

Crime-Solving Insects: Activity Version

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Essential Question(s)

How do insects aid in forensic investigations?

Summary

In this series of activities, students delve into the field of forensic entomology by engaging in hands-on activities designed to spark curiosity, deepen understanding, and activate critical thinking skills. Students review the life cycle of flies, assume the roles of forensic investigators, and tackle authentic case students. Throughout these activities, students make real-world connections between the content and the field of forensic entomology, its processes, and how it is applied to solve crimes. These activities are based on the lesson "Crime Solving Insects" and can be used in a forensics class or club.

Learning Goals

Standards

College and Career Preparation Standards 6–12 (6th -12th)

9.6 (S): Students will foster curiosity, inquisitiveness, wonder, and imagination by applying scientific reasoning and engineering practices to investigate, analyze, and explain phenomena in the natural and designed worlds, demonstrating an understanding of scientific relationships and patterns. (Clarification Statement: To achieve this standard, instruction should align to grade-level state standards for science and engineering.)
10.6 (S): Students will foster curiosity, inquisitiveness, wonder, and imagination by applying scientific reasoning and engineering practices to investigate, analyze, and explain phenomena in the natural and designed worlds, demonstrating an understanding of scientific relationships and patterns. (Clarification Statement: To achieve this standard, instruction should align to grade-level state standards for science and engineering.)
11.6 (S): Students will foster curiosity, inquisitiveness, wonder, and imagination by applying scientific reasoning and engineering practices to investigate, analyze, and explain phenomena in the natural and designed worlds, demonstrating an understanding of scientific relationships and patterns. (Clarification Statement: To achieve this standard, instruction should align to grade-level state standards for science and engineering.)
12.6 (S): Students will foster curiosity, inquisitiveness, wonder, and imagination by applying scientific reasoning and engineering practices to investigate, analyze, and explain phenomena in the natural and designed worlds, demonstrating an understanding of scientific relationships and patterns. (Clarification Statement: To achieve this standard, instruction should align to grade-level state standards for science and engineering.)
9.13.1: Students will join or initiate at least one school- or community-based organization aligned with their personal or social identities (e.g., cultural clubs, service groups), documenting how participation strengthens their sense of self and fosters connections with mentors and like-minded peers.

Attachments

- ABC Graffiti—Crime-Solving Insects.docx
- ABC Graffiti—Crime-Solving Insects.pdf
- Activity Slides—Crime-Solving Insects.pptx
- Case Cards—Crime-Solving Insects - Spanish.docx
- Case Cards—Crime-Solving Insects - Spanish.pdf
- Case Cards—Crime-Solving Insects.docx
- Case Cards—Crime-Solving Insects.pdf
- Case Resources—Crime-Solving-Insects - Spanish.docx
- Case Resources—Crime-Solving-Insects - Spanish.pdf
- Case Resources—Crime-Solving-Insects.docx
- Case Resources—Crime-Solving-Insects.pdf
- Designing the Case Folders—Crime-Solving Insects.docx
- Designing the Case Folders—Crime-Solving Insects.pdf
- Detective Notes—Crime-Solving Insects - Spanish.docx
- Detective Notes—Crime-Solving Insects - Spanish.pdf
- Detective Notes—Crime-Solving Insects.docx
- Detective Notes—Crime-Solving Insects.pdf
- Forensic Entomology Guided Notes—Crime-Solving Insects - Spanish.docx
- Forensic Entomology Guided Notes—Crime-Solving Insects - Spanish.pdf
- Forensic Entomology Guided Notes—Crime-Solving Insects.docx
- Forensic Entomology Guided Notes—Crime-Solving Insects.pdf
- Life Cycle Cards—Crime-Solving Insects - Spanish.docx
- Life Cycle Cards—Crime-Solving Insects - Spanish.pdf
- Life Cycle Cards—Crime-Solving Insects.docx
- Life Cycle Cards—Crime-Solving Insects.pdf

