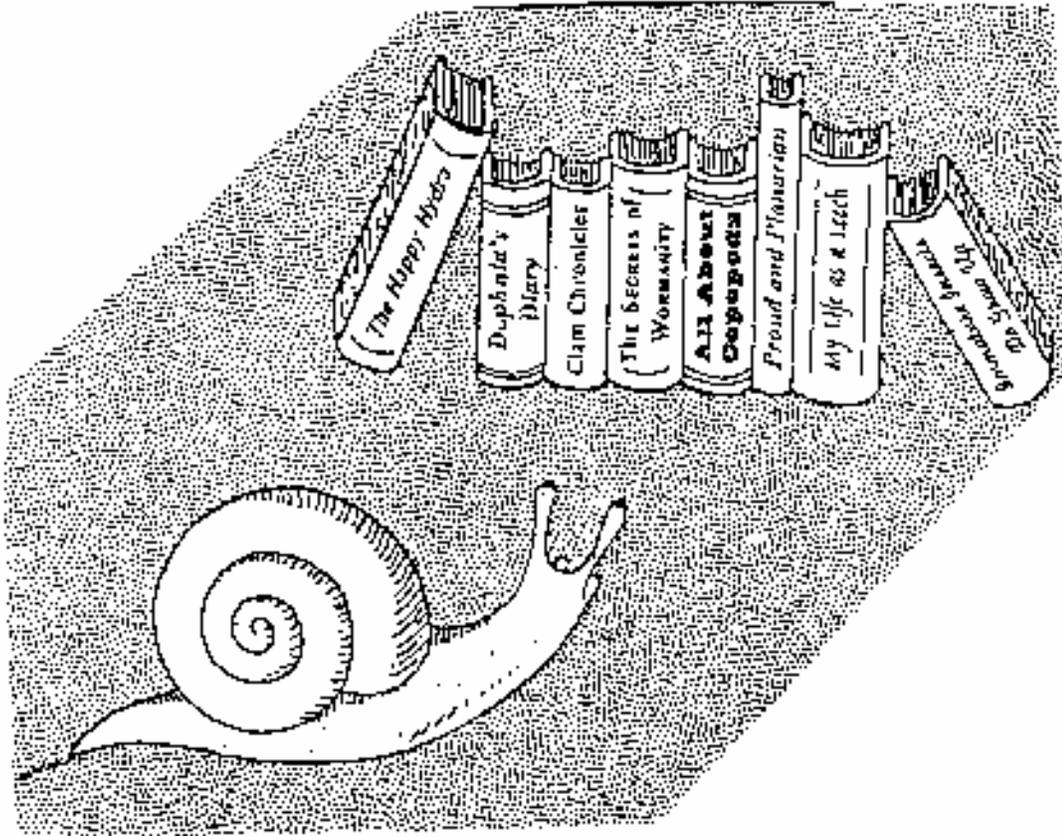


Days of Our Spineless Lives



by Lori Ihrig and Charlie Drewes
Presented at NABT 2000

Notes to the Instructor

(By L. Ihrig, Williamsburg Community Schools, IA)

Before beginning this activity, my students spend one 90-minute period in the field collecting invertebrates. The next two 90-minute periods are spent in the classroom sorting and identifying living specimens they collected. Then, they are introduced to this writing assignment (pages 3-13), which I require them to read thoroughly. Any questions they have about the assignment are answered.

Next, they select an organism. Then, they begin answering the numbered questions in this assignment by combining knowledge they have gained by studying the living organisms with information they have obtained from various reference sources, mostly books. Sometimes they are challenged with new terminology or concepts in biology which they may not have previously studied. The motivation needed to successfully deal with these challenges arises as students sense their evolving "ownership" of their selected organism and their creative writing project. Combining this sense of ownership and a need to know, students are now ready to develop an understanding of new concepts through additional activities and reading materials.

The amount of class time dedicated to this project can vary depending upon how the project is utilized. If the project is used as a final assessment, less time will need to be spent teaching concepts than if the project is used as a basis for the ecology unit. It may even be possible for students to do much or all of this activity without using living invertebrates. However, it is strongly recommended that living organisms be used as much as possible, because they dramatically increase student interest. Also, the activity need not be limited to invertebrates; any living organism that the instructor has available or familiarity with will work. However, questions may need to be modified to suit other groups of organisms.

