

It's a 3d printer object? It's a Fruit? Oh! Maybe It's an Insect!!!

It's a 3-D printer Object? It's a Fruit? Oh, maybe it's an Insect!!! Aims students perform inquiry and hands on science activities. They has potentiality to increase the creative and scientific thinking of kids. The projects aims increase the curiosity about science issues. This project aims to inspire students for science.

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Overview & Background

This project is an opportunity to build into practice some of the educational activities and ideas that have to do with my background: biology (scientific training) / museology education/didactics of science education and a 16-year work experience in a center of science and technology / museum. I like to draw, I like to learn and I try to understand how people learn. I also like museums, science and hand 's on activities, 3D printer and stl file design. I started using tinkercad newly. With this project I try to improve my skills in 3D design and I hope to improve my English which is unfortunately it's not very good.

Objectives

- Understand key ideas related to the topic: Insects and their relatives haven't the same characteristics.
- Understand insects belong with their relatives to the group called Arthropods.
- Understand Arthropoda is subdivided in other groups.

Arachnida: spiders, scorpions (and others)

Insecta: Lady-bug, bee, wasp

Another groups (it's not important students know all. You should explain if students have curiosity.)

- Recognize what is an insect

- Recognize the spider and the scorpion aren't insects
- Play the role of entomologists and perform mini investigations
- Know more about bees and the math in nature
- Perform art and science activities
- Learn about life cycles
- Improve the knowledge about nature

Audiences

Primary Education

Subjects

Biology

Nature

Science

Mathematics

and Others

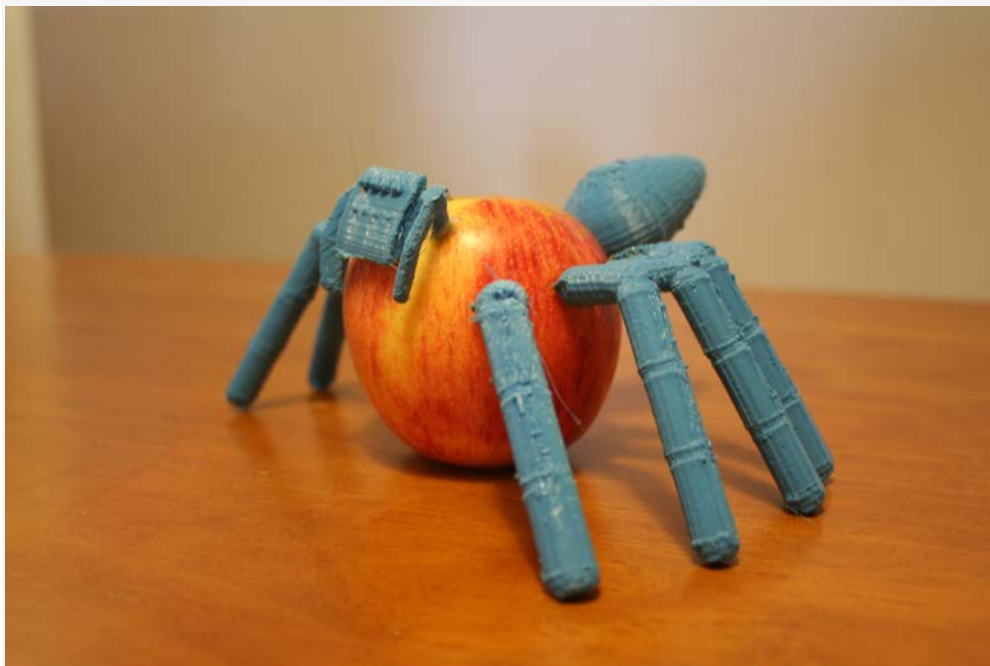
Skills Learned

Insects

Arachnids

Beehives

Life Cycles

**Vision of the project**

Insects have a great potential to attract students to science. The project tends to improve the knowledge of students about nature, biology, math, and others issues.

The teacher does not need to perform all activities. Let your creativity flow.

I suggest team work in small groups of student's and in each table a box with the 3-D printed objects. Students should communicate their own ideas in group and each group to the whole class.

Some Relevant Information about Insects and their Relatives

Insects shall be the group of living beings with greater diversity. They appear in the earth about 360 million years ago.