- Life Cycle Map—Crime-Solving Insects - Spanish.docx
- Life Cycle Map—Crime-Solving Insects - Spanish.pdf
- Life Cycle Map—Crime-Solving Insects.docx
- Life Cycle Map—Crime-Solving Insects.pdf
- Reflect and Discuss—Crime-Solving Insects - Spanish.docx
- Reflect and Discuss—Crime-Solving Insects - Spanish.pdf
- Reflect and Discuss—Crime-Solving Insects.docx
- Reflect and Discuss—Crime-Solving Insects.pdf

Materials

- Activity Slides (attached)
- Pen or pencil

Activity 1

- ABC Graffiti handout (attached; one per group)
- Life Cycle Map handout (attached; one per group)
- Life Cycle Cards handout (attached; one set per group)
- Forensic Entomology Guided Notes handout (attached; one per student)
- Markers (different colors for each group)
- Rulers (one per group)
- Pipe cleaners

Activity 2

- Forensic Entomology Guided Notes handout (attached; continued from previous activity)
- Designing the Case Folders document (attached; one copy for teacher)
- Case Cards handout (attached; see Designing the Case Folders document)
- Case Resources handout (attached; see Designing the Case Folders document)
- Detective Notes handout (attached; one per student)
- Colored pipe cleaners (at least five different colors)
- Plastic bags (one per case)
- Manilla envelopes
- Scissors
- Forceps or tweezers (optional)
- Plastic or latex gloves (optional)

Activity 3

- Designing the Case Folders document (attached; one copy for teacher)
- Case Cards handout (attached; see Designing the Case Folders document)
- Case Resources handout (attached; see Designing the Case Folders document)

Activity 4

- Reflect and Discuss handout (attached; one per student)

40 minutes

Activity 1

Teacher's Note: Graphic Images Disclaimer

This forensic entomology activity contains graphic images and videos. Review all media prior to the activity. Assess student maturity levels and provide content warnings to students or offer alternatives if necessary.

Use the attached **Activity Slides** to facilitate this activity. Move to **slide 2** and introduce the ABC Graffiti strategy to students. Divide students into small groups and give each group one marker and one of the attached **ABC Graffiti** handouts.

Explain to students that they should work with their group members to respond to the prompt "What can we learn from bugs?" by filling in as many letters as possible.

Display **slide 3** and have students begin writing. Start the 3-minute timer. When time is up, display **slide 4**. Have students rotate to the next group, briefly read that group's responses, and resume writing on that ABC Graffiti handout. Start the timer again. Repeat the process once more using **slide 5**.

Once all rounds are complete, invite volunteers to share the responses on their ABC Graffiti charts.

Transition through **slides 6–8** and share the title of the activity, the essential question, and the learning objectives.

Organize students into small groups and give each group one copy of the attached **Life Cycle Map**, one set of the attached **Life Cycle Cards**, one set of cut pipe cleaners, and one ruler. Share that students should complete a modified Card Sort to review the bug life cycle. Display **slide 9** and ask groups to identify the life cycle stages of a fly by organizing the life cycle stage cards on to the Life Cycle Map. Begin the 2-minute timer on the slide and have students work.

Possible Student Responses

At this point in the lesson, students may not correctly identify the life cycle stages, but that is okay.

Once time is up, pass out one copy of the attached **Forensic Entomology Guided Notes** handout to each student. Move to **slide 10** and review the correct order of stages on the Life Cycle Map. Clear any misconceptions students may have.

Display **slide 11** and share instructions for Round 2 of the Card Sort. Have students retrieve the ruler and the pipe cleaners from their bags. Instruct students to measure the pipe cleaners, which represent the size of a fly at each stage of the life cycle, and place them on the "Size" space next to the corresponding stage of the Life Cycle Map. Remind students that not all spaces will be filled.

Begin the 3-minute timer and have students work. Once time is up, invite volunteers to share out what size the fly should be at each different stage.

Go to **slide 12** and have students remove the last set of cards from their bags for Round 3 of the Card Sort. Have them use the information they have gathered so far to infer the duration of each time the fly spends in each stage. Have them indicate their inferences by placing the time duration Life Cycle Cards on the map. Begin the 2-minute timer on the slide.

After time is up, transition through **slides 13–15** to review the answers for both Round 2 and Round 3 of the Card Sort. Encourage students to rearrange their Life Cycle Maps as needed and take notes on the Forensic Entomology Guided Notes handout. As you share the information, highlight the fact that adult flies lay their eggs on openings of a carcass because these openings are the easiest points of entry. This fact is important for later activities.