Pages 9-10 of the student guide are a rubric used to assess each student's final project. Having the rubric in advance helps students to organize their activities, determine their progress, and understand what they need to do to earn the grade they desire. Pages 11-12 provide another tool to assist students in keeping organized and prevent the deadline from sneaking up on them. Setting daily goals and monitoring time on task seem to help my students make steady progress.

With so many concepts to teach in such little time, the decision to make this project one of my students most time-consuming was not taken lightly. The activity is rewarding to me because it meets standards of the National Science Education Standards (NRC, 1996), and it actively engages students in the learning cycle. Moreover, students demonstrate an interest in biology, display their creativity, take charge of their learning and have pride in their knowledge. This project culminates in an evening open house set up by the students to share their knowledge, final projects, and living invertebrates with their families, guardians and friends.

“Days of Our Spineless Lives: A Never Ending Saga”

The Project

You are going to develop and apply your knowledge about ecology and an invertebrate to write a creative essay/story. Write your story in *first person* [for example: “I am a tiny... and I live in...”]. You can use your own creativity and inventiveness to give your organism some “personality” and “preferences,” **but specific information about the organism’s biology should remain as factual and accurate as possible.** Try to make your essay sound like a flowing story, rather than a disconnected list of answers to the questions.

Step One-Questions to consider in your essay:

In your story you must address all of the questions listed below. If information is not available you need to apply your knowledge of ecology and the invertebrate to create a feasible speculative answer. In a postscript you will detail what information is speculative by discussing what you (a) are unsure of, (b) could find no information about, or (c) would like to know more about.

1. Who are you? Give your *common name* and *taxonomic name*.
2. What do you prefer to be called?
3. What other kinds of organisms are your close or distant *taxonomic relatives*?
4. Describe your general habitat (*macrohabitat*, landform, water form, etc.).
5. Describe details about your specific *microhabitat* (tree, dead log, stone, soil, etc.)
6. Describe your biological *community*. That is, what plants and animals live around you?
7. What is your *niche*? That is, what purpose or function do you serve in your habitat?
8. What do you look like? [Provide a detailed description of your *appearance*, shape, size, color, texture, etc.]
9. What *features* are unique, special, or peculiar about you?
10. Where do you think you will go today? (Possible destinations within your habitat. Note: this is not a destination you are creating for the sake of your story.)
11. Why will you go there? (Purpose of going)
12. How will you get there? Provide a detailed description of your pattern or means of *locomotion*.
13. If you can’t move or go anywhere, why not?
14. Do you prefer to be active in daylight, nighttime, or both? Explain any preference.
15. What will you *eat*? Describe your food preferences.
16. How will you *obtain food*?
17. Describe your dining habits and eating “utensils.”
18. How do you breathe, or *obtain oxygen*?
19. What is your circulatory system like? Do you have a heart and blood?
20. Have you always looked like you do now? If no, describe your earlier appearance(s) -- that is, *life stages* and *life cycle*.
21. How big will you *grow*?
22. How do you *reproduce*? Do you make and use *gametes*? (Sexual reproduction)?
23. Can you “clone” yourself through asexual reproduction? If yes, explain.
24. Do you have a nervous system? Describe its organization.
25. What special structures do you have that are used to *sense* things around you?
26. What other organisms might want to eat you? (*Predators*)
27. How will you *protect* or *defend* yourself from predators?
28. What will you do if part of you gets eaten?
29. Will you experience freezing cold during the winter? If so, how will you *survive* the winter?
30. What other *environmental extremes* might you experience? (Such as, drying, heat...)
31. How will you survive these extremes?
32. How long do you think you will live?
33. What could humans do to destroy you or make you ill?

34. How can humans avoid doing this to you?

Step Two- Observations:

If available in your classroom, study a living specimen of the organism you are writing about. On notecards, carefully note, record, and sketch as many details as possible about its appearance (size, color, shape, appendages, number of segments, etc.) as well as its movements and other behavior. Note its reactions to light, touch, food, etc.

