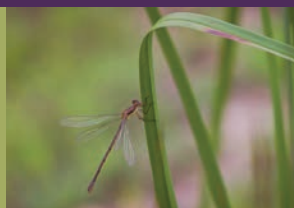


Methods of Teaching Environmental Education Participant's Guide

OFFICE OF ENVIRONMENTAL EDUCATION
AND PUBLIC AFFAIRS

N.C. Department of Environment
and Natural Resources



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N.C. Department of Environment and Natural Resources
Office of Environmental Education and Public Affairs

**METHODS OF TEACHING
ENVIRONMENTAL
EDUCATION
PARTICIPANT'S GUIDE**

Thank you for taking the Methods of Teaching Environmental Education workshop! The Methods is a required workshop for the N.C. Environmental Education Certification Program. It was added to the program in 2009 after program enrollees and certified environmental educators agreed that a workshop was needed to provide basic knowledge of the discipline and to impart practical skills, techniques and resources for educators of all experience levels. We have also found that it allows for sharing between teachers who use EE in the classroom and non-formal environmental educators in the field. This workshop was revised in 2014. Your feedback is essential and valued. Please use the evaluation included in this book and you can also contact us at the office: Lisa.Tolley@ncdenr.gov or Marty.Wiggins@ncdenr.gov

The online **MOTEE Appendix** can be found on the N.C. Office of Environmental Education and Public Affairs website. Go to www.eenorthcarolina.org, select “Find Resources” under the RESOURCES drop down menu, and search for “MOTEE” or use <http://bit.ly/MOTEEAppendix>. There are many supplemental resources on this page that extend the content of this workshop.



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READING 1.1 – Schedule and Goals

Schedule

- I. Welcome and Overview
- II. Learning Styles and Individuals
- III. Creating the Learning Environment
- IV. Teaching Methods
- V. Practicing Developmentally Appropriate Education
- VI. Closing the Loop of Learning: Assessment
- VII. North Carolina Essential Standards
- VIII. Reflection

Methods of Teaching EE Workshop Goals

1. Introduce learning styles and understand the needs and backgrounds of diverse learners to create an inclusive learning experience.
2. Gain skills and resources for managing groups, creating the learning environment and dealing effectively with safety issues.
3. Introduce inquiry and other teaching methods to meet a variety of learning styles and to guide the development of lesson planning.
4. Explore age-appropriate concepts and programming/lessons (pre-k through adult).
5. Gain skills in writing program and lesson objectives and introduce basic assessment strategies.
6. Introduce the Common Core State and N.C. Essential Standards and learn how to incorporate them into EE programming.

READING 1.2 - What is Environmental Education?

In the classroom and beyond, the desired outcome of environmental education (EE) is environmental literacy. To that end, environmental education strives to increase public awareness and knowledge of the environment and to provide the skills necessary to make informed environmental decisions and take responsible actions. EE does not advocate a particular viewpoint, but rather provides a context for learning in which the learner can develop a deeper connection to nature and develop the problem-solving skills to address various environmental issues.

Environmental education (EE) teaches children and adults how to learn about and investigate their environment, and to make intelligent, informed decisions about how they can take care of it. (NAAEE, What is Environmental Education?)

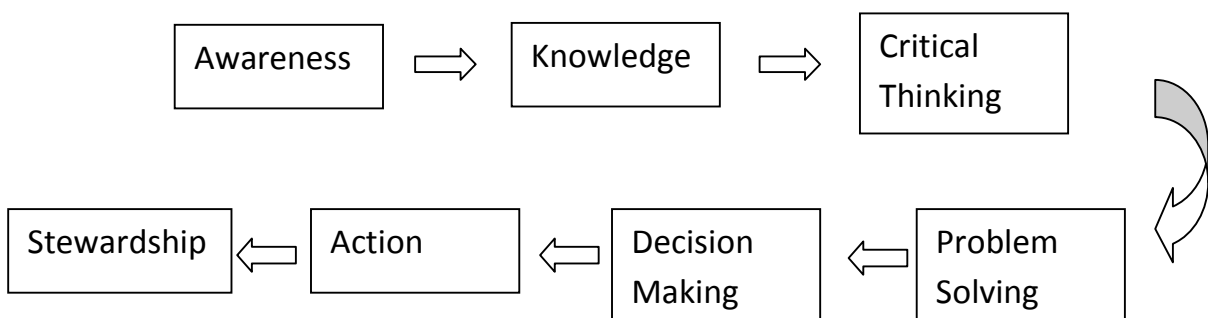
Environmental education does not advocate a particular viewpoint or course of action. Rather, environmental education teaches individuals how to weigh various sides of an issue through critical thinking and it enhances their own problem-solving and decision-making skills. (U.S. EPA, Environmental Education and Literacy)

