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**Title:** Using pop culture and folk art to teach basic entomology to 5<sup>th</sup> graders

## Project Summary:

The United States has fallen behind many other industrialized nations in science and math. Studies have shown that interest in science and math wanes as students move through middle and high school (Historic summit aims to improve science education. (2008, *Natural History*, 117(6), 44-44. <http://search.proquest.com/docview/210639461?accountid=13360>). Therefore developing and nurturing interests in math and science is crucial for grade school students. The aim of this project was to see if using pop culture, in the form of popular video games, and folk art would stimulate at least an initial interest in entomology/biology. Two separate lesson plans were developed and presented to 5<sup>th</sup> grade students in a behavioral special needs classroom. The students themselves are divided by school into three groups based on reading level, 1) Below second grade, 2) Below grade level (5<sup>th</sup>), and 3) At or above grade level. This particular class was chosen because of their accessibility and their overall lack of interest in school.

## **Method**

The methodology employed was to administer a pretest, lesson plans, and then post test. In conjunction with the lecture activities and art projects were incorporated to offer a more “hands on” experience. Metrics used to evaluate the success or failure of the lesson plans was based solely on comparison of pre and post test scores. Also a cost analysis for materials used was calculated with the result of \$2.31 per student. Students were allowed to keep all props and art projects. Furthermore students showed an interest in keeping the props used in demonstrations so random questions were asked in an effort to ‘award’ correct answers with props.

## **Results**

The primary method for determining results is based on test scores. From my own perspective interest was luke warm during the introduction but the students became involved once video games were mentioned. Furthermore once the props were introduced and passed out every student became involved (one student refused to take the pretest until he saw everyone else getting a juice box.) Overall raw scores increased over 100 points from pretest to post test. On average students doubled their score from pretest to post. As a whole the class improved from 21% on the pretest to 56% on the post test. Average pretest score was 3.65 and post test score was 8.95 so more than double.

## **References**

- **Creager, Joan G. (1976). Why Entomology? The American Biology Teacher, Vol. 38, (4), p. 203.**
- **Pryor, Gregory S. (2008). Using Pop Culture to Teach Introductory Biology. The American Biology Teacher, Vol 70, (7), p. 396,398-399.**
- **Hocking, Brian. Six-Legged Science Cambridge: Schenkman, 1968. print**

## ***Mouth parts, The key to the need to feed***

**Overview:** This lesson will demonstrate and discuss the variation of insect mouth parts and how they work and function and what role mouth parts play in an insects predator/prey relation.

**Objective:** Students will be able to name and identify four sets of mouth parts, give an example of an insect for each type of mouth part and describe the basic function.

**Key Concepts:** What makes an insect an insect (number of body segments, wings, antenna, wings)

Types of mouth parts (Chewing, Piercing/sucking, Siphoning, Sponging)

**Duration:** 30 minutes

**Setting:** Classroom

**Indiana State Science Standards:** Sc.5.4.7 2000,

**Introduction:** Knowledge of general entomological principals and concepts including but not limited to the major types of mouth parts and their function along with major insect orders. Basic game play knowledge of four types of current video games (First person shooter, sports theme, racing, puzzle).

**Materials:** Chewing mouthparts hair clip

Piercing/sucking juice box and straw

Siphoning party favor

Sponging sponge

**Engagement:** The lesson will begin with a brief introduction of the instructor if needed, and then the students will be asked if they enjoy video games. Instructor will ask students what their favorite video games are. Whatever game is mentioned the instructor will incorrectly describe the game. For example if a sports game is mentioned the instructor will say that it is the game with street racing in Toyko, or if a racing game is mentioned the instructor could describe it as a game about a young girl who grows up to conquer a kingdom. The point of this is to initially get the students attention and pull them actively into the discussion by having them correctly describe the various games.

Next the instructor will ask the students if it is important to be able to describe a game, any game on the type of game play it offers. As an example it can be pointed out the need to know the type or genre of a game before purchase or before accepting an invitation to come over and play. Would the students want to go over to a friend's house to play pong? With this line of thought introduced the instructor will explain the need for basic description and how it pertains to everyday life. As an example the instructor can ask the class what the difference is between a human and a dog, or the difference between a fish and a bird. This will transition into common characteristics and the class can be asked what the common identifying characteristics of insects are.

