthusiasm for the GEOpod technology and its potential usefulness as a learning tool in their meteorology courses. Students remarked that the technology was not only visually compelling, but also helpful in deepening their understanding of a topic. Further evaluation of GEOpod is planned following its implementation in upper-level meteorology courses and in applied settings such as student forecasting for the Millersville University Campus Weather Service.

The GEOpod project is in its final year (2009–12). Friendly users will be tapped to test further enhancements to GEOpod made during the summer and the plug-in will become available to the community as open-source software thereafter. For those interested in experiencing GEOpod, a short course (the AMS Short Course on Interactive Immersion Learning: Flying through Data Onboard the GEOpod) will be offered at the 93rd AMS Annual Meeting in Austin, Texas, on Sunday, 6 January 2013. Information on the short course and registration can be found at http://annual.ametsoc.org/2013/index.cfm/programs-and-events/short-courses.

This project is funded through a grant from the National Science Foundation (NSF-IIS 0835411).

FOR FURTHER READING

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ON THE WEB

THE USE OF SOCIAL MEDIA TO IMPROVE CLIMATE LITERACY

The Green Ninja Project

BY EUGENE CORDERO

During the summer of 2011, Google.org hosted a workshop to provide hands-on training on technology and science communication with a focus on climate science. The participants, who were primarily climate scientists with an interest in science communication, were offered an opportunity to learn more about how new media tools such as blogs, search technology, and games could be used to help them become more effective communicators. Although there was a wide range of topics covered during the workshop, this essay will focus on optimizing the YouTube platform and the related use of other social media tools to communicate climate science. A case study using the Green Ninja Project—a Web-based educational project that utilizes social media to improve climate change literacy (see inset)—will be described to illustrate how some best practices for using YouTube were applied to an existing educational program.

With more than 3 billion videos viewed each day, YouTube offers the opportunity to share science with a lot of viewers without the cost and challenges of other commercial media. However, with more than 1 million new films uploaded daily, competition for viewers' attention is fierce. A variety of strategies were shared during the workshop to help participants understand this medium and the best practices for building a strong subscriber base. Although no single recipe for success exists, a majority of the current top 100 YouTube channels use elements of these best practices. It is also clear that having consistent viewers and building a strong and loyal subscriber

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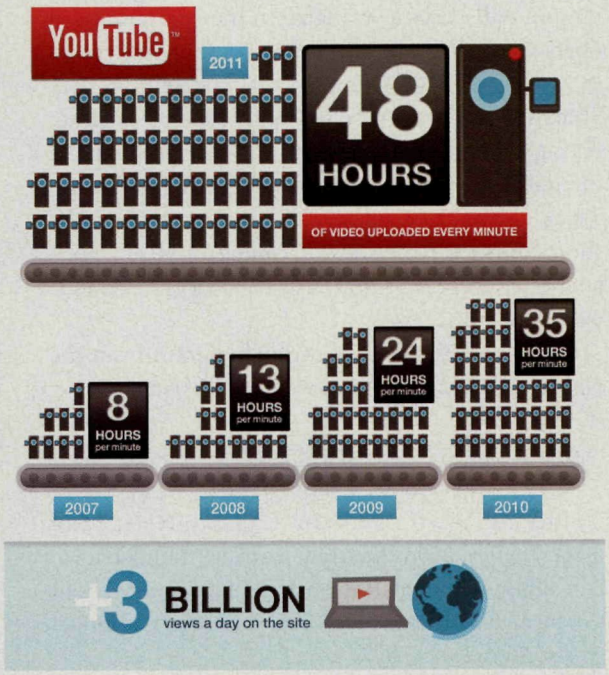


The scope of social media's influence is illustrated in YouTube statistics of viewership and hours of uploaded video every minute. Platforms like YouTube combined with an abundance of video-producing technology (e.g., cellphones) have made online video-sharing a popular and attractive medium for exchanging information.

base is the goal for any outreach program; aiming solely for a video to go viral should not be the goal. While YouTube is known for those viral videos, they are actually quite unusual—almost like winning the lottery.

