

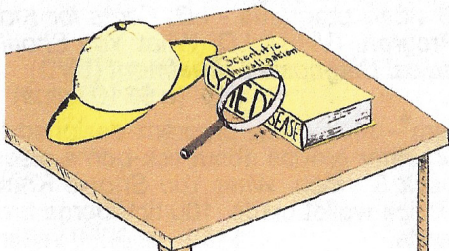
About the Lyme Disease Foundation

The Lyme Disease Foundation ("LDF"), a 501(c)(3) founded in 1988, is the only national non-profit health agency devoted to Lyme disease and other vector-borne diseases. The LDF is dedicated to prevention, detection, and recovery from Lyme disease and other vector-borne disorders. We do this through education, research, and advocacy.

The LDF has been instrumental in securing and increasing government funding for Lyme disease research & education. The LDF conducts international medically accredited scientific conferences on Lyme disease & other vector-borne diseases. The LDF has funded over \$500,000 of Lyme disease scientific research, fosters physician/researcher networking, educates the community, and connects patients with medical & support systems.

Go to our website (www.lyme.org) or contact the LDF to obtain a listing of our educational offerings.

Materials: Lesson Plan, video, Survey form, Tips & Tabulation Methods form, Educator Survey, LD brochure, wallet card, LD & Pets, LD Poster Duo, LD Health Alert, and Test your Lyme IQ.

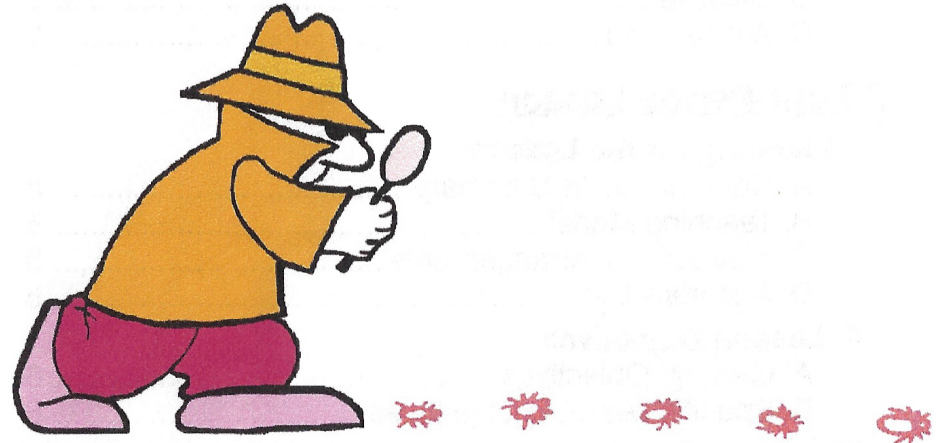


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Lyme Disease & The Scientific Method:

An Investigative Survey on Personal Protection

ONE-PERIOD & FOUR-PERIOD LESSON PLANS



Funded by a grant from the
Centers for Disease Control & Prevention

Lyme Disease Foundation ("LDF")
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A One-Period Lesson

I. Planning for the Lesson

A. CONTENT / SKILLS SUMMARY

The major purpose of this lesson is to illustrate the Scientific Method using information and activities about Lyme disease ("LD").

B. TEACHING MODEL

This lesson will combine cooperative group learning activities with whole-group learning activities.

C. INSTRUCTIONAL ARRANGEMENTS

1. The students will be in a whole-group setting for the lesson initiation and for viewing the *Lyme Disease: An Investigative Survey on Personal Prevention* video produced by the LDF.
2. The students will then be arranged into groups for the cooperative learning activity. Each group will receive literature containing information about LD. Each group will apply the scientific method to their assigned area about LD.
3. Each group will report their findings to the class.

D. MATERIALS LIST

1. LD Information provided by the LDF:
 - This Lesson Plan
 - Video - *Lyme Disease: An Investigative Survey on Personal Prevention*
 - Lyme disease Posters. Place in a location to facilitate group viewing.
 - LD Survey, Tips & Tabulations, and other printed material. Please make sufficient copies to distribute to the students.

2. TV

II. Lesson Objectives

A. GENERAL OBJECTIVES

1. The students will learn about the symptoms, causes, and strategies for prevention of LD.
2. The students will learn how to apply the scientific method.