Conclude this activity by collecting all materials and handouts. These will be used during Activity 2.

Teacher's Note: Timing

Activity 1 will likely last for the duration of one meeting period. Consider starting Activity 2 during the next meeting.

60 minutes

Activity 2

Begin this activity by reviewing what you did during the previous meeting. Pass back the Forensic Entomology Guided Notes to students.

Transition through **slides 16–17** and share what a forensic entomologist does as part of their job. As you share information, have students continue to take notes on the Forensic Entomology Guided Notes handout.

Move to **slide 18** and introduce the I Notice, I Wonder strategy. Share that students should watch the video on the next slide and take notes in the chart under the "Video Reflection" section of their handouts. Transition to **slide 19** and play the *Forensic Entomology* video clip.

Embedded video

https://youtube.com/watch?v=dntO3YANo18

Optional Video Addition

If you would like to share additional information about forensic entomology with students, unhide and display **slide 20**. Share the video *How Entomologists Use Insects to Solve Crimes*, which includes multiple examples of cases involving forensic entomology.

This video is optional, but can help transition into the next activity.

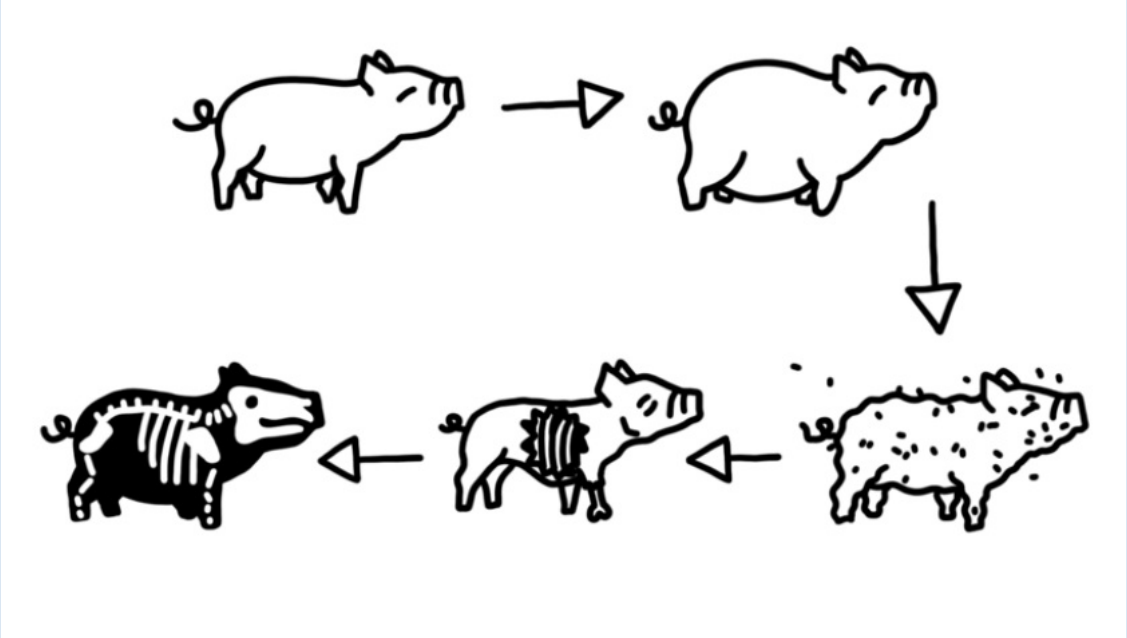
Display **slide 21** and explain how forensic entomologists use insects as evidence. If you begin this activity during a new class session, remind students to take out their Forensic Entomology Guided Notes handout and continue completing it.

Show **slide 22** and introduce the Cognitive Comics strategy. Share that students should draw visuals depicting how they understand the stages of body decomposition in the boxes under the "Stages of Decomposition" heading as you share information on the next slides. Encourage students to use an animal or human body as the main image in each box.

Transition through **slides 23–26** and describe the stages of decomposition on as much detail as necessary. Review the image of the fly life cycle on the slides, which goes clockwise from eggs, larva, pupa, to adult. After reviewing all content, invite volunteers to share their comic strips with the whole class.