So how do you build a solid and loyal subscriber base? Here are some important steps:

1. *Honor your image.* Start by creating a solid look, feel, and image. Consistent branding is important. Does the site have a recognizable look and feel? Most people remember the theme song to their favorite TV show.
2. *Every second counts.* Unlike TV viewers, who are leaning back, Internet users are leaning forward, ready to engage and do something. So, paying attention to each video, and making sure it's lively and engaging, is important. YouTube analytics provide each channel with useful data about their viewers, including a tool (called "audience retention") for determining if there are sections in a video where people stop watching. If such a situation is found, then the video can either be edited or amended using the annotations feature to help better engage the audience.
3. *Be regular.* Regular content—weekly or at least a couple of times per month—is important. As with commercial television, people tune in regularly for their favorite shows, and often they have their favorite YouTubers.
4. *Engage your audience.* The Internet is about interactions, so create ways to make the experience two-way. Develop a call to action—ask your audience to leave a comment, subscribe to the channel, tweet about the show, share with their friends, or upload their own photos or videos. This builds loyalty and can attract additional viewers.
5. *Socialize.* Use other social media tools to bring people into your world. Partner with other groups with similar values; collaborate so you can co-promote. Use your blog or Facebook presence to draw traffic or solicit feedback. Then, analyze your results to learn about your viewers.
6. *Make money.* Finally, if you do the right things, it's also possible to make money by selling ads that play during your video. YouTube claims there are hundreds of YouTube artists making six figures a year, so it's possible that a successful science or educational program could make enough money to support part of the production efforts.

The Green Ninja Project is an educational initiative that aims to educate young people about the science of climate change and then give them the tools and inspiration to make changes in their community. The adventures of the Green Ninja, a climate-action superhero, are told in various animated and live-action films. Working directly with teachers and educators, the Green Ninja Project develops resources and lesson plans to help bring climate science topics into the classroom. Eugene Cordero leads a collaboration of scientists, educators, and artists who together create Green Ninja media for education and social change.

The Green Ninja Project (www.greenninja.org) is a useful case study to exemplify some of these steps. An understanding of successful YouTube approaches led to various changes in the outreach strategy for the Green Ninja Project, and it also led to some rethinking of earlier assumptions. These changes included a stronger emphasis on a consistent brand and feel, the use of annotations to generate calls to action within the videos, and more emphasis on both a blog and Facebook presence to help drive traffic to the videos and generate more audience interactions. At present, these strategies appear to be working, as total viewership this year is already 30 times larger than in 2011. However, it was also realized that one of the challenges to further expanding viewership is producing regular content. Although plans for a weekly show are in the works (stay tuned for *The Green Ninja Show* starting in January 2013), an understanding of YouTube best practices will help shape priorities and expectations for the weekly show that are realistic.

The value of social media as a communication tool is well established, and yet remains a challenge for many. With so many tools for engagement (e.g., social, blogs, chats, tweets, and videos) and so many platforms (e.g., Facebook, Tumblr, Google+ Hangouts, Twitter, and Vimeo), getting started can seem quite daunting. A piece of advice shared often during the Google workshop was to choose one tool and then experiment with it. It's not necessary to tweet, blog, and use Facebook all at once. Try one out, play with it for a while, and see if it's something you enjoy. The goal for many scientists and educators is to communicate with others, so use a tool you feel comfortable with and have fun with it. Good luck and see you online!

HERE COMES THE CLEANING SUN

The world's first packaged branded soap, Sunlight, was produced by the British company Lever Brothers in 1884. At the time they probably never imagined that real sunlight could eventually be used as a cleaning product. Researchers at the Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB in Stuttgart have been working with titanium dioxide molecules that are activated by UV light to help fight the stubborn mold and moss that collect on outdoor furniture. When added to the plastic that makes up the furniture, the molecules trigger a reaction that produces free radicals that kill the stubborn substances. In a test, the surfaces of the furniture made from photocatalytic plastics were almost completely clean, even after spending two years outside. The scientists are working on more products, such as paint and a self-cleaning coating for glass surfaces. And those who live in cloudier climates don't need to despair because unlike some of its predecessors, this coating only takes about an hour of sunlight to be effective. The researchers say the next step is to develop new materials that can be activated by artificial light. (SOURCE: Fraunhofer-Gesellschaft)

ON THE WEB

WORKBOOK HELPS CHILDREN COPE "AFTER THE STORM"

New findings from a study in the *Journal of Affective Disorders* indicate that children are a high-risk group for long-term adverse reactions following a natural disaster. Annette M. La Greca, professor of psychology and pediatrics at the University of Miami, studied children's reactions following Hurricanes Andrew, Charley, and Ike, and discovered that it's critical to evaluate children and help them cope with stress in the aftermath.

"Children may have to move or change schools," La Greca notes. "Their neighborhood may not be safe for outdoor play and they may not be able to spend time with their friends. Children need help coping with these and other post-disaster stressors."

The researchers found that children who have experienced a disaster and exhibit signs of post-traumatic stress and depression are less likely to recover by 15 months post-disaster than other youth. They also report more severe levels of psychological symptoms and experience more post-disaster stressors than other youth. La Greca emphasizes the importance of identifying these children to help improve their psychological functioning.

