

Whyville

By Cathleen Galas and Jen Sun
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What is Whyville?

Whyville.net is an inquiry based, learner-centered, online science community that appeals widely to adolescents between the ages of 9 and 14. Whyville has more than 2 million registered users. In addition, about 68% of the users are girls, an unusual feature for a science education site. Caltech science educators and researchers created Whyville and founded Numedeon in 1999 to create an online science-learning environment for kids. Caltech's hands-on, inquiry based, constructivist pedagogy is the internationally recognized Cal-Tech Pre College Initiative (CAPSI). Whyville, privately owned by Numedeon, Inc. in Pasadena, California, has now been online for eight years, the longest running virtual online community.

The Whyville world supports exploration, communication, interaction, real world problem solving, and science education as users participate actively in learning by completing science activities and games, writing in the Whyville Times and researching issues confronting the community, meeting and communicating with others online, and having fun. When users first come into Whyville, they are given a blue, "newbie" or "bluebie" head to represent their online identity. One of the first activities users usually engage in is to procure enough

of the Whyville currency, clams, to purchase face parts, clothes, and accessories to represent themselves uniquely within the virtual world.

Whyvillians earn a salary of “clams” by participating in interactive science and math activities, or they can pick up some extra clams for jobs in the community such as cleaning up the Whyville cafeteria. When users are online they are participating in various science and math activities, chatting with each other, whispering to a friend close by, changing their faces at Pick Your Nose, writing for the Whyville Times about issues they personally care about, using the warp wagon to quickly travel around the world or through time, as well as selling, purchasing, and trading their avatar parts. Whyvillians can spend their virtual salary on designing face parts to sell by creating their own online business, designing their own avatar, customizing their chat bubbles, or buying a virtual Scion car to drive through the community.

Occasionally, players experience the outbreak of a virtual epidemic, called Whypox, which impacts their chat by inserting “Achoo” and covering their avatars with red spots. Sometimes when Whyvillians visit the beach (one of the most popular social areas), they discover the water is red or brown and try to learn why by visiting the WhOI Plankton Lab.



Learning Internet Safety

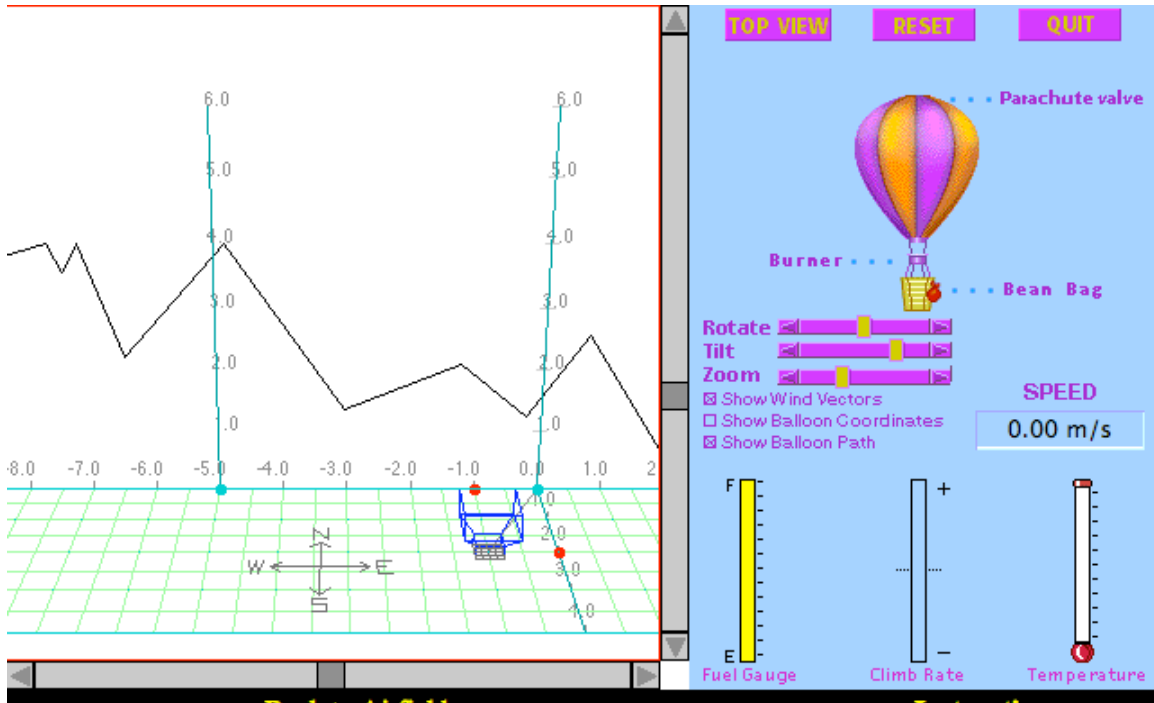
Tweens and adolescents learn the lessons of internet safety within the Whyville community. Parental permission is required for users under the age of thirteen. Once users register, and before they can participate in chat, they must pass a test to get their chat license after spending three days getting familiar with the community and the safety tools. Abusive language is not tolerated: there are filters for language, and swearing, bigotry or threats are not tolerated. Whyvillians with duct tape over their mouth have lost chat privileges for a few days to think about their behavior. Users learn not to divulge personal information online, as asking for or giving out personal information or passwords is not allowed. However, some users learn the hard way, give out their password to someone promising them