B. SPECIFIC LEARNING OBJECTIVES

1. Students will demonstrate their knowledge of the scientific method by designing or following a problem-solving strategy related to LD which incorporates the steps of the scientific method.
2. Students will demonstrate an understanding that scientists differ in how they go about their work. Although there is no fixed set of steps scientific investigations usually involve these 7 steps:
 - 1st - **Identify The Problem** - This is written in a simple 1-2 sentence statement.
 - 2nd - **Research Information and literature** - e.g. search for handouts, online data, contact nonprofits, or go to the library.
 - 3rd - **Formulate a Hypothesis** - Make a simple 1-2 sentence statement of the theory that you want to test. e.g. People do not know what a tick is.
 - 4th - **Prepare an Action Plan** - This is a description of how you plan to test your theory. e.g. Are you doing research, conducting a test, calling resources, or conducting a survey.
 - 5th - **Test the hypothesis** - Actually conduct the experimentation, laboratory studies, or surveys.
 - 6th - **Interpret your Data** - Tabulate & analyze your data.
 - 7th - **Draw Conclusions** - Write a paragraph on what the problem was, your hypothesis, and whether or not the testing proved or disproved your theory. And, discuss what additional testing/research should be done.
3. Students will demonstrate an understanding that hypotheses are widely used in science for determining what data to pay attention to, what additional data to seek,

and for guiding the interpretation of the data.

4. Students will describe the common symptoms of LD.
5. Students will describe the common treatments of LD.
6. Students will describe how LD is transmitted to people.
7. Students will present a detailed outline of how to remove a tick that has penetrated the skin.
8. Students will be able to describe several precautionary measures that can be taken to help prevent LD.

III. Conducting the Lesson

A. INITIATION

1. Ask for volunteers to state an illness that caused him/her to miss several days of school.
2. Brainstorm a list of diseases that infect humans.
3. Brainstorm a list of diseases that infect humans that have been discovered within the past 20 years.
4. Briefly comment about awareness, danger of ticks, and importance of preventing LD.

B. SEQUENCE OF LEARNING ACTIVITIES

1. Introduce the video by stating that it is about two important topics: *Lyme disease* and *The Scientific Method*.
2. Write the steps to the scientific method on the blackboard and briefly comment on each step, as indicated in the *Specific Learning Objective* section:
 - 1st - **Identify The Problem**
 - 2nd - **Research for Information and literature**
 - 3rd - **Formulate A Hypothesis**
 - 4th - **Prepare An Action Plan**
 - 5th - **Test your hypothesis**
 - 6th - **Tabulate and Interpret your Data**
 - 7th - **Draw Conclusions**
3. View the *Lyme Disease: An Investigative Survey on*

Personal Prevention video (14 min.). Have the students outline the steps of the scientific method in their notebooks, with brief notations about the applications to LD given as an example.

4. Break the class into cooperative learning groups. Distribute informational material to each group. You can teach the material in two manners. The first option is to design a program around the enclosed *Survey* and *Tips & Tabulation* forms. The second option is more involved and has the students develop a study from scratch.
 - a. **"Personal Prevention Survey" and tabulation form.**
Using this option allows the group(s) to develop a theory that is covered by the form and then test it using the material provided. Different theories could be that people: know about LD, do not know how to remove a tick, or know about preventing LD.
 - b. **Students can develop their own project** by splitting into groups. Then, have each group take a different topic and develop their own 7-steps. Interviews can be conducted of fellow classmates. Topics can include the awareness of: LD symptoms, preventing LD, how to remove a tick, and LD & pets.
5. The first task for each group is to work cooperatively to design a model investigation by following the 7-step scientific method regarding their assigned topic or by designing it around the use of the Survey form. The steps of the group's model should be outlined on paper.
6. The next task for each group is to prepare a brief presentation for their classmates on how they developed their model of the scientific method and what they learned about LD.
7. The final task for each group is to conduct a brief presentation to their classmates on their modeling of the scientific method, including what they learned about LD.

C. CLOSURE

1. Ask for student volunteers to summarize the steps of the scientific method.
2. Ask for student volunteers to summarize what they have learned about LD symptoms, prevention, and treatment.

D. ASSESSMENT

Several methods of assessment can be utilized, including:

1. Assessment of cooperative group work
2. Assessment of group presentations
3. Assessment of related questions on a subsequent quiz
4. Assessment of applications of the scientific method on subsequent scientific investigations in class
5. Assessment of performance on related homework assignment

Suggestion: Apply the steps of the scientific method to another problem relevant to your community.

A Four-Period Lesson

I. Planning for the Lesson

A. CONTENT / SKILLS SUMMARY

The major purpose of this lesson is to illustrate the scientific method, design a study using the scientific method, and implement the scientific method in an investigation of LD.

B. TEACHING MODEL

This lesson will combine cooperative learning activities and whole-group learning activities aimed toward conducting and reporting on group research.

C. INSTRUCTIONAL ARRANGEMENTS

1. The students will be in a whole-group setting for the lesson initiation and for viewing the *Lyme Disease: An Investigative Survey on Personal Prevention* video produced by the Lyme Disease Foundation.