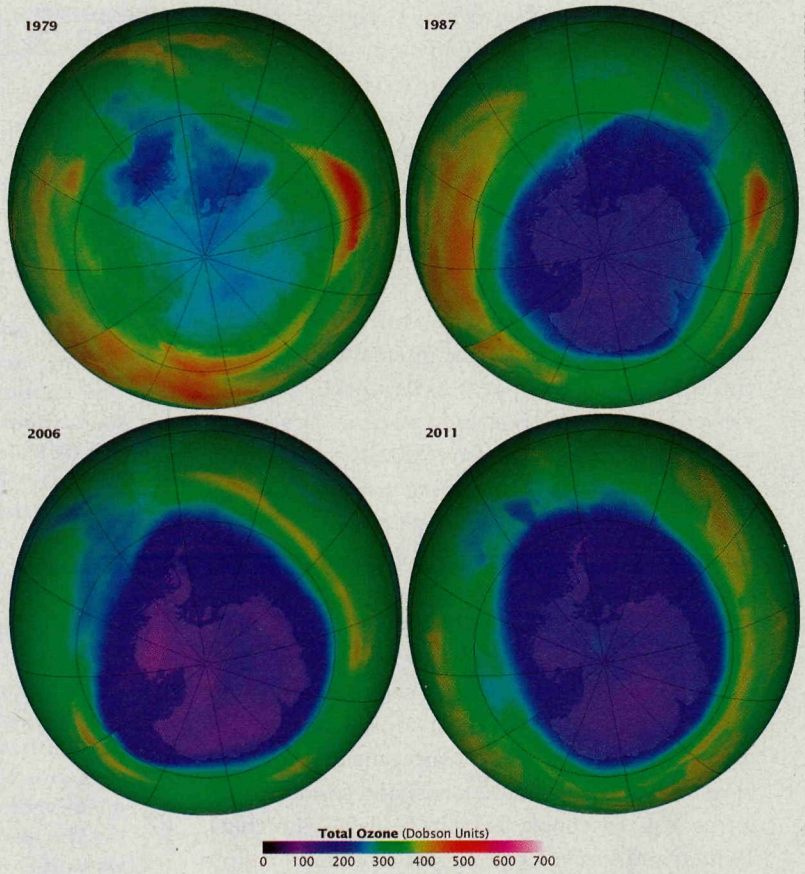
To help, La Greca has developed a workbook for parents to help their children cope in the wake of a natural disaster. The *After the Storm* guide book provides tips for helping children stay healthy and fit, maintain normal routines, and cope with emotions such as fear

and worry. The book is available for free download at www.7-dippity.com. (SOURCE: University of Miami)

A New Place for NASA Content

NASA's new iPad app, Space Place Prime, highlights recent Web content of interest to Earth and space science enthusiasts of all ages. It gathers videos, articles, and photos from various NASA websites, including the Space Place site (http://spaceplace.nasa.gov) and the Earth Observatory Image of the Day page (www.earthobservatory.nasa.gov/IOTD).

The free app features a grid of images, each one leading to an article, photo, or video with a tap of the screen. A list mode of content menus is also available. The site is updated daily with new material, and favorites can be tagged for permanent archive. Sample articles include "Watching Sea Level Rise from Space" and "Life in a Greenhouse? How Ghastly!," while video highlights include "A Taste of Solar Maximum." The adjacent image is an example of a photo that can be found on the Space Place Prime app.



Originally appearing on NASA's Earth Observatory page, it shows the Antarctic ozone hole on 16 September (which is the International Day for the Preservation of the Ozone Layer) in 1979, 1987, 2006, and 2011.

The app can be downloaded at http://itunes.apple.com/us/app/space-place-prime/id543935008?mt=8.

TECHNOLOGY

Algorithm Enhances Wave Energy

Marine energy is currently 50 times more expensive to collect than the market price for the energy itself, but a study published recently in *Renewable Energy* has developed a new methodology that vastly improves the efficiency of wave energy converters (WECs), potentially making this type of energy more commercially feasible.

WECs collect wave energy that is generated by the resistance force between the converter's fixed upper section and its moving lower part. The problem is that each wave brings a different amount of energy, and the WEC must adjust to those differences. If there is too much or too little resistance between the two sections, then no energy is generated. The new method utilizes a unique control algorithm in tandem with existing wave-prediction technology to establish the optimal resistive force for the WEC depending on the characteristics of each oncoming wave. Lab simulations using wave data showed that energy collection doubled using the new technique, as compared to the typical amount generated by WECs.

The study found that the height of the wave is the most important variable in the process, and that the WEC needs only a 1-second prediction of wave height to function properly. A processor attached to the WEC calculates the algorithm five times per second, allowing it to generate the ideal mechanical response to each individual wave.