Four general characteristics will be emphasized.

Three body segments.

Three sets of legs.

Antenna.

Wings. As an aside instructor can mention that most insects have two pairs of wings and some have no wings at all. This is meant to be a refresher and to get the students focused on insects.

Four video games will be displayed on screen or written on a chalkboard. For best results games listed by the students should be used as examples if possible but the important thing is to use one game for each of the four categories, First person shooter, Sports, racing, and puzzle solving. For this lesson plan the following games will be used as examples. Halo, Madden, Mario kart, and Tetris.

**Activity one:** Students will describe and detail what makes each of the video games different from one another while the instructor lists the characteristics on the chalkboard. The connecting link between the video game and type of mouthpart is listed below.

**Exploration:** Video games come in many varieties and while they are all made up of the same basic principals (some sort of achievement) and forms (console/format) the actual game play can be quite different. Halo is a first person shooter (the player takes on an aggressive role using weapons to combat an enemy) while Madden is a sports game (player controls a team). Mario Kart is a racing game while Tetris is a puzzle solving wall building game. All four can be played on the same console system using the same controller but they function in very different ways. Each title functions in a different way just as the four different types of mouth parts function in a different way. Let's take each game style and connect it with a mouthpart.

Chewing mouth parts are pretty simple and straight forward just like Madden and other sports games. Madden is a football game and at its most basic level you just try to score. This is achieved by two lines of players smashing into one another and trying to slip the ball past both

lines and into the end zone. Food starts on one side, passes through the chewing mouth parts and moves on towards the gut not unlike a running back trying to score a touch down. The chewing mouth parts work by cutting and crushing food particles and forcing them further into the mouth cavity. Lots of beetles and caterpillars along with cockroaches have chewing mouthparts

*At this point spring loaded hair clips will be passed out and demonstrated as a physical example of chewing mouth parts. Students will get a few moments to play and test out the hair clips and ask any questions before moving on to the next part.*

Piercing/sucking mouthparts are combination mouthparts and can be compared to a combination of games such as Halo and Skyrim or first person shooter games and adventure role playing games. The first part piercing is similar to using a weapon in a first person shooter. What is the object? As a player you try and pierce your target using something like a gun or a sword and inflict damage. The bullet or the blade must penetrate the target. Insects with piercing/sucking mouth parts perform a similar act to acquire food. These insects have a proboscis which penetrates an outer layer(sort of like penetrating shields) to get to the nutrients inside the target. For insects the targets can either be other animals or plants. Piercing is only the first half of the process though and that is where the RPG games come in. One of the common elements in some RPG's is draining of a target of its life force, essence, or health. Think of games such as Skyrim or Assassins Creed. After piercing, an insect takes nutrients from its target by sucking similar to the way vampiric weapons take a small amount of health from a target and transfer it to the wielder. Some insects that have piercing/sucking mouth parts include mosquitoes, aphids, and assassin bugs.

*At this time juice pouches (such as Capri Sun) will be passed out to each student as a physical demonstration of how piercing/sucking mouth parts work. Students will be allowed to drink the juice pouches if they choose and ask questions.*

Siphoning mouth parts are similar to piercing/sucking except there is no penetration of any tissue. Think of the game Mario Kart or any other racing game. Most of the games are light hearted non-aggressive and very colorful. A common feature of these games are the twists and turns, the curves of the path of the race route. Siphoning uncurl and travel down to the food source and siphon up the nutrients. Butterflies and moths are examples of insects that have siphoning mouth parts.

*At this time party favors will be passed out to the students as a physical example of siphoning mouthparts. It can be pointed out that the siphoning mouth part of butterflies and moths uncurl in a similar fashion to the party favor. Again students will be given a few minutes to explore and ask questions.*

Sponging mouth parts are like the game Tetris. Tetris is simply dropping blocks into position and sponging mouth parts are just as simple. The insect drops its mouth piece onto the food source and absorbs it before pulling the sponge back up and ingesting the nutrients. In some cases the insect will also excrete a digestive fluid to break down the food source. The common house fly is a good example of this and that is why it can sometimes feel as if a fly is biting.