2. The students will then be arranged into groups for cooperative learning activities. Each group should receive literature containing information about LD. Each group will apply the scientific method in an authentic manner.
3. Each group will report their findings to the class.

D. MATERIALS LIST

1. Lyme disease Information provided by the LDF.
 - Lesson Plan
 - Video - *Lyme Disease: An Investigative Survey on Personal Prevention*.
 - LD Posters. Place in a location to facilitate viewing by all students.
 - LD Survey, Tips & Tabulation form, and other printed material. Please make sufficient copies to hand-out to the students.
2. VCR & TV

II. Lesson Objectives

A. GENERAL OBJECTIVES

1. The students will learn about the symptoms, causes, and strategies for prevention of LD.
2. The students will learn how to apply the scientific method

B. SPECIFIC LEARNING OBJECTIVES

1. Students will demonstrate their knowledge of the scientific method by designing a problem-solving strategy related to LD which incorporates the steps of the scientific method.
2. Students will demonstrate an understanding that scientists differ in how they go about their work. Although there is no fixed set of steps, scientific investigations usually involve these 7 steps:

- 1st - **Identify The Problem** - This is written in a simple 1-2 sentence statement.
 - 2nd - **Research Information and Literature** - e.g. search for handouts, online data, contact nonprofits, or go to the library.
 - 3rd - **Formulate a Hypothesis** - Make a simple 1-2 sentence statement of the theory that you want to test. e.g. People do not know what a tick is.
 - 4th - **Prepare an Action Plan** - This is a description of how you plan to test your theory. e.g. Are you doing research, conducting a test, calling resources, or conducting a survey.
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 - 7th - **Draw Conclusions** - Write a paragraph on what the problem was, your hypothesis, and whether or not the testing proved or disproved your theory. And, discuss what additional testing/research should be done.
3. Students will demonstrate an understanding that hypotheses are widely used in science for determining what data to pay attention to, what additional data to seek, and for guiding the interpretation of the data.
 4. Students will describe the common symptoms of LD.
 5. Students will describe the common treatments of LD.
 6. Students will describe how LD is transmitted to people.
 7. Students will present a detailed outline of how to remove a tick that has penetrated the skin.
 8. Students will be able to describe several precautionary measures that can be taken to help prevent LD.
 9. Students will demonstrate skills in administering or possibly designing a survey intended to provide information about public understanding of LD.
 10. Students will report on their interpretation and analysis of data accumulated in a survey.

III. Conducting the Lesson

A. INITIATION

1. Ask for volunteers to state an illness that caused him/her to miss several days of school.
2. Brainstorm a list of diseases that infect humans.
3. Brainstorm a list of diseases that infect humans that have been discovered within the past 20 years.
4. Briefly comment about LD awareness, danger & prevention.

B. SEQUENCE OF LEARNING ACTIVITIES

DAY ONE - Present the Scientific Method, View the video, 1st Identify the Problem, 2nd Research, 3rd Formulate a Hypothesis.

1. Introduce the video by stating that it is about two important topics: *Lyme disease* and *The Scientific Method*.
2. Write the steps to the scientific method on the blackboard and briefly comment on each step, as indicated in the Specific Learning Objective section:
 - 1st - **Identify The Problem**
 - 2nd - **Research** for Information and literature
 - 3rd - **Formulate A Hypothesis**
 - 4th - **Prepare An Action Plan**
 - 5th - **Test your hypothesis**
 - 6th - **Tabulate and Interpret your Data**
 - 7th - **Draw Conclusions**
3. View the *Lyme Disease: An Investigative Survey on Personal Prevention* video (14 min.). Have the students outline the steps of the scientific method in their notebooks, with brief notations about the applications to LD given as an example.
4. Break the class into cooperative learning groups.
 - a. Distribute LDF informational material to each group. The materials should include items as listed on the cover of this Lesson Plan.

- b. The first task for each group is to work cooperatively to **Identify The Problem** which they would like to investigate. e.g. Do middle school students know protective measures to take to reduce the risk of LD? Do kids know what a tick looks like? Students can choose a topic that is covered by the enclosed Survey form.

- c. The next task for each group is to **Research** for information and other literature. This would include LDF material as well as other resources, such as an encyclopedia.

- d. The next task for each group is to **Formulate a Hypothesis**.

- e. After completing the above and before the end of class on Day One, the group should show and explain their problem and hypothesis to the instructor. The instructor should comment constructively and give approval (or deny and guide) for further investigation in this area.

5. Assignment: Continue to *Research* sources of information and literature about LD. Encourage a visit to the school or public library. A school nurse is a good resource.