Step Three- Use of Resources and Taking Notes:

Use any and all available resources to gather specific information about the organism's ecology, anatomy, behavior, etc. The types of biological information you will need can be determined by reviewing the questions listed above. This biology information may be obtained from journals, magazine articles, library reference books, textbooks, world wide web, resource people, or other references. In addition to biology facts, the information you gather may include copies of photographs, diagrams, etc. You may trace, redraw, or modify these pictures to use in your essay, but **try to maintain accuracy and detail in your pictures. Below each picture, include a legend that describes the picture [for example: "Here I am attached to a..."]**

There are many book resources available for you in the classroom. You may also use the public library, school library and the world-wide-web to gather resources and information. The authors of the following list of books have spent a considerable amount of time creating books that are thorough and filled with accurate information and drawings. Unfortunately, the same cannot always be said for information that is on the web.

Book Resources

- Kneidel, S. A Kid's Guide to Catching and Keeping Insects and Other Small Creatures. John Wiley, 1999. [ISBN: 0-471-25489-4]
- Pennak, R.W. Freshwater Invertebrates of the United States. 3rd ed. John Wiley, 1989. [ISBN: 0-47-63118-3]
- McCafferty, W.P. Aquatic Entomology: The Fisherman's and Ecologist's Guide to Insects and Their Relatives. Jones and Bartlett, 1983. [ISBN: 0-86720-017-0]
- McGavin, G.C. Insects, Spiders and Other Terrestrial Arthropods. Dorling Kindersley, 2000 [ISBN: 0-7894-5337-1]
- Rainis, K.G. and B.J. Russell. Guide to Microlife. Franklin Watts, 1996. [ISBN: 0-531-11266-7]
- Ruppert, E.E. & Barnes, R.D. Invertebrate Zoology. Saunders College Publishing, 1994. [ISBN 0-03-026668-8]
- Thorp, J.H. & A.P. Covich. Ecology and Classification of North America Freshwater Invertebrates. Academic Press, 1991. [ISBN: 0-12-6900645-9]

Web Resources

- <http://www.britannica.com/>
- <http://www.earthlife.net/insects>
- <http://orion1.paisley.ac.uk/courses/Tatner/biomedica/home/museum.htm>
- <http://www.ecb.org/guides/biology/index.htm>
- <http://netvet.wustl.edu/invert.htm>
- <http://animaldiversity.ummz.umich.edu/index.htm>

Taking Notes

All of the information you collect will be recorded on notecards that will be submitted with your final project. The notecards should use the following format:

<u>Title</u>	Name Date
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Example:

Name Date
<u>Movement</u>
Daphnia swim by using the long and bristled antennae that are located on their head. Their movements are jerky, but their antennae are powerful.
Pennak, R.W. <u>Freshwater Invertebrates of the United States</u> . 3 rd ed. John Wiley, 1989.

Step Four- Create Your Story

Below there are two examples. One is an example of a successful way to write a creative essay while highlighting accurate biological information. The other example is an essay in which the creative storyline is used at the expense of accurate biological information.

Daphnia:

Where do you think you will go today?

Why will you go there?

How will you get there?

Poor description for essay:

Today, as my first project, I think I'll go up to the water surface where it is bright and sunny. I like to float on the water. I think that's why I'm nice and tan. While I'm on the surface, I'll grab some food... maybe a bug-burger. They are my personal favorite. Recently, I noticed that the algae seem to hang out near the water surface during the daytime. I wish they didn't do that—all that green stuff really annoys me. If I feel like it, I may make a marathon swim to the other side of the lake where the water is calmer and the bottom is sandier—and there's a beach! Plus, there may be some really big bugs over there. Some of my aquatic friends think I'm pretty obsessed because I eat the same food all the time, but I don't care what they think because I'm healthy and my stomach is bulging with bugs. Of course, no matter where I go, I'll use my long legs for galloping in the water. I know my legs are pretty short. But I try hard and I usually get where I want to go. That's more than my friend, the sponge, can say—even though I think he's smarter than me!

Critique:

Essay above incorrectly implies the following: daphnia's preferences for flotation on water surface, tanning, insectivorous feeding, and swimming with legs. Use of the last word "me" is grammatically incorrect—even though it is probably true!!!!