*At this time small sponges will be passed out to the students (and can be used to clean up any mess made from the juice pouches) as a physical example of sponging mouth parts. Students will be given a few minutes to explore and ask questions.*

**ELABORATION:** Students will be brought back to attention and shown a series of insect pictures through a power point presentation or flash cards. At least two examples of each type of mouth part will be shown in random order. Students will be asked to vote by show of hands what type of mouth part is represented followed by discussion on differing answers. Before moving to next slide students will be asked if they think the insect is predator or prey and why and group discussion will be encouraged. Students will also be given time to ask questions.

**REVIEW:** Each type of mouth part will be again briefly discussed touching lightly on each video game example and with more emphasis placed on the passed out physical examples. The power point slides of insects will be shown again and this time students will be asked to hold up the appropriate prop (hair clip, juice pouch straw, party favor, or sponge) to demonstrate their understanding. Students will be given time to ask questions.

## ***They got legs and they know how to use them!***

**Overview:** This lesson describes and initiates discussion on the differences and diversity of insect motility and touches on the roll of predator/prey relations as they relate to leg adaptation.

**Objectives:** Students will recognize that insects have six legs and be able to explain how and why this can be an advantage.

**Key Concepts:** Insects have six legs and have different motility than other organisms. Some legs have modified or adapted to perform an additional function.

**Duration:** 50 minutes

**Setting:** Classroom

**Indiana State Science Standards:** SCI.5.3.1 2010 Va.5.8.2 2008

**Introduction:** Knowledge of general entomology and concepts is needed. Instructor should know and understand the benefits insects get from having six legs and how some insects have modified legs to exploit specific niches. Instructor will also need to know, understand, and be able to explain insect motility (how the legs work to move the insect).

**Materials:** One flat footed action figure with two legs that will stand unassisted.  
(Recommended Super hero figure)

One four legged figure. (Recommended stuffed animal)

Wide Popsicle sticks (2 per student plus extras)

Flexible straws multi-colored (6 per student plus extras)

Marshmallow foam shapes (1 per student {cut to make 2 halves})

Glue

Scotch tape

**Engagement:** The lesson begins by placing the two legged action figure on a stool and then asking the students if the figure is stable. Instructor should demonstrate that a simple tap and/or slight shaking of stool will cause the figure to fall over. It can also be asked of the

students if they have ever been pushed and lost their balance. Next instructor places the four legged figure on the stool and asking if it is more stable. Instructor can then demonstrate that a light push from the front or back does not cause figure to topple but push from the side can. Next the six legged straw insect (pre-made) is placed on stool and the process is repeated. This demonstrates that the six legs offer improved stability over a flat surface. *Optional* Instructor can also construct a two legged person and a four legged animal from straws and using scissors cut legs off until figure falls over then repeating with straw insect showing that six legs offers a benefit with loss of limbs.

**Activity:** Popsicle sticks, pre-cut straws, and pre-cut marshmallow foams are passed out so the students can build their own walking insect model. The process for creating the “walkers” is as follows. 6 straws per walker (preferably 2 colors such as 3 yellow and 3 green) are pre-cut by instructor about two inches from bottom of flexible joint. Three straws of the same color are then glued (or taped) together in a “Y” shape. The top of the straw is then bent down forming the bottom of each leg. Sponges should be pre-cut into two 1 centimeter halves. The Popsicle sticks (2) are then glued to the top and bottom of each sponge to form the body of the “walker”. Once dry the two sets of legs can be inserted between the sticks and stacked on one another forming three legs on each side (two yellow one green on left and two green one yellow on right). The one centimeter height of the sponges provides enough space to insert the straw legs stacked and keep them in place but also allow movement and manipulation. The walker gives the student a physical model that demonstrates how an insect moves the center leg on one side with the outer legs on the other side all at the same time to walk. The flexible straws also allow for minor independent adjustments to demonstrate how an insect can quickly move over uneven terrain.

**Exploration:** Using a “walker” the instructor will guide the students through the process an insect uses to get from one side of the desk to the other. First one color of straw is moved forward and then the other color. This shows that the insect constantly has three “feet” on the ground at all times in a tripod formation which allows for greater stability. People have only a single foot on the ground when walking and four legged organisms have two which are both less stable. Insects employ a dual tripod form of locomotion in which all three legs of one tripod move forward and then the other. Using common classroom materials such as pens and pencils, erasures, and even wadded up paper it can be demonstrated that the insect can easily maneuver over uneven terrain. NOTE: the “walker” models do not work perfectly, they are after all just straws and sticks. However with practice a student should be able to walk his/her walker across their desk like an insect. The art project can also be used as part of a program to fulfill state requirements (VA.5.7.2 2008). Further students can participate in a caterpillar walk. The caterpillar walk will use five students to simulate a six legged insect. Please see attached sheet for instructions on performing a caterpillar walk.



