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Ecological Footprints

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Project Abstract:

9th grade students from Mr. Cheyne's Algebra I and Ms. Cerra's Environmental Science classes set out to learn about and comprehend the concept of an Ecological Footprint through research, surveys, and computer modeling. Students were introduced to the concept of Ecological footprint in their science class. Through a series of classroom activities and discussions they began to formulate the project's components. Additional component ideas came from their Math class as they were studying graphs, mean, mode, and average. In the end students decided to set out to accomplish three things. First they searched the web for three different online Ecological footprint calculators which were then compared and contrasted to determine which calculator would be appropriate for their age group. Students then created a set of questions based on the chosen calculator in order to survey a sample group of students in the school. The collected data would then be collected and organized for analysis by using the TI84 and Excel program. The students wanted to get a general idea of how great an impact the students of Charlotte High School actually had on the environment. Along side of the survey, students wanted to create an interactive visual representation of what an Ecological footprint is, this would be accomplished by using Agent Sheets computer modeling program. As they were studying early river valley civilizations in their Global I class, they thought it appropriate to make the theme a river valley with Woolly mammoths as prey, Saber tooth tigers as the predators, and the human impact would be hunter-gatherers who were evolving into the first early farmers. In this way they could show the change in ecological impact of humans from the hunter-gatherer to early farmers.

Problem Definition:

In the not so quiet school of Charlotte High, 14 self contained 9th grade students set out to understand their connection to the environment. Having been exposed to an aspect of connectivity referred to as Ecological Footprint, they were naturally curious about the degree of impact they as individuals had on their environment. Initially they performed internet research to find an Ecological footprint generator to calculate their individual footprint. From this generator they would develop a survey to question a sample group of students from the school. The survey would help them acquire a general idea of just how great an impact our student body had on the environment. To further their understanding of the term Ecological footprint, they would create an interactive computer model which would express that term visually.

Problems Encountered:

Through their internet research the students realized that not only were there a number of different footprint generators, many of them used questions which were not applicable to their age group. Some generators had far too many questions, some asked questions that were too complex; most students had no idea of the household income, expenses and energy type. As a group they compared three potential calculators in order to decided on the one that was best suited for their age group; the group chose this one, http://www.bestfootforward.com/footprintlife.htm. Using this they would calculate their individual foot print and with the results of the survey, calculate each individual footprint from the data collected during necessary in determining the overall impact of the student

body. This data they planned to use in order to generate graphs and analyzing results in order to get an idea of the degree of impact the student body had.

Computer knowledge and skill level became the next hurdle to overcome. Most of the project group had very little experience with basic computer use; students needed to be trained on how to maneuver around a computer to locate things such as a program that had no icon on the desktop or even how to open a desired program. To overcome this, students were grouped in pairs to work together on one computer. Even still instruction was slow going as much time was needed to provide individual aid. The addition of an additional computer savvy adult familiar with the modeling program would have been another aid. Making use of the LCD projector was key to speeding things up as best as possible.

Setting up the gallery of agents was perhaps the most time consuming as each team was creating their own depictions. Combining this with the nature of the population, it became very obvious that having a pre-developed gallery of agents would have been a better move than allowing students with obsessive compulsive behaviors to start from scratch; especially when the point was to develop an interactive model and not art. This would have given us more time to concentrate on the programming aspect.

Programming also proved to be a challenge and the point at which some students turned off. This was most likely due to two reasons; they had spent so much time on the depictions that they had no patience to continue and some have reading comprehension difficulties and found it difficult to grasp the 'If….Then' statement. Had the first problem been avoided, the second would have been easier to overcome. This impacted the complexity of the model as in order to maintain interest enough to complete the

project, certain conditions that could have made the model more life like were not attempted; the most important of these was procreation. As a result the model will not show populations replenishing. The static or balanced ecosystem will eventually extinguish all animal agents if left to run on for a long period of time. Additionally, humans do not show population growth but civilization growth. Therefore it is possible to have only one human agent eventually take over the entire habitat and extinguish all animals.

Evaluation of Results:

Even though the group made compromises with programming their visual interactive representation, they did accomplish what they set out to do. One can easily figure out that human ecological footprints have and will continue to have significant impact on our environment. Additionally, it makes the viewer consider the consequences of uncontrolled environmental consumption.

Educational standards used:

Math, Science, and Technology:

1. Analysis, Inquiry, and Design. Students will use mathematical analysis, scientific inquire, and engineering design, as appropriate to pose questions, and seek answers.
2. Information systems. Students will access, generate, process, and transfer information using appropriate technologies.
3. Mathematics. Students will understand mathematics and become mathematically confident by communicating and reasoning mathematically.
4. Science. Students will understand and apply scientific concepts, principles, and theories pertaining to the living environment and recognize historical development of ideas.
5. Technology. Students will use technological knowledge and skill to design, construct, use and evaluate systems to satisfy human and environmental needs.

Social Studies:

2. World History. Students will use a variety of intellectual skills to demonstrate their understanding of major ideas, themes, developments, and turning points in world history.

Agent sheets model directions:

The project is named “RV the Cherokee”.

When the worksheet is opened you will see an ecosystem with grass (habitat), trees, bushes, water, prey, and predators. Clicking on run at this point represents a balanced system.

To introduce the evolving hunter-gatherers simply select the Humans agent and place as many groups of humans as you would like into the balanced environment.

Hit run and watch mankind take over by building villages and leaving their “footprint” on the environment. Changing the number with which one starts the scenario will result in a change in the time it takes the human race to overtake the land.