Scientists classify the insects and their relatives in a group they called Arthropoda. The name “arthropod” comes from two Greek words, arthros, “jointed,” and podes, “feet.” All arthropods have jointed appendages, segmented body plan, exoskeleton composed of chitin, paired jointed appendages on variable number of segments. Scientists classify insects and their relatives into categories based on similar characteristics.

The arthropod group can be divided in other groups called: Insecta (include insects), Crustacea (crabs, lobsters, shrimp, etc.), Diplopoda (millipedes, etc.), Chilopoda (centipedes,...) and Arachnida (spiders, scorpions , ticks , etc.) .

There are other important characteristics in the animal division by these groups, Crustacea – Crustaceans includes lobsters, crabs, crayfish, shrimp and others.

The body of a crustacean is composed of segments. Each somite, or body segment can bear a pair of appendages:

- The cephalon or head (Two pairs of antennae, the mandibles and maxillae)
- The thorax segments bear legs, which may be specialised as pereiopods (walking legs) and maxillipeds (feeding legs)
- And the pleon or abdomen bears pleopods and ends in a telson, which bears the anus, and is often flanked by uropods to form a tail fan.

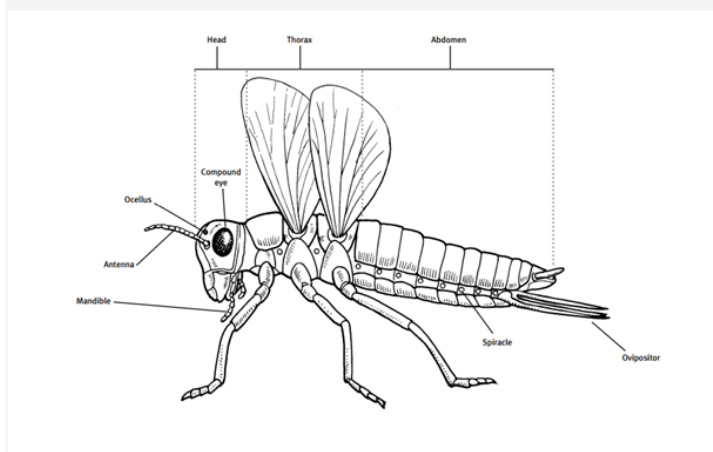
Arachnida – They have eight legs although the front legs in some species has converted to a sensory function while in other species, different appendages can grow large to take the appearance of extra pairs of legs. They have two body regions (cephalothorax and abdomen). They have chelicerae and pedipalps.

Chilopoda - Centipedes are elongate and flattened. They have a segmented body and a pair of legs per body segment.

Diplopoda - Millipedes are usually cylindrical (sometimes slightly flattened). Except for the first three trunk segments, each segment has two pairs of short legs.

Insecta – The group Insecta, which belongs insects, are Arthropoda that have three pairs of legs. The segmented body of these animals is divided into three regions: head, thorax, and abdomen. They have two antennae and usually wings. They have compound eyes which contains several thousand of lenses.

If you note, the other Arthropoda groups have more than three pairs of legs and only one or two body regions, and they never have wings.



Activity 1 - What makes an insect... an insect?

Activity objective:

Students should discover the characteristics of the insects and how they are different from spiders.

Materials/Resources:

Fruits and vegetables

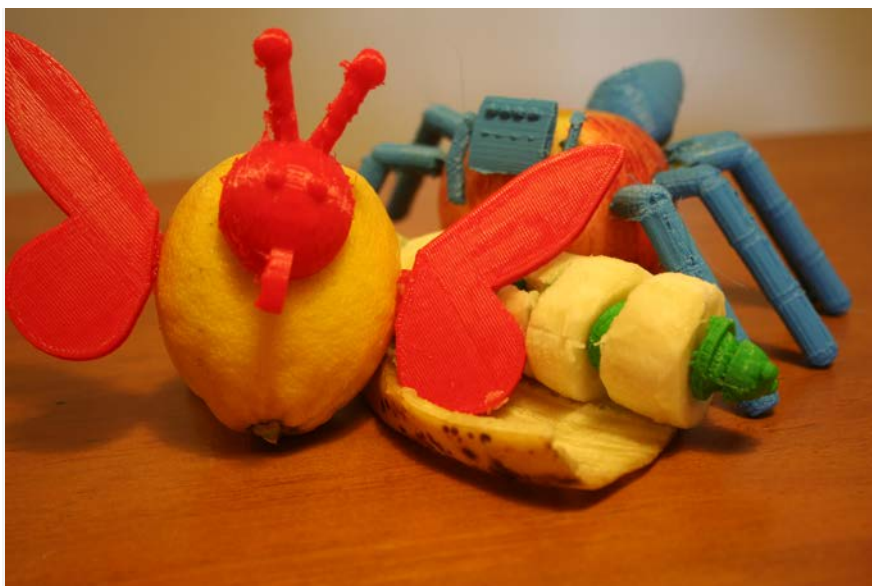
3-D printed objects (dragon fly, ant, ladybug, Butterfly, caterpillar, ant, spider, other insect) in a box.