Components of Environmental Education

The U.S. Environmental Protection Agency defines the components of environmental education as follows:

- Awareness and sensitivity to the environment and environmental challenges
- Knowledge and understanding of the environment and environmental challenges
- Attitudes of concern for the environment and motivation to improve or maintain environmental quality
- Skills to identify and help resolve environmental challenges
- Participation in activities that lead to the resolution of environmental challenges

The Southeast Environmental Education Alliance places the components of environmental education into a continuum representing the learning process:



READING 2.1 - Kolb's Learning Styles Theory

(Kolb, 1985 Learning Style Inventory. Boston: McBer & Company)

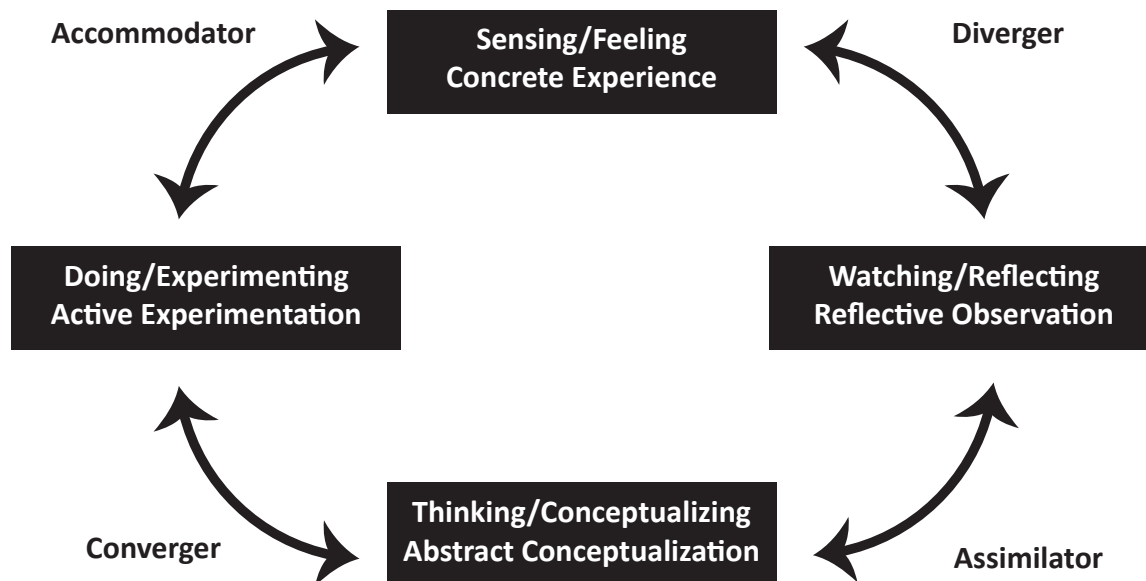
<p>Accommodator - combines learning steps of Active Experimentation (doing) and Concrete Experience (sensing)</p> <p>The Accommodating learning style is 'hands-on', and relies on intuition rather than logic. These people prefer to take a practical, experiential approach. They are attracted to new challenges and experiences, and to carrying out plans. They commonly act on 'gut' instinct rather than logical analysis. These learners will tend to rely on others for information rather than carry out their own analysis. People with an accommodating learning style prefer to work in teams to complete tasks. These learners set targets and actively work in the field trying different ways to achieve an objective.</p>	<p>Diverger – combines learning steps of Concrete Experience (sensing) and Reflective Observation (watching)</p> <p>The Divergers are able to look at things from different perspectives. They are sensitive. They prefer to watch rather than do, tending to gather information and use imagination to solve problems. They are best at viewing concrete situations from several different viewpoints. These people perform well in situations that require ideas-generation, like brainstorming. People with a diverging learning style like to gather information. They are interested in people, tend to be imaginative and emotional, and tend to be strong in the arts. People with the diverging style prefer to work in groups, to listen with an open mind and to receive personal feedback.</p>
<p>Converger – combines learning steps of Abstract Conceptualization (thinking) and Active Experimentation (doing)</p> <p>People with a converging learning style can solve problems and will use their learning to find solutions to practical issues. They prefer technical tasks, and are less concerned with interpersonal aspects. People with this style are best at finding practical uses for ideas and theories. They solve problems and make decisions by finding solutions to questions and problems. This group is more attracted to technical tasks and problems than social issues. People with a converging style like to experiment with new ideas, to simulate, and to work with practical applications.</p>	<p>Assimilator - combines learning steps of Abstract Conceptualization (thinking) and Reflective Observation (watching)</p> <p>The Assimilators prefer a concise, logical approach. Ideas and concepts are more important than people. This group requires good clear explanations rather than practical opportunities. They excel at understanding information and organizing it in a clear logical format. People in this group are less focused on people and more interested in ideas and abstract concepts. People with this style are more attracted to logically sound theories than approaches based on practical value. In learning situations, people with this style prefer readings, lectures, exploring analytical models, and having time to think.</p>

