Smiling While Guiding Thirty Sixth Graders through Internet-Based Curricula when the Internet is Down (And Other Lessons Learned with *One Sky, Many Voices* Projects)

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For several years, the *One Sky, Many Voices* (OMSV) (www.onesky.umich.edu) education and science group at the University of Michigan has developed, researched, and learned from technology-rich inquiry science programs adapted to thousands of classrooms across the country. Our work to support thousands of students, teachers, and scientists as they forecast current storms or predict landfall for live hurricanes off the coast of Florida is extremely challenging. Nevertheless, our research results demonstrate strong learning gains and new motivation to learn science among a wide range of middle school students as a result of participation in our programs (see website for research papers). Importantly, we have also learned several important lessons on how to design and support Internet-based curricula among thousands of simultaneous learners. Below we share four of these lessons learned, as well as our latest curricular program.

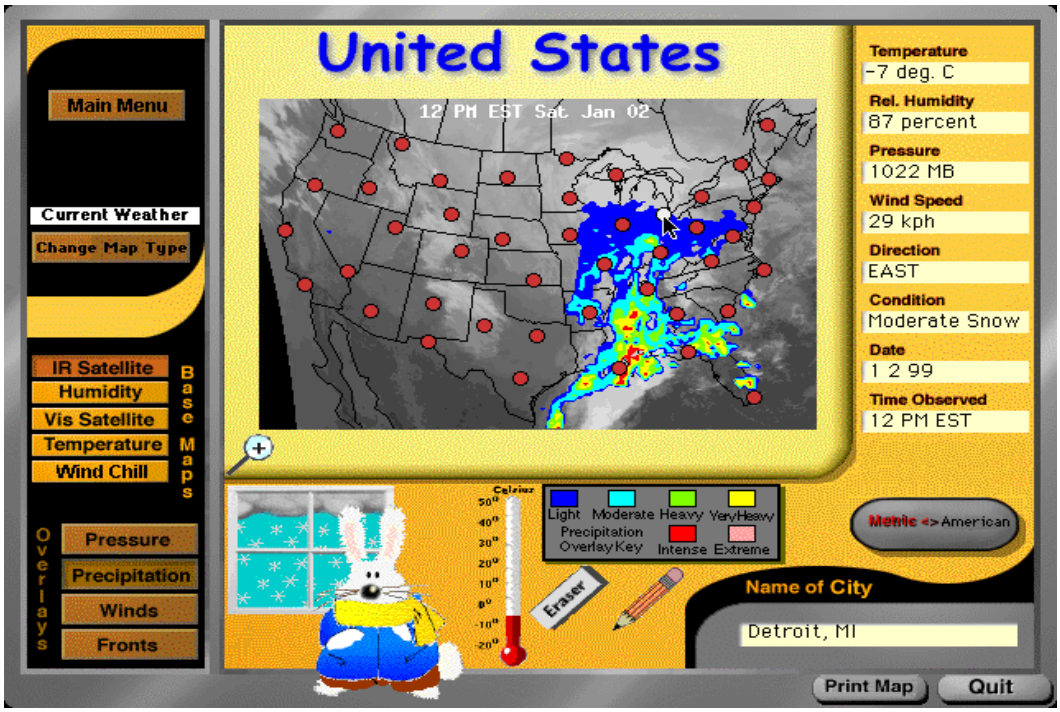
Lesson 1: The Internet-Based Programs Must be Far More Reliable Than the Internet Itself

Our project materials describe one goal as the following: *To create innovative, inquiry-based science programs that utilize current technologies such as CD-ROMs and the World Wide Web for the interactive study of current science.*

One of the somewhat unique benefits of our program is that for our $20. classroom subscription fee, we provide Internet-capable CD-ROMs that retrieve current weather imagery from websites around the world, and place them in a kid-friendly interface that allows learners to customize the images as they wish, such as superimposing current radar over live satellite images as pictured below (see Figure 1). Our web browser sits on this CD-ROM, and it allows learners to get whichever live images they need to answer their own questions about weather (as guided by our eight weeks of activities). Unlike traditional web browsers, our CD-ROM-based browser does not allow kids to check sports scores or the weather in Tampa, FL—only to retrieve weather imagery, thus keeping kids' attention focused more directly on the science activities at hand.

What happens when a teacher wants to guide her class through our activities to forecast live storms, and realizes her Internet connection is down? We quickly realized that we needed a good response to this issue if we were to entice many teachers to use our programs each year. Therefore, we added complete sets of imagery of archived storms on each CD-ROM. The archived storms look exactly like the live pictures, and allow

students to work with all of our activities when the Internet is not available. This feature allows teachers to continue teaching our activities each day of the program, even when their Internet connection was down or unreliable. Good teaching cannot wait for the Internet to become a reliable resource every day of every academic year. Therefore, in order for classrooms to take advantage of Internet-available resources such as current weather imagery, we strongly recommend that other projects consider mechanisms to provide consistent educational resources for their programs so that good education can continue even when the Internet does not.