**Elaboration:** Having six legs has been so successful for insects that some have modified or adapted legs to further exploit their environment. One of the most readily recognized examples of such an adaptation is the praying mantis. The forelegs have adapted to grasp and hold prey. Other examples are Mole crickets forelegs adapted for digging, the honey bees legs modified for the collection of pollen, grasshoppers modified back legs for jumping, and predacious diving beetles legs adapted for swimming. The instructor can put together a powerpoint presentation of such insects to show the students how the legs have been modified to gain further advantage. This also leads into a discussion on how the legs come into play with the predator/prey relationship. Long legs can give an insect speed to either run down prey or escape predators. Leaf insects have modified legs to blend in with foliage for camouflage. The mantids and predacious diving beetles legs give them an advantage to capturing prey etc.

**Review:** Using a powerpoint the instructor can lead the students through what they have learned by asking questions such as how many legs an insect has and how they work. What are the advantages of having six legs? What are some modifications/adaptations that insects have and how do they help?

## Caterpillar Walk

Line up 5 students front to back. Mentally number their left feet as 1-5 and letter their right feet A-E. The front and back person will be the only ones with a free leg, all other legs will be tethered to another leg. Use Velcro straps if available. Tether the legs together in the following fashion.

1 O O A  
2 O O B  
3 O O C  
4 O O D  
5 O O E

It is recommended that the students attempt the walk on a soft surface such as carpet or grass. Once the students are tethered together you can let them attempt to walk. After they fall down line them back up and adjust straps as needed. Designate legs 1,2, 5, B, and C as RED legs and legs 3, 4, A, D, and E as blue legs. Have the students practice picking up their leg as you call out each color. Once they understand which leg to move call out each color in turn and they should be able to walk around the room. It will take practice but the students should have a good time learning.

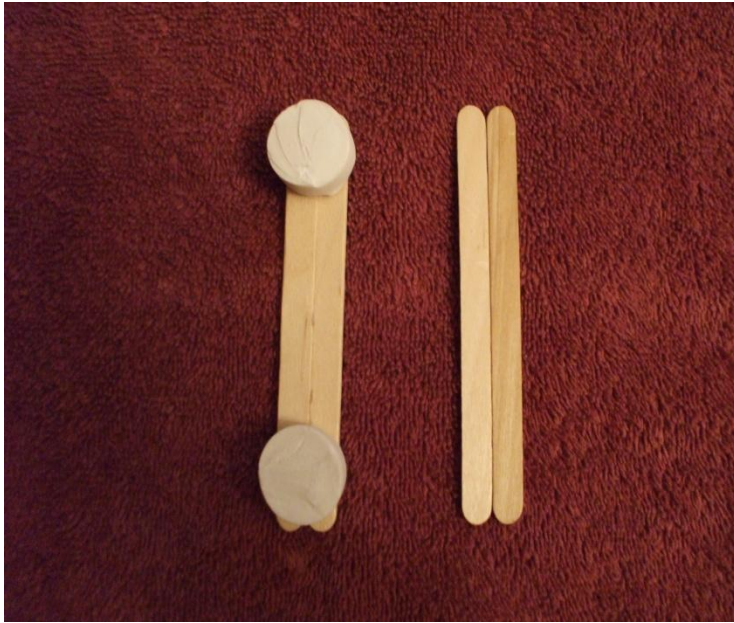
# How to make Walkers

# Materials needed

- Wide Popsicle sticks (2per)
- Multi-colored flexible straws (6per)
- Marshmallow foam shapes (1per)
- Glue
- Scotch tape
- Scissors



- Cut the marshmallow foam shapes to approximately 1cm height
- Glue the foam shapes to the popsicle sticks and then glue



- Cut the staws to approximately 4 inches with the bend in the middle



- Tape the straw together in a “Y” formation. It is preferable to use different colors for each set of straws.



- Slide straws into the popsicle stick body and bend to make the legs. Stacking one set of straws on the other should create a snug fit and allow movement.