DAY TWO - Review, 4th Action Plan, 5th Testing

1. Review with whole class the progress made on the previous day and review the steps of the scientific method.
2. The next task for each group is to **design** an **Action Plan** to carry out their scientific investigation. Their goals are to explore the problem they identified and attempt to confirm their hypothesis. The action plan they develop may include the use of the enclosed survey instrument.
3. The next task is for each group to **Test** the Hypothesis by **designing and preparing** a survey instrument, similar to the example included in this informational packet. Or, actually use the *Survey* and *Tips & Tabulation* forms. Then, each group should make specific plans for how the survey will be administered.

4. **Assignment:** Test the hypothesis Conduct the survey on your target audience (on family, friends, peers, community members, students in the lunchroom, etc.)

DAY THREE - Review, 6th Data Tabulation & Interpretation, 7th Conclusion

1. Review with the whole class the progress made to date and review the steps of the scientific method. Discuss guidelines (length of time, appropriate visual displays, etc.) for upcoming presentations.
2. The next task for the groups is to conduct Data Tabulation by combining and tabulating the data gathered from the surveys.
3. The next task for each group is to analyze and interpret the data.
4. The next task is for the groups to formulate a Conclusion to the exercise, discussing whether or not their hypothesis was proven or not proven.
5. The next task for each group is to prepare a brief presentation for their classmates on their modeling of the scientific method, their conclusion, and what they learned about LD.
6. **Assignment:** Continue to prepare for the group presentation. This may include preparation of charts, graphs, transparencies, or other visual displays.

DAY FOUR - Review, Group Presentations

1. Begin the lesson by reviewing/discussing some of the guidelines for the presentations. Also, review how to be good listeners and clearly state your expectations for learning during the presentations.
2. The final task for the groups is to make brief presentations to classmates on their investigative research using the

steps of the scientific method. Included should be information about LD, how they conducted their research, their findings, and the conclusion to their study.

C. CLOSURE

1. Ask for student volunteers to summarize the steps of the scientific method.
2. Ask for student volunteers to speculate on other variations on LD topics which scientists could research using the scientific method.
3. Ask for student volunteers to suggest other problems/issues that they might like to investigate in the future using the scientific method.
4. Ask for student volunteers to summarize what they have learned about LD symptoms, prevention, and treatment.

D. ASSESSMENT

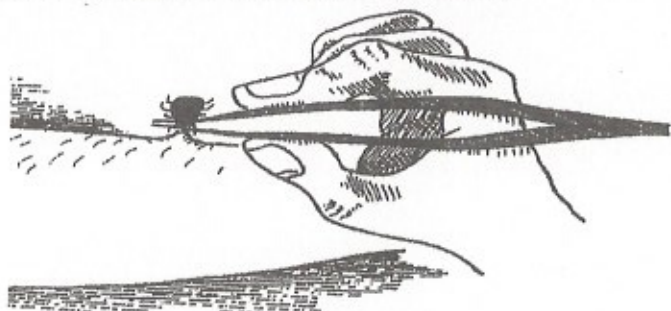
Several methods of assessment can be utilized, including:

1. Assessment of cooperative group work,
2. Assessment of group presentations,
3. Assessment of related questions on a subsequent quiz,
4. Assessment of applications of the scientific method on subsequent scientific investigations in class,
5. Assessment of performance on related homework assignment.

Suggestion: Apply the steps of the scientific method to another problem relevant to your community.

HOW TO REMOVE A TICK

Ticks have reverse-facing harpoon-like barbs that are used to penetrate and maintain attachment to the skin. Ticks secrete a cement-like substance that helps adhere them to the skin. For these two reasons ticks often are firmly attached to humans and animals.



1. Using fine point tweezers, grasp the tick's mouthparts (place of attachment) as close to the skin as possible.
2. Gently pull the tick straight out with steady pressure. Do not twist or jerk the tick.
3. Place the tick in a small vial with a blade of grass and label with the date, your name and address, the body part bitten, and send for tick identification and testing.
4. Wash your hands. Disinfect the tweezer and the bite. Mark in permanent marker the edges around where you were bitten, and watch for an enlarging rash.
5. Contact your doctor. The LDF Medical Advisory Committee recommends treatment on the bite of ticks capable of transmitting Lyme disease.

CAUTIONS I

- Check pets carefully, especially around their ears and eyes.
- Children should be told to seek adult help for proper tick removal.
- Adults should have someone else remove their own attached ticks.
- It is better to wait for tweezer removal than to pull the tick off with your fingers.
- If you must remove the tick with your fingers, use a tissue or leaf to avoid contact with infectious tick juices.
- *Do not* prick or burn the tick as it may cause the release of infectious tick juices.
- *Do not* try to smother the tick with petroleum jelly, as it has enough oxygen to last through the entire feeding.