riches, get scammed, and may experience a loss of all their possessions and clams, and have to start all over. These lessons are perhaps more safely learned in an adolescent virtual world like Whyville and then applied in the real world.

Science Learning Games





Whyvillian salaries go up when they play interactive games, which have differing numbers of levels with different salary incentives. Users are awarded their salary each day they log onto Whyville. They may also receive one-time bonuses and raises for contributing to the public understanding of disease spread during a Whypox epidemic when they visit the CDC to analyze and discuss the virus. If users want to start their own clam-making business by designing and selling face parts, the tools and instructions for face design are available to them at Akbars. A ledger is included in each users satchel and shows a bank statement with clams earned and spent, a salary ledger listing games and levels with corresponding financial rewards, and a bonus ledger offering clam bonuses for various achievements, including educating parents about ones Whyville citizenship.

There are numerous educational games and activities to participate in and earn salary rewards. Whyville's partners sponsor some of the games. NASA sponsors several simulation games, including a game that teaches ion engine principles, the next technology for long distance space travel. The Skater game teaches angular momentum. The Alien Rescue Game takes you around the world in search of lost aliens while learning how the perceived path of the sun changes throughout the year. Geodig takes you around the world to discover rocks, fossils, and gems. The Great Balloon Race, created by the University of Missouri, challenges you to navigate altitudes and analyzes vector fields to race your balloon. In Mimi's Dance Studio, you design a dance using vector arithmetic. The Getty Trust sponsors the Getty Museum on Whyville, where citizens learn about art composition and travel the world and time searching for artwork and learning about art and artists. In the SmartCars Arena you are challenged to design circuitries to drive robot cars to race. The Greek Theater draws a crowd when a forum is held on spectroscopy to help players with hardest game in Whyville, the Spitzer Spectrometer. These are only a few of the many interactive games available to Whyvillians, and City Management and Whyville sponsors are often at work designing new ones.



The Hot Air Balloon Challenge: Level 5

Individuals learn about personal nutrition while participating in the University of Texas Health Science Center at San Antonio (UTHSCSA) nutrition initiative called WhyEat. Players eat and design daily virtual breakfast, lunch and dinner menus. If they eat healthy, they move faster and chat quicker, whereas, if they don't eat healthy, they are bulimic, have a calcium deficiency; get scurvy or experience other avatar health consequences. Players learn that there are many different ways to stay healthy.

My vision was poor.	I was feeling a bit heavy.	My bones were brittle and my belly didn't feel so good I was also feeling a bit weak.	I was feeling so bloated. I was also feeling a bit weak.
			
<p>How I looked Wednesday Aug 30, 2006 (How you look today depends on what you ate on the last 7 days.)</p>	<p>How I looked Friday Jun 30, 2006 (How you look today depends on what you ate on the last 7 days.)</p>	<p>How I looked Saturday Jun 24, 2006 (How you look today depends on what you ate on the last 7 days.)</p>	<p>How I looked Monday Jun 19, 2006 (How you look today depends on what you ate on the last 7 days.)</p>

Periodically, the beaches in Whyville are brown or red and players are asked, "What is happening to the water in Whyville? Say 'sample' to get a sample of the water. Go to WhOI's Plankton Lab to find out what's in it." Whyvillians go to WhOI, sponsored by Woods Hole Oceanographic Institute, where they can get in a boat with various sensors to sail the ocean and investigate the phytoplankton blooms.