Books/Sites with insect information for students discover the characteristics of insects and their relatives (like spiders and scorpions).

Activity Steps

1. Divide the students in groups of four
2. Place in each table a box with 3-D printed objects and a variety of fruits and vegetables
3. Allow the students to explore the 3-D printed material.
4. Encourage them to build their own insect
5. Ask the class about insects and write on board what they're thinking
6. Ask questions that will lead them to think without giving the correct answers. Allow students can get the answer by themselves
7. Allow students to discover more information about the bugs in the books and make new brainstorming.
8. Allow students to communicate and give their explanations about what they discover in the books about insects.
9. Use the last 15 minutes of the class to explain some scientific content.

Additional notes: It's important to understand what kind of PLA can be used with food. Wash the vegetables, the fruit and the 3-D Objects after you give them to the children. They will stick the objects in the food, so it's important that the objects are clean. Don't use the same PLA you use in playdough in food (fruit's or cake). If you use the spider in this activity don't use the scorpion. You will need them for the next activity.



Activity 2 - Where is the Intruder? - Treasure Hunt in the Garden

Activity objective:

Understand if students are able to identify what is an insect and explain why the scorpion is not an insect.

Materials/Resources:

Fruits and vegetables

3-D printed objects (dragon fly, ant, ladybug, Butterfly, caterpillar, ant, scorpion, other insect) in box.

Playdough

1 garden treasure insect map (facultative)

Scientist notebook

investigation magnifying glasses for kids

Preparation:

Ask a friend to build the scorpion and place them in the garden.

No student should know the scorpion is in the garden. Another possibility is the teacher place all the insects and the intruder in the garden.

Activity Steps:

1. Allow students build the insects with playdough.
2. Divide the class in two groups.
3. Tell them they are play the role of an entomologist. One of the groups will hide the insects in the garden. The other will find where the insects are. They don't know but somebody will put a scorpion in the garden.
4. Allow the other group with the scientist notebook search the insects and write what are the characteristics of the insects.
5. After that they change what they were doing.
6. Finalize the activity asking about the insects they found in the garden until they speak about the intruder.
7. Go to the garden with the glasses see the real bugs. Kids will work in a team and they can perform other activities in the garden.



Activity 3 - There's a bug in my cupcake?

Activity Objective

Scientific kitchen session about bugs, relatives and their mysteries can be used to students learn more about them.

Materials/Resources

Ask your student's what they will need

Microwave

Cupcake

Other ingredients

Activity Steps

1. Divide the students in groups
Students must investigate a bug or similar
2. Students will be invited to investigate how they can cook a simple bug cupcake in the microwave.
3. After they decide the type of recipe they what they perform the recipe and attach the parts of the bug they need (3-D printer objects) to the cake

It's important do not use in this session the same models you used in the garden.

It's important try to understand what kind of PLA can be used with food.

Try this kind of thing:

<http://www.craftsy.com/blog/2013/08/how-to-make-cake-in-a-mug-in-the-microwave/>



Activity 4 - Bees know math?

Activity Objective:

Who lives in the beehive? Bee knows math?

Bees are social. They live in the hive in highly organized society.

They have common purposes of survival. In this activity students have the opportunity to explore and build with hexagonal pieces and perceive the role of the queen bee, the drone and the worker. The choice of hexagonal shape of honeycomb is optimal for bees. Bees can maximize the number of alveoli minimizing the spent wax.

