No two students learn best in the exact same way. In an effort to meet the diverse learning needs of my sixth grade science students, and to keep students motivated, I developed an ecosystem unit that I hoped would achieve the above, plus meet the Michigan Content Standards and Benchmarks for Middle School students. In this effort, ideas were pooled from many sources, including from a course in the Educators' Science and Mathematics Institute Series (ESMIS) at Michigan Technological University, “Artistic Expression Explored Through Science and Mathematics”.

The unit I am going to describe is a great introduction to the school year. Concepts from previous years were reviewed, students were introduced to new concepts, and students got to spend time outdoors. Through the use of observational skills, science processing skills, stories, drawings, nature journaling, games, music, writing, and acting, students furthered their understanding of habitats, food chains and webs, and the other relationships that are exhibited in an ecosystem. I was particularly excited about incorporating so many of the arts. Artistic expression is an avenue often neglected in our teaching, yet can be a powerful motivator to a learner reluctant to do homework. Additionally, it can add great depth to understanding concepts.

**Getting Started-A Focus on Habitats**

On the first day of the unit, a list of vocabulary words to be covered was handed out to students. In previous years, I have put definitions on the board or overhead, and had students copy them in their journal. This year, students were actively involved in defining and teaching terms to each other. After dividing students into small groups of three, each group received a card with a vocabulary word on it. It was their responsibility to figure out the term’s meaning, and then act out the term or relationship for the whole class. For example, students acting as rabbits eating grass could portray the term consumer. This charades type of activity was quite enjoyable and an easier way to remember a term. Just to be sure, however, the teaching group still provided a definition for students to copy down into their journals.

Day two and three were spent discovering trees as habitats. Using a lesson from *Project Learning Tree* (Trees As Habitats) for guidance, students went outside to take inventory of the plants and animals that live on, in, and around a tree. After students had taken their inventories (and encouraged to draw organisms that they don't know), we returned to the classroom. Numerous resource books were made available for identifying the unknown. Then, we combined our data for a class total, as we discussed the ways that those plants and animals depend on trees for survival and, in turn, influence the trees. Now students were ready to apply what they've learned! I gave students the choice of writing a make-believe interview with a tree or a story from the tree's perspective, with the tree revealing how different plants and animals depend on it, and how they affect it. As they prepared to write, they listened to two songs from Mary Miche's audiocassette *Earthly Tunes-Nature Songs for Kids*, “Bugs in Your Bark” and “What is a Tree?” Both songs are catchy tunes that do relate to a tree as a habitat.

For the next three days we continued to use *Project Learning Tree (PLT)* activities to further our habitat study. “The Forest of S.T. Shrew” (listed as activity number eight in the
book) had students listening to a story of S.T. Shrew and Jackie, who took a “shrew’s eye-view” of life in the woods, and gained an appreciation for the variety of living things that make forests their homes. While listening to the story, students were asked to sketch or take notes in their journal on things they learned or heard. Following a class discussion on the story, students were given a choice of an assignment. They were instructed to write a story about Jackie’s next adventure in another habitat, or to draw a scene from the story, illustrating everything that Jackie saw. If drawing, students were encouraged to use watercolors, colored pencils, or any medium of their choosing.

The next PLT activity, “The Fallen Log”, had students back in our school's woodlot, examining fallen logs in various stages of decomposition. Students were asked to sketch a log and the organisms they saw in, on, around, and under it, and explain how these organisms were depending on it. It's important that students see logs in various stages of decomposition, so that they can begin to understand the decomposition process. Again, back in the classroom, resource books were made available for students to identify the various organisms and plants they found on their logs. One of the common organisms students saw outside was a slug. Yes, it was time to play another song from Mary Miche's *Earthy Tunes* audiocassette called “Banana Slug”. (Okay, Banana Slugs are native to the California redwoods. But the song does teach us something about slugs in general!) By this time, students were caught singing these *earthy tunes* around the school, whether they liked them or not! There is just something about a song that sticks with us during the day.

I should mention that I daily used some of the vocabulary terms that students were introduced to on day one of this unit. But this next assignment (to do with the fallen log) gave a great opportunity to see how much students were applying and remembering. Students were asked to draw a decomposing log, and include numerous consumers, producers, and decomposers that had some relationship with the log. Organisms had to be clearly labeled as to what they were.

Food chains, food webs, and energy pyramids

After six days of studying habitats, it was time to move on to food chains, food webs, and energy pyramids. Students need to see that the flow of energy with a food chain can result in a balance among various organisms, and that a break in the food chain link can destroy the balance. A great way to do this is through the study of owls and owl pellets. The next two to three days were spent dissecting an owl pellet and completing the lab handout. (These materials are available from most science catalogs/suppliers.) During the process, students sorted bones, and tried to figure out what the owl had eaten. (Bone sorting sheets, also available from suppliers, are a must!) Students were asked to construct a food chain for their owl.

As homework on the first night, students were asked to draw, or find a small picture of a local habitat producer, consumer, or decomposer. As they arrived the next day, students intended to have them staple their picture on the bulletin board. After all pictures were posted, I was going to ask students to return to the bulletin board during their dissection work time, and, using a piece of yarn, connect their picture to another with which it directly or indirectly interacts. (For example, interactions would be someone it “eats”, or “is eaten by” or “depends on for shelter”.)