They continue to analyze their water sample under the microscope in the Plankton Lab, discover nutrient pollution, and plant seedling marsh grasses in places that will stop the nutrient pollution. The Whyvillians seedling plants affect the simulation. If they analyze the correct nutrients and find the appropriate places for the seedlings, the bloom is quelled.

Whyville Case Studies to Guide You

Three classroom research study iterations, planned and executed 2002-2005 and funded by an NSF grant, were conducted in Cathleen Galas' two sixth grade science and math classes at Seeds University Elementary School, the laboratory school for the Graduate School of Education and Information Studies at UCLA. All three of the iterations were studies using the participatory simulation of the Whytox epidemic in Whyville to study epidemiology. The research team on all three projects included principal investigator Yasmin Kafai, UCLA, Cathleen Galas, teacher-researcher, UES, UCLA, Jen Sun, Numedeon, Inc., and varying UCLA graduate students. The NSF study also gathered information on interested Whyvillians outside the classroom, and in an after-school setting, in order to look at both the formal and the informal learning environments and affordances in Whyville.

In the first classroom study, Whyville was integrated into the class study of epidemiology. The in-class spread of disease activity complemented the virtual infection of Whytox in Whyville. Students conducted experiments, read and talked about disease concepts, worked at solving the dilemma of how Whytox was transmitted within Whyville, tracked the progress of the disease of all classmates, participated in lively classroom discourse on and offline about the virus and its spread, wrote about bacteria, virus, germs, flu epidemics and other epidemiology concepts to the Whyville Times, used the tools at the CDC to simulate disease spread and brainstormed and tried solutions.

The next two iterations of the study and classroom implementation added epidemiology concepts. In the second iteration, students received 2 of 3 vaccine doses necessary for full immunization at the beginning of the study, which they were able to keep or sell to others. The third iteration added study of the concept of computer virus to the participatory simulation.

Papers and reports written on these research interventions, both in and out of the classroom are available at:

<http://kafai-whyville.blogspot.com/>

Using Whyville in a Classroom

Teacher Roles

Using Whyville in class transforms the teacher's traditional role of providing answers into one of asking questions and fueling student curiosity, and creating an engaged community of inquiry in the classroom. The classroom is student-centered, rather than teacher centered. Project based, inquiry process, and a constructivist classroom environment are key to working with students in Whyville. The teacher facilitates inquiry, asks questions, prods student questioning and exploration, helps mediate discussions, and assists students in researching unknowns. Teacher modeling of inquiry behaviors such as asking and refining questions, planning research strategies, sharing and discussions skills, and out-loud reflective thinking about their work, reinforces student's skills and confidence in their skills over time. The teacher's work in the classroom requires taking these many demanding roles in facilitating rather than directing student learning.

If your students are not used to inquiry activities involving the formulating their own questions and researching answers, or working on projects or games without technology, changing the classroom environment may take a bit more time and reassurance from you, as the teacher, that it is alright to come up with their own questions, that there may be more than one answer, and not a particular "right" answer, that you expect your students to become independent learners and be able to plan their own learning and research strategies. Encourage discussion and sharing of student perceptions in class. Try to discover "experts" in your class in different science games, entrepreneurial activities, and scientist behavior in searching for causes of an epidemic. Publicly announce the expert and their observed expertise, and ask if they are available to assist other students. Encourage a class culture of learning from peers, and reinforce virtual identities of master scientists within Whyville.

Your teacher experience within Whyville is valuable. Begin by exploring Whyville, creating your own avatar identity, earning clams by participating in some of the games, and learning your way around the community. As you experience this world, think about what you do in the world and what justifies your actions in the world and in the various science games. To later help your students mediate the environment, you can begin to reflect on your interactions, and on what evidence you base your decisions. As you learn to play Whyville well, you will be able to help your students figure out, discuss, and

reflect on various thinking strategies through discourse in the classroom.

Learning how to think innovatively is part of the process, as is taking appropriate risks. Take risks yourself, be willing to fail at the games until you win, and you can better help your students learn. Use your students as a resource. My students were always eager to assist me, and my modeling taking risks and failing publicly multiple times at the Hot Air Balloon as I learned, empowered other students to take the risks and put in the hard work it takes to complete some of the games and work toward solving some of the real-world problems. As a teacher, bring up the notion of "hard fun", the notion of satisfaction when you are working on something difficult that you care about, and master it (Seymour Papert).¹ As they teach you about the game, they themselves also learn and become experts. At first, many adults and teachers may not have the patience and skill to put in the hard work to complete the levels of the science games. Your best video game players may amaze you with their skill and foresight. These now "expert" students may have been less motivated in traditional school activities.