Materials/Resources

20/40 hexagon

Queen Bee

Drone

Worker bee

Activity Steps

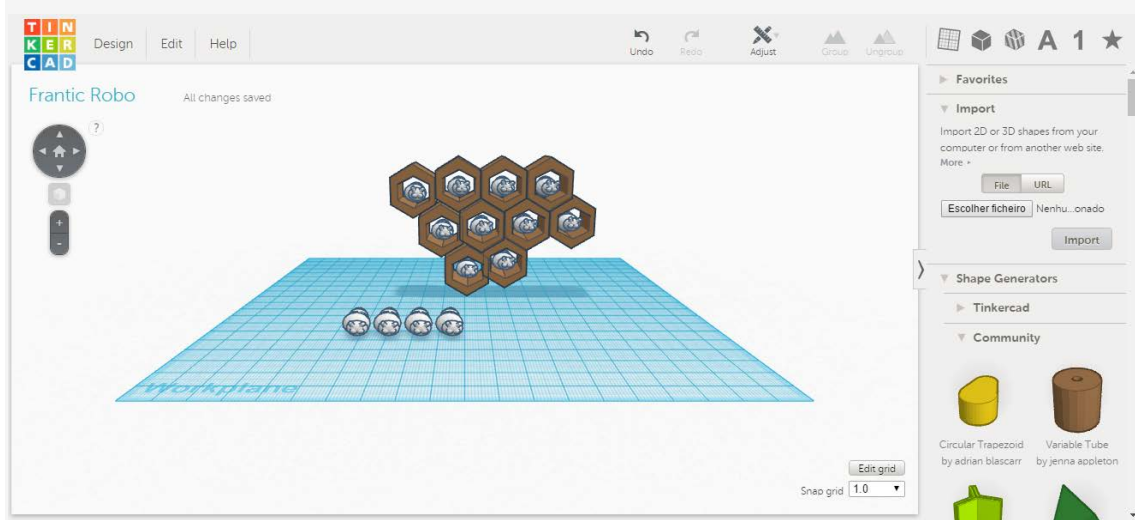
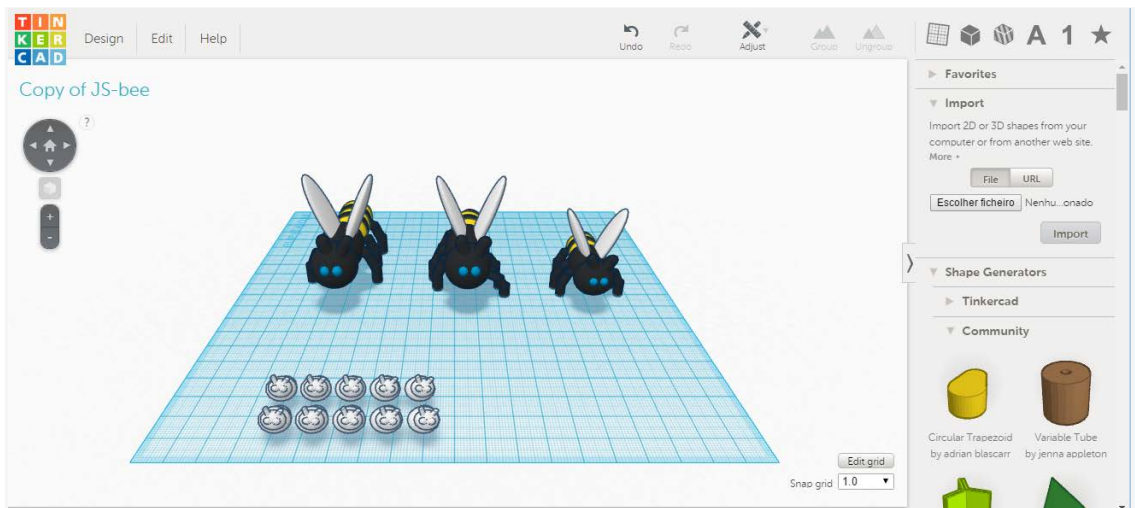
1. Present the queen, the drone and the worker bee to kids
2. Allow students accomplish mini investigations on this type of issues
3. It's important they see movies or explore books before the teacher give them the scientific explanation

The students can find interesting answers in the following websites:

<https://www.youtube.com/watch?v=QEzlsjAqADA>

<http://climatekids.nasa.gov/bees/>

4. In this activity you also can use the life cycle of the bee



Activity 5 - Life Cycles of the Bee, Ant and Butterfly

Activity Objective

Understand that insects and other's animals have a life cycle. They born, develop into an adult, reproduce and die.

Observe the Life Cycle of the bee, ant and butterfly.