Good Description for essay:

Today, as my first project, I think I'll swim upward a few feet toward the surface where it is bright and sunny. I don't know if anybody ever notices, but I often like to move toward the light. While I'm up near the surface, I'll try to snack on some delicious, nutritious algae. Algae are my personal favorite. Recently, I noticed that the algae seem to hang out near the water surface during the daytime. I wonder why? If there are no algae right above me, then I may make a marathon swim to the other side of the lake where the water is calmer and the bottom is sandier—and there's a beach! Plus, there may be more algae over there. Some of my aquatic friends think I'm pretty obsessed because I eat the same food all the time, but I don't care what they think because I'm healthy and my stomach is green! Of course, no matter where I go, I'll use the long and bristled antennae on my head to swim. I know my movements

are jerky but, hey, my antennae are powerful and I get where I want to go! That's more than my friend, the sponge, can say!

Critique:

Essay above correctly incorporates the following biological features: daphnia's positive phototaxis, preference for algae as main food source, and accurate description of locomotor appendages and movement.

Step Five-Summarize

Summarize by highlighting some of your most unique adaptations and special characteristics that make you well suited for survival and that allow you to successfully perform in your niche (reproduction, predatory abilities, locomotion capabilities)? Why do you deserve to receive an "Invertebrate Emmy Award" or be selected for the "Invertebrate Hall of Fame" or be voted the "Survivor"?

Step Six- Write Your Postscript

In a separate section, entitled "POSTSCRIPT" at the end of your essay, indicate which aspects of the organism's biology you were (a) interested in, (b) unsure of, (c) could find the most information about, (d) could find no information about, or (e) would like to know more about. Your postscript does not need to be written in first person from your invertebrate's point of view, but it can be written in first person from your point of view.

Step Seven- Create a Visual

Your final story must include visuals that you created. Your visual can be hand drawn, traced, created on the computer, etc. Your visuals may not be photocopies from print resources (books, magazines, journals, etc.) or printouts from the World Wide Web. Minimally, you must include a descriptive drawing of your invertebrate. This drawing should be large enough to label the distinguishing features without compromising the artistic integrity of the drawing. You may include as many creative or thematic drawings in your story as you desire.

Step Eight- Checklist

Make sure you have met all of the requirements of the project. The details of each requirement are listed above.

- 1) Note cards are complete, properly formatted and ready to be submitted.
- 2) The story is written in first person.
- 3) All questions are answered.
- 4) Observations are included in the story.
- 5) Self-created visuals are accurate, neat and labeled (not photocopies or printouts from the world -wide-web).
- 6) Your summary is complete.
- 7) Your postscript is complete.
- 8) Your works cited page is accurate, complete and properly formatted.
- 9) Your calendar of daily goals is ready to be submitted.
- 10) Your daily OT ratings are complete.

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- 6) Your summary is complete.
- 7) Your postscript is complete.
- 8) Your works cited page is accurate, complete and properly formatted.
- 9) Your calendar of daily goals is ready to be submitted.
- 10) Your daily OT ratings are complete.

Days of Our Spineless Lives Rubric

(This is how your final product will be graded.)

	Excellent	Acceptable	Needs Improvement
Biological Information (Content)	<u>All</u> of the required biological information is presented in the story. <u>All</u> of the information is accurate and accuracy is <u>never</u> sacrificed to embellish the story line.	<u>Most</u> of the required biological information is presented in the story. <u>Most</u> of the information is accurate, but <u>sometimes</u> the accuracy of the information is sacrificed to embellish the story line.	<u>Most</u> of the required biological information is <u>not</u> presented in the story. <u>Most</u> of the information is inaccurate, and <u>oftentimes</u> the accuracy of the information is sacrificed to embellish the story line.
	40 39 38 37 36	35 33 31 29 27 25	24 20 16 12 8 4 0
Quality of Ideas	The ideas in the story are rich in thought and imagination, relevant to the story line and clearly presented.	The ideas in the story are sound but unimaginative; most ideas are relevant to the story line.	The ideas in the story are unimaginative, not relevant to the story line, undeveloped and incomplete.
	20 19 18	17 16 15 14 13 12 11	10 9 8 7 6 5 4 0
Organization (Font size, margins, works cited, heading, title, double spaced)	The paper meets <u>all</u> of the formatting requirements.	The paper meets <u>most</u> of the formatting requirements.	The paper meets <u>few</u> of the formatting requirements.
	10 9	8 7	6 5 4 3 2 1 0
Drawing	The drawing is <u>exceptional</u> . It is accurate, neat and labeled.	The drawing is of <u>good quality</u> . It is accurate, neat and labeled.	The drawing is of <u>poor quality</u> . It is either neat, accurate or labeled. (Not all three.)
	10 9	8 7	6 5 4 3 2 1 0
Notecards	<u>All</u> of the notecards are complete, thorough and properly formatted.	<u>Most</u> of the notecards are complete, thorough and properly formatted.	<u>Few</u> of the notecards are complete, thorough and properly formatted.
	10 9	8 7	6 5 4 3 2 1 0
Time on Task (Grade is only received if assessment calendar is accurate and complete.)	Averages a score of "3" on the "Daily on Task Behavior Rubric".	Averages a score of "2" on the "Daily on Task Behavior Rubric".	Averages a score of "1" on the "Daily on Task Behavior Rubric".
	10 9	8 7	6 5 4 3 2 1 0