Student's Roles

One of the first orders of business for most students is to establish their online identity within Whyville by creating their avatar. The construction of this identity helps students to pursue their work and communication within Whyville.

Student's view of themselves as learners able to investigate possible solutions for problems and questions answers is critical to the inquiry process using Whyville in the classroom. Students should be expected, and invited, to ask and refine questions, propose explanations, plan and research, communicate their findings along the way via discussion, email, y-mail, or Whyville chat, and reflect on and critique their own and others learning methods.

Whyville in the classroom is a synchronous and an asynchronous online community of learners. Online, students interact by chatting in the public sphere, where their chat in Whyville is seen by all, or by whispering privately to one individual in the room. They may also y-mail other Whyvillian friends that may not be online at the moment. In this environment, the student must take greater responsibility over their increased control and self-direction, and learn to communicate successfully in oral and written forms within Whyville. Students

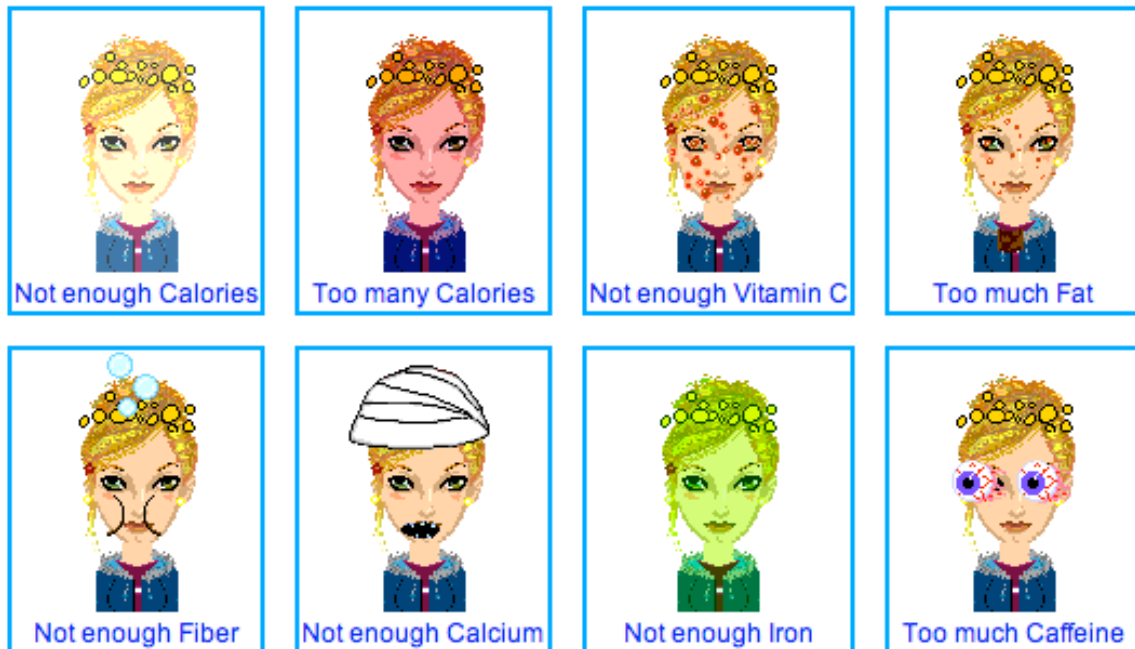
regularly involved in projects may have an easier adjustment period to this new independence and interdependence within the virtual Whyville community and the real classroom supporting Whyville.

Possible Classroom Study to Integrate with Whyville Participation

Whypox Simulation: Epidemiology

The Whypox simulation is a participatory simulation within Whyville. Whyvillians “catch” Whypox in different ways. Students need to figure out how the pox is transmitted, the course of the disease, and come up with ideas to contain the spread during the next outbreak. The Whyville CDC has tools online in Whyville in the Whypox lab, including the Infection Simulator and the Epidemic Simulator. Be sure to coordinate with City Management at Whyville the beginning of your curricular intervention.

WhyEat Challenge: Nutrition and Health



In the WhyEat Challenge, you choose daily nutrition in your WhyEat Health Journal to keep your own avatar healthy. If your avatar has issues, you may visit the dietician to find out what the problem is and then begin to analyze and rectify the problem. You may also take the challenges above to try to correct the nutritional issues by examining the menu resulting in the particular avatar and replacing foods to make a healthy menu. This simulation runs all the time, and can therefore be accessed by your classes at any time.