Lesson 2: Good Support Means Participants Supporting Each Other

"The lateral learning and discovery that accompanies the core program is incredible. And just perhaps that is all a part of the plan." (An OSMV teacher from New York)

As a result of participation in the conversations on the OSMV teacher message boards, this teacher realized what he calls "lateral learning", meaning the tips on teaching that he learned from other teachers who had taught this program in previous years. As the curriculum is subscription-based and implemented at the same time in all classrooms, message board conversations often focus on the lesson being taught that week, allowing teachers to feel more confident in their enactment even if they are enacting it for the very first time.

In our program we provide professional development and support to two loose categories of teachers: urban systemic teachers and mavericks. The urban systemic teachers are all from the local urban district that partners with OSMV for urban reform and professional development. The maverick teachers are from all across the country, largely find us on

their own, and can not be provided the same type of supports that can be provided to the local teachers in our partner district. Designing teacher professional development and support for both groups has been an on-going process.

Teachers participating in our programs are often stretching themselves to engage with content and teaching that they have not attempted before. Even those that have been participants for years encounter unique challenges to their teaching and ideas about learning with each new enactment. We have developed a variety of resources to support risk taking. More distant teachers utilize the teacher message board referred to earlier to learn from peers and scientists about today's weather, a message of the day from scientists built into the CD-ROM, and support within the curriculum materials themselves. In our local urban partner district, the OSMV team conducts workshops in the summer as well as on-going workshops and study groups prior to and during the enactment of the curriculum. For each teacher, we work to provide ongoing, responsive supports that help them find conversations, tips, and resources that smooth their individual teaching of our Internet-based programs.

Lesson 3: Promote Large Scale, Not Scaling

Scaling is a major thrust of educational reform initiatives; without broad impact in a large number of schools reforms run the risk making no lasting change on the educational landscape. One of the clear lessons from our work is that curricular programs can not be 'scaled' in the sense of providing cookie-cutter curriculum that researchers feel must be implemented in a particular way in a wide variety of school settings. The resources and constraints that individual teachers encounter are diverse and cannot all lead to the same enactment. We obviously want our curriculum to be adopted by as many teachers as possible, but we do not prescribe, or even anticipate that they will all enact it in the same way. We build curricula that we fully expect will be adapted by teachers to their local classrooms. We think that this flexibility is one of the real strengths of our curricular programs.

Lesson 4: Teaching Inquiry is Many Variations on a Theme

Our final lesson deals with the idea, or more correctly the ideal, of science inquiry. When people talk about inquiry there is an implication that there is a clear and somewhat monolithic idea of how this should look in classrooms. For example, there should be small groups of student engaged in a variety of more or less self guided activities with the teacher moving from group to group acting as a resource and guide. While this is a nice image, it is not realistic within the constraints of some schools, so we believe that the definition of what inquiry looks like needs to be broadened. One example is our work to redefine what small group inquiry activities could look like in a class size of 35, as is common in urban schools in our region. (The bottom line answer is that inquiry can work very well without small groups). We need to develop multiple exemplars of inquiry, so that teachers in a variety of environments can have strong and successful models to follow. This approach can help a wide range of teachers to be effective as agents of successful inquiry without breaking themselves against an unattainable single model of the right way of doing things.

New Program: BioKIDS

We are currently developing a new curricular program, BioKIDS: *Kids Inquiry of Diverse Species*, built on the lessons from our earlier programs and extending them into the area of biodiversity. BioKIDS gets students involved in collection of field data and construction of a local field guide for their area, but also gives them access to large data sets about species distribution and behavior so they can deeply explore inquiry into species interrelationships. Local data collection is done by students in the field with GPS capable handheld computers and CyberTracker ™ software that allows them to easily record animal sightings and later compiles them into a large class or even program-wide database. Students also use the Internet to build species accounts that describe their species in detail and can be linked to other students accounts from all over the country to create webs of relationships. The Animal Diversity Web™ (animaldiversity.ummz.umich.edu) at the University of Michigan provides access to professional level species accounts and also hosts the student-created accounts. Finally, Nature Mapping™ (www.fish.washington.edu/naturemapping) provides access to large biodiversity data sets and a simplified geographic information systems interface that allows students to do more in-depth inquiry as to how species relate to each other.

BioKIDS gives the OSMV team another opportunity to improve on our design and understanding of technology-rich inquiry science curriculum in the hopes that we can continue to meet the needs of as many science teachers around the country.

Registration for OSMV programs is accessible before each program on our web site: http://www.onesky.umich.edu. Please contact onesky@umich.edu for any additional information.