Materials/Resources

Life cycles of bee, ant and butterfly

<https://www.youtube.com/watch?v=ocWgSgMGxOc>

Activity Steps

1. Place the objects of the life cycle of the three insects in a box
2. Explain student's what is a life cycle and try them separate de pieces in the three life cycle
3. Allow they see some films about the issues like thid one
<https://www.youtube.com/watch?v=ocWgSgMGxOc>
4. Allow they explain the insect's life cycle.

Other resources:

Ants: https://www.youtube.com/watch?v=vG-QZOTc5_Q

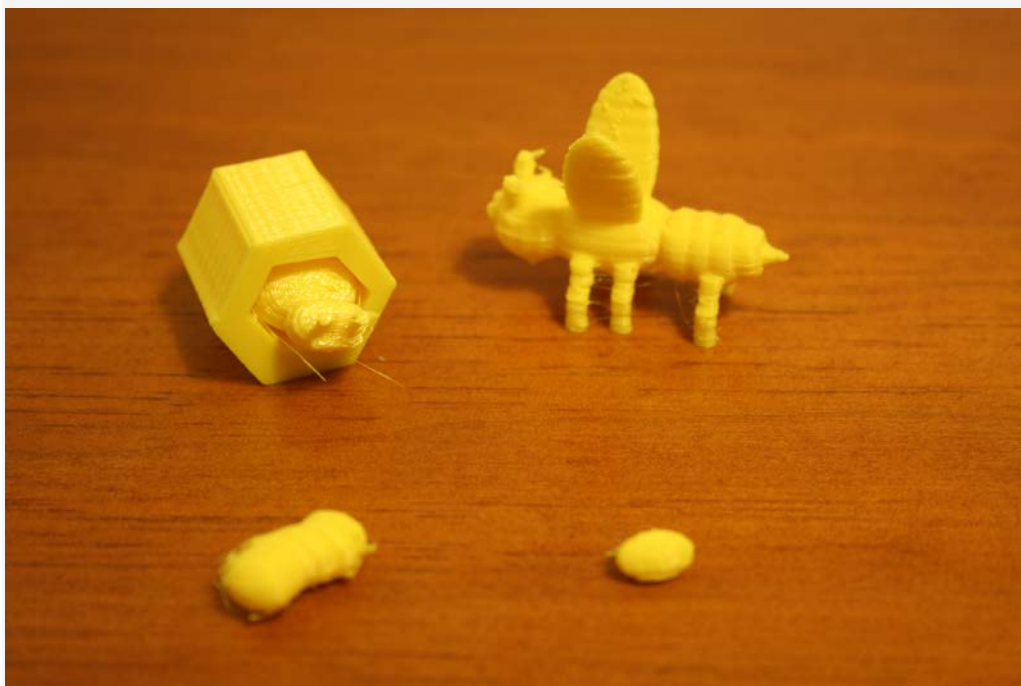
Life cycle about butterflies:

http://www.magicoflife.org/Life_Cycles.pdf

<https://www.youtube.com/watch?v=aNoqN-IX5qs>

<https://www.youtube.com/watch?v=K0GP1zZ7qvs>

<https://www.youtube.com/watch?v=qO37yoTi9es>



Activity 6 - Art and Science - Making My Imaginary Insect/Bugs creativity

Activity Objective:

It's time to allow students to use their creativity and imagination to build a new insect invented by them. All the combinations between art and science are possible.

Materials/Resources

Tissues, journals, 3-D Print insects, playdough et al.

Activity Steps

1. Give the materials to kids
2. Let them work

Note: If they want they can make a new insect with a dragon wings, a dinosaur body and a scorpion stinger

Duration

Time for each activity: 1 hour/ 1 hour and 30 minutes

(It's depend of the interest of the student's)

Preparation

The teacher need to print the stl files and have the materials needed for the activities.

Tissues, newspapers, 3-D Print insects, playdough et al.

Laptop to see the suggested films or others they need.

Insect's Books

Children's insect magnifying glasses
Microwave
Cupcake
Other ingredients.



References

<http://www.iflscience.com/physics/why-do-honey-bees-make-hexagonal-honeycomb/>
<https://ncmns.wordpress.com/2013/06/07/what-butterflies-have-in-common-with-straws/>
<http://nautil.us/issue/35/boundaries/why-nature-prefers-hexagons>
<http://www.enchantedlearning.com/subjects/arachnids/scorpion/Scorpionprintout.shtml>

If you need more information see the original project in:

<http://www.thingiverse.com/upalermo/designs>

Or send me an email.