WHyOI: Phytoplankton Blooms

Be sure to coordinate with City Management at Whyville the beginning of your curricular intervention.

Other Ongoing

What to do before introducing Whyville

Register and Explore

Teachers should register as educators online within Whyville at: <http://www.whyville.net/teacher/registration.html>. Follow the online directions for signing up as a teacher AND for getting verified as a



Class Roster

teacher.

Once City Management at Whyville has verified your status, you will receive a class roster in your satchel that contains all of your Whyville belongings. This satchel is found above the Groovy Bus, your navigational bar in Whyville. On the pull down menu, go to "Newbie Help" and click on the various articles to help you learn about Whyville. If you have other questions, go to the pull down menu, scroll down to "Ask a Question". Volunteer experienced Whyvillians will answer your y-mails about how to things work, how to play some of the games, or give friendly advice.

Your class roster will list all of your student avatar names and you will be able to check off whether you've received their permission slip and update their privileges. Be sure to make a list for yourself that shows your students' names with their corresponding avatar names. This way, when you meet "chillzone" online, you can quickly note which of your students you are meeting.

If you want your students to participate in the simulation of the Whypox epidemic or the Red Tide simulation, please contact ??? to coordinate and schedule your class study. You should begin class immersion in Whyville about a week prior to either outbreak. The lead-time before the Whypox outbreak or the introduction of the red tide gives students time to create avatars, explore Whyville, earn clams by completing science activities, and become invested in the Whyville community. For the Whypox epidemic or the phytoplankton bloom, you may wish to schedule approximately 7-10 weeks for your large unit of study, including the participatory simulation within Whyville. Both of these simulations also depend upon the behaviors of

the community at large, so understanding either “outbreak” may need more or less time.

If you want your students to participate in the Whyville WhyEat health nutrition, building and running their own businesses as entrepreneurs, or by purchasing Scion cars via a loan payment plan and learning about WhyCo (FiCo) scores, you can have students enter Whyville and begin these at any time. You may also wish to schedule 7-10 weeks for these studies also, as it takes time to play with menus and see avatar results, it takes time and earning clams to begin and foster a business, and it takes time to earn some clams and learn about other behaviors that will influence one’s WhyCo score within Whyville.

Here you can view all the items involved in your WhyCo score.

Whyville Scion Solutions has calculated your WhyCo score:

340

This WhyCo score is pretty low. Whyville Scion Solutions might still be able to loan you clams, but you'll get a much better loan if you increase your WhyCo score. Adjust some of the settings to see how you might increase this score.

Feel free to adjust the settings to see how your WhyCo score changes under different situations.

Recalculate

Return to Reality

Lifetime:	12 or more	Weeks on Whyville	?
Visits Per Week:	1	Days per week you usually visit Whyville	?
Weekly Income:	100 - 199	Clams per week you make from salary, jobs, art, etc.	?
Cash:	2,000 or more	Clams	?
Behavior:	0	Punishments for inappropriate behavior in last 3 months	?
Whyville Times:	0	Articles you've written in the last 3 months	?
WhyPass:	0	Weeks left on your WhyPass	?
Y-mail Helper:	<input type="checkbox"/>	Is Y-mail Helper	?
Senator:	<input type="checkbox"/>	Is a Whyville Senator	?
Homeowner:	<input type="checkbox"/>	Owns a House in Myville	?
Past Loans:	0	Loans you have paid back in the past	?
Loan Defaults:	<input type="checkbox"/>	Has defaulted on a loan	?

Gather Resources

Depending on your upcoming unit of study, begin gathering many different resources appropriate for the unit. These resources should be available for students whenever they need or want to browse or purposefully research topics. You may have units of study with lessons and experiments that you have experience using in the classroom. The difference in using the unit in conjunction with a Whyville simulation will be that you will be ready to use different nonlinear lessons from the unit as you observe student interest and motivation on various

topics. You may want to check out multiple library books that sit on a table in the classroom. If you have access to a classroom website, you may want to post a set of internet resources that cover all possible areas of interest within your unit. These net sources may include various interactive animations, graphics, photographs, learning games, simulations, and articles. Some of the sites with photos, pictures and animations may have other text that is above your students reading level, but they may garner a wealth of information from just looking at photos, pictures, and graphs, and reading captions. You may also find some "Ask an expert" sites to additionally post. Students can directly email experts with their questions. (If you don't have a classroom website, post these internet resources in the room.)