Instructor Checklist

The following checklist is provided for the instructor to use when assessing the content of the project. Checkmarks are only provided for questions that are both accurately and thoroughly answered in the story.

- 1) Who are you? Give your *common name* and *taxonomic name*.
- 2) What do you prefer to be called?
- 3) What other kinds or organisms are your close or distant *taxonomic relatives*?
- 4) Describe your general habitat (*macrohabitat*, landform, water form, etc.).
- 5) Describe details about your specific *microhabitat* (tree, dead log, stone, soil, etc.)

- 6) Describe your biological *community*. That is, what plants and animals live around you?
- 7) What is your *niche*? That is, what purpose or function do you serve in your habitat?
- 8) What do you look like? [Provide a detailed description of your *appearance*, shape, size, color, texture, etc.]
- 9) What *features* are unique, special, or peculiar about you?
- 10) Where do you think you will go today? (Possible destinations within your habitat. Note: this is not a destination you are creating for the sake of your story.)
- 11) Why will you go there? (Purpose of going)
- 12) How will you get there? Provide a detailed description of your pattern or means of *locomotion*.
- 13) If you can't move or go anywhere, why not?
- 14) Do you prefer to be active in daylight, nighttime, or both? Explain any preference.
- 15) What will you *eat*? Describe your food preferences.
- 16) How will you *obtain food*?
- 17) Describe your dining habits and eating "utensils."
- 18) How do you breathe, or *obtain oxygen*?
- 19) What is your circulatory system like? Do you have a heart and blood?
- 20) Have you always looked like you do now? If no, describe your earlier appearance(s) -- that is, *life stages* and *life cycle*.
- 21) How big will you *grow*?
- 22) How do you *reproduce*? Do you make and use *gametes*? (Sexual reproduction)?
- 23) Can you "clone" yourself through asexual reproduction? If yes, explain.
- 24) Describe your nervous system? What does it look like? How does it work?
- 25) What special structures do you have that are used to *sense* things around you?
- 26) What other organisms might want to eat you? (*Predators*)
- 27) How will you *protect* or *defend* yourself from predators?
- 28) What will you do if part of you gets eaten?
- 29) Will you experience freezing cold during the winter? If so, how will you *survive* the winter?
- 30) What other *environmental extremes* might you experience? (Such as, drying, heat)
- 31) How will you survive these extremes?
- 32) How long do you think you will live?
- 33) What could humans do to destroy you or make you ill?
- 34) How can humans avoid doing this to you?

Daily Goal Calendar and OT Rating

MON	TUES	WED	THU	FRI
O.T. Score: Goals:				
O.T. Score: Goals:				
O.T. Score: Goals:				

O.T. Score: Goals:				
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Daily On-Task Behavior Rubric

Score	Frequency	On Task Behavior
3	All of the time.	<ol style="list-style-type: none"> 1. Fair share of work. 2. Strives for quality work. 3. Talks about assignment with partner(s)/team. 4. Works on assignment.
2	<p>Most of the time.</p> <p>A few times.</p>	<ol style="list-style-type: none"> 1. Fair share of work. 2. Strives for quality work. 3. Talks about assignment with partner(s)/team. 4. Works on assignment. <ol style="list-style-type: none"> 1. Talks with people other than partner(s)/team. 2. Is off task—irrelevant talking. 3. Not working on assignment. 4. Causing others to be off task.
1	Multiple times.	<ol style="list-style-type: none"> 1. Talks with people other than partner(s)/team. 2. Is off task—irrelevant talking. 3. Not working on assignment. 4. Causing others to be off task.
0		<ol style="list-style-type: none"> 1. Did not contribute to partner(s)/team. 2. Was continually disruptive.