Sample Cognitive Comics

Completed student comics may look similar to the image below. If students are struggling with the activity, consider using the example to assist them.



Transition through **slides 27–29** and review which insects appear at each decomposition stage. Emphasize how the presence or absence of certain insects helps forensic scientists determine the postmortem interval (PMI). Explain that, for example, when scientists find a hide beetle on a body, they know that flies have already come and gone and the body is in a late stage of decomposition.

Display **slide 30** and have students watch *Crime Solving Insects with Michael Chism*, a video interview with someone who works in the field of forensic entomology.

Embedded video
https://youtube.com/watch?v=ieiBSQyKEoo

After students watch the video, move to **slide 31** and introduce the educational paths students can take to pursue a career in the field of forensic entomology.

Divide students into small groups and give each group one of the case folders featuring Case 1 from the **Case Cards**. Give each student one copy of the attached **Detective Notes** handout.

Display **slide 32** and share that you and the whole class will work together to complete Case 1. Have students familiarize themselves with the contents of the case folder, but have them keep the bag of "evidence" sealed. Then, invite students to place everything to the side. Lead a discussion using the three questions on the slide and have students take notes on the Forensic Entomology Guided Notes handout.

Transition through **slides 33–34** and discuss insect succession. Draw students attention to the table on slide 33, which outlines the insects that arrive at different states of body decomposition. Highlight that blow flies are often the first to arrive at the corpse, as this is relevant to the case studies. Next, move to **slide 35** and have students take the **Case Resources** handout from the folder. Facilitate a discussion using the questions on the slide.

Transition through **slides 36–37** and share other factors that impact a PMI. Remind students to continue to take notes on their handouts as you share each slide. When reviewing slide 37, remind students that both temperature and the presence of drugs will affect the development of fly larvae and increase or decrease the estimated PMI.

Display **slide 38** and have students read the Case 1 Case Card from their folders. Have them remove the bags of evidence from the folders and measure it. Allow them time to discuss their evidence and the questions on the slide, then ask volunteers to share out points from their responses to the questions. As students share, answer questions, ask clarifying questions, and clear up any misconceptions. Move to **slide 39** to display the correct responses to the questions.

Have students return all materials to their case folders and have them return the folders. Conclude this activity and collect materials for use during the next activity.

60 minutes

Activity 3

Review the previous activities with students. Organize students into small groups and display **slide 40**. Assign students to one of the stations around the room, and explain that students should solve the case at that station. Stress that they should only rotate to the next station when asked. If needed, unhide **slide 41** and provide reminders of things to look for when solving a each case.

Display **slide 42**. Have students use the provided resources to solve the case at their station as the whole class solved Case 1 earlier. Start the 10-minute timer on the slide.

Teacher's Note: Timing

Ten minutes is the recommended amount of time students should spend on each case study, but you may want to adjust this amount of time based on your students' needs.

When time is up, have students rotate to the next station and restart the 10-minute timer. Repeat this process until students have visited every station.

Transition through **slides 43–48** to review the correct data for each case. For each case, allow students to share out their responses before presenting the correct data and resolving any misconceptions. When reviewing Case 3, draw students' attention to the temperature (84–86 °F) and presence of oleandrin when assessing blow fly development. Share that only temperature affects house and flesh flies.

Collect all materials at the end of the activity to be used for future activity meetings.

25 minutes

Activity 4

Begin this activity by reviewing what students have accomplished during the past three activities.

Display **slide 49** and introduce the career-focused video *Crime Solving Insects with Ashley Meerschaert*. Share that this video highlights a career path related to forensic entomology, and this career in forensic science works with skulls and bones. Play the video for students.

Embedded video

https://youtube.com/watch?v=MyJAvzPElW4

Go to **slide 50** and distribute the **Reflect and Discuss** handout. Have students first respond to the questions individually. Then, have them find an Elbow Partner, share their responses, and take notes. Have them adjust their own responses based on any information they gained from their partner. Invite volunteers to share out.

Research Rationale

Research rationale for this resource is provided in the literature review Career Exploration Through Experiential Learning - Forensics.

Resources

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