As teacher, you should also have experiments, lab resources such as microscopes, prepared and blank slides, a collection of appropriate hands-on activities, real and virtual field trips, DVDs or videos. Any other software, posters, models, or artifacts that would be relevant to your unit should be in classroom and available as needed to students. Planning materials, a clipboard for questions, butcher paper, computers set up with internet access, the Whyville parent permission slip, and any school or district permission slip deemed necessary by your administrator, should be gathered and ready.

Survey Student Access

Poll students with a survey that asks about their home internet access and computer availability so that you are aware who in your class will be easily able to log in to Whyville outside of class. Once you are aware of student access or lack thereof, it is an opportunity to build awareness and home access alternatives for students and their parents. Students without access should be individually and privately supported by other means. Contact your school and local librarian and arrange that your students have access to computers before and after school. If there is a computer lab in your school, perhaps those students could have permission to be in the lab before/after school, and/or during recess and lunch. Talking to students and parents without net access about the educational advantages the net provides sometimes results in parents signing up for inexpensive ISP services to support their child. If there a local computer clubhouse in your school neighborhood, contact them, and find out how to get your students involved.

Build a scavenger hunt or exploration

Before introducing your students to Whyville, you may want to design an introductory scavenger hunt activity to facilitate their exploration of

Whyville in groups. The scavenger hunt is a good way to get students to get to many places in Whyville and start them working collaboratively on solving the science games.

What to do during Whyville Intervention

Register Students

Send home and collect the Whyville parent permission slip from all of your students. Send a letter home to parents explaining your use of Whyville in the classroom. You can go to the "What Kids Say" section on the island sign-in screen to find several links that will give you assistance in providing the rationale to parents. You should also refer them to the website and encourage them to sign in as a guest. Remind them in your letter that students will learn internet safety in a supportive environment, and they will not be able to use chat until they have been online 3 days and passed the chat license test. A few parents may not agree to the use of chat at all in the beginning. Work with them, and keep in contact within the first and second weeks, reporting to them how their child is doing. They may then reconsider.

Use the URL in your class roster and follow the directions there to have your students register in Whyville UNDER YOUR CLASS ROSTER. Make sure they don't just go to Whyville on their own and register, as they will not be listed in your class roster. As they pick screen names, be sure to keep a list with their real names and corresponding screen names so you know who's who online. Be sure to send your student permission slips to Numedeon, Inc. at 300 S. Raymond Ave. #7, Pasadena, CA 91105. Each student will then receive 100 clams.

Explore/Scavenger Hunt

Introduce your students to Whyville. Give them online time to explore, perhaps in groups. One idea for expediting exploration is a scavenger hunt that takes them around the community, into the games, on the Warp Wagon to travel the world and time, to Grandma's to get donated face parts, Give your students a copy of screen names and their corresponding real names, so they can recognize each other online. Caution them, however, to not use their real names online. Your students will become familiar with the class names quickly, and may only use this sheet in the introductory phase. They can easily meet other Whyvillians by saying "hi", or by going to their y-mail (click on the walkie-talkie on top of the bus). Within y-mail there is a "Friend Finder" button to invite others to meet. Get online with your students. Say hello to them and ask them questions. They will soon be able to help you around the community and give you tips.

Students Explore and Share Expertise

Debrief daily Whyville participation in a class discussion. Work on building an open discourse with your students about their activities within Whyville. Give them plenty of time to explore, build their avatars, and complete science activities. Different students will be interested in different parts of Whyville, and avatar building may be a major concern for many. This is normal and helps them build their virtual identities for the community. Ask for volunteer "experts" in different science activities to briefly report tips for game success.