Appendix A

The information in this appendix is from: Natl. Research Council. National Science Education Standards. Washington: Natl. Acad., 1996. [ISBN # 0-309-05326-9]. This project provides opportunities for teachers to develop and demonstrate “the qualities that are most closely associated with science teaching and with the vision of science education described in the *Standards*.” (Natl. Research Council 29)

Teaching Standard A: Teachers of science plan an inquiry-based science program for their students. In doing this, teachers

- 1) Select science content to adapt and design curricula to meet the interests, knowledge, understanding, abilities, and experiences of students.
- 2) Select teaching and assessment strategies that support the development of student understanding and nurture a community of science learners.
- 3) Work together with colleagues within and across disciplines and grade levels.

(Natl. Research Council 30)

Teaching Standard B: Teachers of science guide and facilitate learning. In doing this, teachers

- 1) Focus and support inquiries while interacting with students.
- 2) Challenge students to accept and share responsibility for their own learning.
- 3) Recognize and respond to student diversity and encourage all students to participate fully in science learning.

(Natl. Research Council 32)

Teaching Standard C: Teachers of science engage in ongoing assessment of their teaching and of student learning. In doing this, teachers

- 1) Use multiple methods and systematically gather data about student understanding and ability.
- 2) Analyze assessment data to guide teaching. (Natl. Research Council 37)

Teaching Standard D: Teachers of science design and manage learning environments that provide students with the time, space and resources needed for learning science. In doing this, teachers

- 1) Structure the time available so that students are able to engage in extended investigations.
- 2) Create a setting for student work that is flexible and supportive of science inquiry.
- 3) Make available science tools, materials, media and technological resources accessible to students.
- 4) Identify and use resources outside of school.
- 5) Engage students in designing the learning environment. (Natl. Research Council 43)

Teaching Standard E: Teachers of science develop communities of science learner that reflect the intellectual rigor of scientific inquiry and the attitudes and social values conducive to science learning. In doing this, teachers

1) Enable students to have a significant voice in decisions about the content and context of their work and require students to take responsibility for the learning of all members of the community. (Natl. Research Council 45)

Teaching Standard F: Teachers of science actively participate in the ongoing planning and development of the school science program. In doing this, teachers

1) Plan and develop the school science program.

2) Participate in decisions concerning the allocation of time and other resources to the science program.

3) Participate fully in planning and implementing professional growth and development strategies for themselves and their colleagues. (Natl. Research Council 51)

This project provides opportunities for students to begin developing and demonstrating understanding of three of the six Life Science content standards.

Life science content standards:

1) Interdependence of organisms

2) Matter, energy and organization in living systems

3) Behavior of organisms (Natl. Research Council 181)

Each of the content standards are broken down into specific concepts that provide a guide to teach the content standard.

Guides to the content standards: The Interdependence of Organisms

1) The atoms and molecules on the earth cycle among the living and nonliving components of the biosphere. Energy flows through the ecosystem in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers.

2) Organisms both cooperate and compete in ecosystems.

3) Living organisms have the capacity to produce populations of infinite size, but environments and resources are finite.

4) Human beings live within the world's ecosystems. (Natl. Research Council 186)

Guides to the content standards: Matter, Energy and Organization of Living Systems

1) The energy for life primarily derives from the sun.

2) The chemical bonds of food molecules contain energy.

3) The complexity and organization of organisms accommodates the need for obtaining, transforming, transporting, releasing and eliminating the matter and energy used to sustain the organism. (Natl. Research Council 186)

Guides to the content standards: Behavior of Organisms

1) Multicellular animals have nervous systems that generate behavior (Natl. Research Council 186).