At the completion of our lab we were to observe our bulletin board and all of the connections. This was when I was to ask students to think about what would happen if one element of the ecosystem were missing. I knew I'd need to explain this using a simple food chain, (and introduce the terms producer, 1st level consumer, 2nd level consumer, if they hadn't already been used.) We would have explored all of the possibilities of missing links in a food chain, and discussed how this would affect the other...
organisms of the food chain. All this was intended to develop an understanding that the more complex and diverse a system is, the more stable it is.

The bulletin board, however, never materialized. Instead, we drew numerous food chains on the board and discussed the impact of a missing link on all other organisms. We did apply labels for producer, 1st level consumer, and 2nd level consumer.

Our owl pellet dissection and lab may have been complete, but our complete understanding of these food chains and webs was not. To expand this more, and to work towards the construction of an energy pyramid, we went outside and played “The Food Chain”. In this game, taken from The Art and Science Connection-Hands on Activities for Intermediate Students by Kimberley Tolley, students simulated the interactions of organisms in a food chain, by assuming the roles of animals that try to get something to eat without being eaten. After playing the game several times, and noting what was needed to achieve a balance, students went back to the classroom to create an energy pyramid. Each student began by drawing a simple food chain with a minimum of a producer, 1st level consumer, and 2nd level consumer, with these labels being properly applied.

Next, I showed students how to draw a pyramid and divide it into layers. The number of layers needed to correspond to the number of organisms in their food chain. Students were shown how to layer the pyramid, with the bottom layer as producers, the next layer up as 1st level consumers, and so on, until we got to the top. The student then filled the different layers of the pyramid with an appropriate number of organisms that would create a balance in nature.

When students were done I had them think about their food chain and real life scenarios that could affect it. For example, how would their 2nd level consumer population be affected if the producers died out, or if the 1st level consumers got diseased? What would happen to the 1st level consumers if there were no producers? Ultimately, I wanted students to understand that a break in the food chain link can destroy the balance.

Other relationships

Organisms in an ecosystem depend upon each other for food, but they also may depend on each other for protection, transportation, or shelter. To complete our unit, we focused on symbiosis, those close, long-term relationships between organisms. To learn about the different kinds of symbiosis, I used another PLT activity called “Dynamic Duos”. Given a sheet of classified ads, students matched the ad up with the given critter having that particular need. Students were then given definitions for the three different kinds of symbiosis, and again reviewed the previously given classified ads for the second time. This time they decide what kind of symbiosis it is. We also looked in our textbook for other examples. As homework, students had to come up with another symbiotic relationship. They were instructed to write a want ad or poem from the point of view of one or both the partners, and to include a picture.

Summing it up

After a discussion and review on topics covered, students were given a project to complete, which served as an assessment on concepts covered to this point. (This idea was taken from Kent County Science Curriculum for the 6th grade.) Students were asked to draw an ecosystem of their choice. In that ecosystem, they had to draw examples of all of the terms that we had covered. A checklist of those was given to every student. For example, predator and prey are terms listed. A student might have chosen to draw our northern hardwoods, and included a white tailed deer as a prey and a wolf as a predator. Everything had to have at least two labels. (For example, the wolf would be labeled as “wolf” and “predator”. It is feasible that it may also be a “2nd level consumer”.) Grading this was an easy chore, as I used the same checklist given the students as my rubric.
Either the element listed was properly depicted in their ecosystem mural or it wasn't. Students were told ahead of time that this was how they were to be graded.

Some final thoughts-

Although I didn't get to include my field trip ideas or discussion questions, I do hope I have shared what I believe to be a “powerful work in progress” for my ecosystem unit. Utilizing ideas from many sources, with an artistic touch, it becomes powerful if students are motivated, excited, and learning. It becomes “a work in progress” as I adapt to keep meeting the diverse needs of my students.

I gave a pretest to all students, which was quite similar to the post-test. Students were given the same checklist as in the post-test, but were just asked to draw examples of everything listed, complete with labels. They did not have to draw the whole ecosystem, and they only had about 30-40 minutes in which to do it. I did not allow them to use any resource materials. On the post-test, students took the assignment home with them, and also had several class periods in which to work on it. They had time to be more creative and to do a neat job. They had access to resource books if they so chose. So, conditions for the two tests were not the same. The pretest results showed an average of 34.9% for the 70 students tested. Post-test results ended up with an average of 82.9% with 68 students tested. That gives a 48% difference between the tests. With testing conditions being different, I can't make an accurate comparison and say we saw a 48% improvement. However, I do believe significant learning took place. When it came to the post-test, students were not so concerned about a definition of a particular type of symbiosis as they were on finding a local example!

No, not everything went as I had hoped for this unit. I had wanted to develop that food web bulletin board, and use it as a teaching tool. Somehow, that just wasn't to be this year. Students forgot their pictures, or hastily drew one (so they wouldn't have a late assignment!), or brought in too many pictures of family pets. Somehow I had miscommunicated what I wanted! I'll have to try again next year.

All in all, though, I was pleased with the outcome of the unit. Students were given a variety of ways to show what they were learning. Generally, assignments were given that even my learning disabled students could feel successful about. Everyone actively participated, with a focus on a student's abilities rather than their disabilities. I covered all of the concepts that I needed to, and most students were enthusiastic, motivated, and learning. The arts are definitely a powerful tool to help make all of that happen!

References


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