Begin Content Study

You may want to begin classroom activities based on the unit of study during the week before or during the Whyville introduction and exploration. Begin your study by building interest and curiosity. One way to begin inquiry study is to put a huge sheet of butcher paper up on the front board with one or two words in the center in a circle, such as "epidemic", "epidemiology", "marine biology", "ocean health", "personal nutrition", "business", "entrepreneur", "buying a car", "getting a loan", whatever you wish to call your unit of study. Ask students to think about what they know about the topic, and what questions they have. Ask them to begin asking questions to which they'd like to know answers. If they are reluctant to begin, you can start with one or two questions of your own. Write them up on the board as part of a web. As soon as students begin jumping in, let them ask and you simply call on them and write the questions. Take a whole period to flush out as many questions as you can. When the same question is asked again, check it on the board, and ask for more. When, and only when, the questions have been exhausted (I try to get to 80-100), stop. You can have a parent, aide, student, or you type up the list and have students keep this as part of their epidemiology notebook. Students usually come up with questions that deal with all content and more that you would ordinarily "cover" in that particular unit of study. Leave a clipboard in the front of the room for students to write down "I want to know about....", and announce that it is there and you will be checking it often. Be ready with your experiments, lessons, online simulations or animations to reinforce learning within the MUVE and to answer questions in depth when students ask. Some students may research deep questions they are interested in, and meet with you, the teacher, briefly to discuss their findings. You may offer to have them give a brief "talk" to the class about what they've found. Moving the onus of "content expert" in various areas to class members becomes a part of the inculcation of your class to a constructivist-learning environment. If they are not used to taking

these leadership positions, talks and discussions with student leaders may take more encouragement and reinforcement on your part.

You may want to schedule a part of each day dedicated to virtual activities online in Whyville, and other parts of the day in discussion and “real” experiments and activities in the classroom.

Using the Whytox Epidemic as an Immersive Simulation in Epidemiology



Epidemiology Study

You may begin investigating and researching disease, communicable disease, and the spread of disease, while simultaneously participating actively in Whyville science activities. A “real” spread of disease activity in class incites more curiosity and provides a smaller population to trace the cause of the disease as Whytox began to spread through Whyville. Go to


<http://www.madsci.org/experiments/archive/859332497.Ch.html> to get the recipe for the Cabbage Juice Ph indicator. To see how this has been used in the past in sixth grade classrooms simultaneously immersed in Whyville, go to:

http://www.cathleengalas.com/Galas_Research_2003-04.ppt.htm.

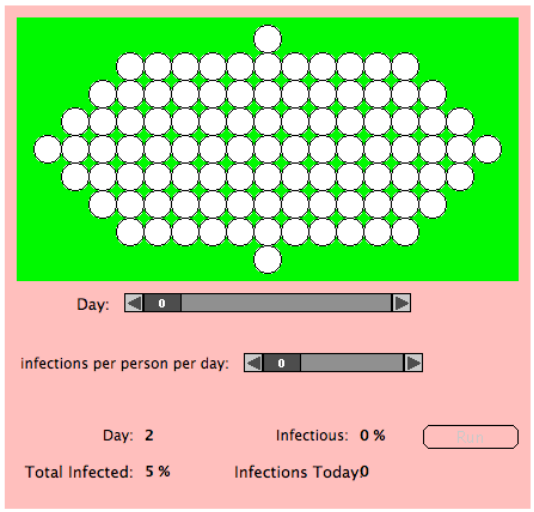
Concurrent classroom activities may include students creating and updating epidemiology concept maps with Inspiration software, observing bacteria under microscopes, experimenting with yeast, writing researched articles for the Whyville Times on bacteria, viruses, and communicable disease.

When the epidemic begins, students may notice that those that seemed to be infected cannot chat without interruption, as an annoying “Achoo” will replace their chat. Then, pink spots, which darken over time, appear on their newly created avatars, and faces

generally reflect a grayish hue.



Why-Pox Lab: Infection Simulator 1



This is a simulation that shows how an infectious disease can spread in a population. Each circle represents a person in a population.

You start the simulation by clicking on one or more dots. These dots are the people who got sick first, bringing the infectious disease into this population.

Next, you choose how many other people each sick person can infect every day by dragging the slider at the bottom. How infectious the disease is and how many people a sick person is in contact with determine this number in real life. Here, you get to play with this number.

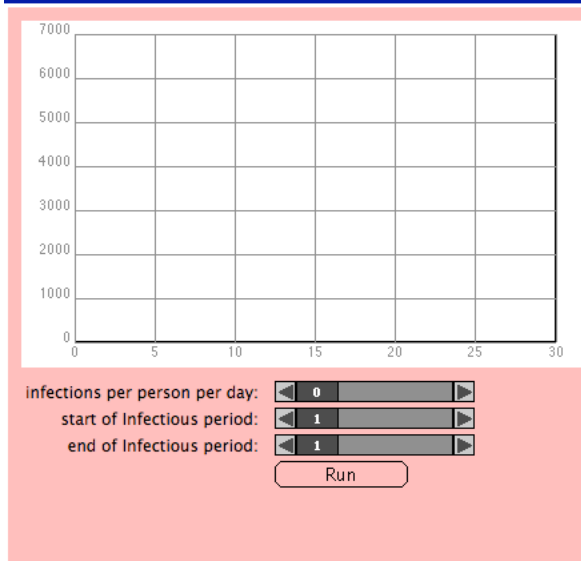
Finally, click the "Run" button to see what happens day by day. The number in the upper-left corner is the number of sick people on each day. You can also drag the Day slider bar back and forths to see how things change from day to day.

In this simulation, each person is sick and infectious for only one day. During this time, the dot is red. An infectious person can infect any of his surrounding 8 neighbors. Once a person is recovered, he has developed immunity for this disease and cannot get sick again. Blue represents immunity.

By this time, students will be ready to go to the Whyville CDC to find out about Whypox history, use the infection simulator and the epidemic simulator to learn about the spread of disease. In class, groups can explore disease parameters and reinforce perhaps previously visited concepts of epidemic and exponential. Using the epidemic simulator students can visualize the large area, fast spread of disease. Have them run many different simulations, changing one variable at a time to see the effects, and then comparing results with classmates and engaging in classroom discourse to explain and understand the concepts more deeply.



Why-Pox Lab: Epidemic Simulator



This simulation allows you to see if an infectious disease can lead to an epidemic. Whether this happens depends on how infectious the disease is.

1. Choose how infectious it is by clicking on the "infections per person per day" bar. For example, a not very infectious disease may cause a sick person to infect 2 other people per day.
2. Choose the start of the infectious period. If you choose 1, that means that the first day you catch this disease, you immediately become infectious and can pass it to others. Often, it takes a little while after you catch a disease before you become infectious.
3. Choose the end of the infectious period. Often, even though you don't feel completely recovered, you are no longer infectious.

Click "Graph" to see how the disease you just designed might spread through a population like Whville's.

Every dot represents another day, moving to the right (on the X-axis) as the days pass. For each day, how high (on the Y-axis) the dot goes shows how many people are infected that day.

While the epidemic is still on the rise, infecting more and more people every day, the graph is going uphill. When the graph is going downhill, it means the epidemic is on its way to being over. If the graph stays flat, that means the disease is not infectious enough to become an epidemic.

Some class studies have sprouted activist, philanthropist Whyvillians who decided they needed to do something about the Whypox on Whyville, by organizing class groups online dedicated to research, spreading the word about ways to prevent infection, fundraising, education, organizing a hospital and university as future educational and research centers. They took on different tasks to combat the spread of the disease within their online community.

During the second and third iteration of this project, we included the concept of computer virus and added the economy of vaccines to the Whyville site during the outbreak.

Epidemiology Resources

CDC Flu Gallery

<http://www.cdc.gov/flu/professionals/flugallery/index.htm>

Cells Alive

<http://www.cellsalive.com/>

Discussion

Simulating the spread of disease, specifically the mythical virus Whypox, within the Whyville community provides a constructivist classroom context for studying epidemiology. In class, students are encouraged to be autonomous, pursue their own questions, understand and discuss concepts and questions, and use, manipulate, and interact with the data, primary sources, and all online and in-class

tools available to them. Participating in an immersive simulation motivates students to discover the source, cause, and duration of the epidemic. Encouragement of student engagement in dialogue online, with each other in large and small group, and with the teacher, and teacher facilitation of inquiry by asking thoughtful open-ended questions and encouraging students to formulate their own questions furthers learning and fosters curiosity and motivation. Students are active learners in this simulation and in the classroom. Collaborative class groups, and the discourse in which they engage daily, contributes to the construction of meaning about disease and its' spread. Learning is student-centered, in that student responses drive the lessons, content and shift the instructional strategies in the classroom. Using Whyville and the online Whytox epidemic as an immersive simulation within the constructivist classroom context provides an engaging, active, and motivating environment for learning about epidemiology.

Next Steps

Although we have case studies using the Whytox epidemic in classrooms, the other content areas previously mentioned also offer rich immersive classroom simulation experiences. Teachers interested in building

Jen—a few sentences here about what Whyville will offer teachers in the future?

Resources

Galas, C., "The Never Ending Story, Questioning Strategies for the Information Age", Learning and Leading with Technology, ISTE, April 1999.

Galas C., "Why Whyville?" Learning and Leading with Technology, ISTE, March 2006.

Kafai, Y., "Everything Whyville! Living and Learning on Whyville.net", a forum for discussing observations and research on Whyville.net, <http://kafai-whyville.blogspot.com/>.

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