READING 2.1 - Kolb's Learning Styles Theory

(Kolb, 1985 Learning Style Inventory. Boston: McBer & Company)

LEARNING STYLE	TEACHING METHOD PREFERENCE
Accommodator, Combination <u>doing</u> and <u>sensing</u>	Role playing, games, labs, recalling past experiences, group work
Assimilator, Combination <u>thinking</u> and <u>watching</u>	Demonstrations, videos, brainstorming, considering ideas from a number of perspectives
Diverger, Combination <u>sensing</u> and <u>watching</u>	Projects, readings, creating models, group work
Converger, Combination <u>thinking</u> and <u>doing</u>	Projects, labs, hands-on activities, practice situations, case studies

Kolb's Learning Cycle



WORKSHEET 2.1 - Learning Styles Reflection

1. What did you learn about yourself and your own learning style and/or intelligences from the activities and readings?

2. How will this impact your teaching?

3. Can you think of an example of either being a student or an educator in which multiple learning styles/intelligences were not accommodated for? How could this situation have been improved?

Here are some basic tips adapted from *Are Learning Styles Invalid?* (Hint: No!) by Richard M. Felder. His complete essay (recommended) is in the online MOTEE appendix.

- Don't just lecture. Provide opportunities in class to both practice new material (for active learners) and to reflect on the outcomes (for reflective learners).
- Teach basic principles and theories (which intuitive learners are comfortable with), but be sure to provide the context of their real-world applications and numerous examples of how to apply them (without which many students may have difficulty grasping the underlying concepts).
- Provide information both visually (pictures, diagrams, flow charts, concept maps, demonstrations...) and verbally (written and spoken explanations).
- Teach new course material in a logical and systematic way (which thinkers and sequential learners need), but be sure to show how it connects to the student's prior knowledge and experience and to problems of global and social importance (for feelers and global learners).
- Utilize a variety of teaching methods in every lesson.
- Allow student choice when possible on methods of learning and assessment of learning.

READING 2.2 -

Diverse Learners

“Diverse Learners.” *Natural Wonders: A Guide to Early Childhood for Environmental Educators*. Marcie Oltman. MN Early Childhood Environmental Education Consortium, 2002, p. 16-17

What does it mean?

In order to create the best possible experience for children, diversity can and should be addressed and planned for. Diversity includes race, language, socio-economic status, disability and even learning style. A quality program will take these areas of diversity into account and will make every effort to address them sensitively.

Programs that strive to create an environment and curriculum that is inclusive go beyond the surface level of “political correctness” and understand that it is in all children’s best interest to be provided with a larger, more accurate picture of the world.

This means being aware that all students are not coming from homogenous backgrounds with the same base of knowledge. It means making a genuine effort to create programs that connect familiar things to children.

Educator Emily Styles of the Seeking Education, Equity and Diversity (SEED) project encourages teachers to develop experiences for students that create both windows and mirrors.

Mirrors are opportunities for children to see their own experiences reflected. Windows allow them to see the experiences of others. Activities or experiences that may be a window for one child could be a mirror for another. If children do not see themselves in an educational experience, they are less likely to retain the information.

Connecting learning that occurs in your programs to children’s home and community experiences is respectful and sets a foundation for learning.

Why is it important?

The United States’ population is becoming increasingly diverse. Some of the most obvious and quantifiable changes are happening in the racial make up of our nation. The Bureau of Educational Statistics predicts that by 2030, children of color will make up over half of the students in U.S. schools. *A Children of 2010* report published in the *Los Angeles Times* (March 1999) predicted that by 2050 no single ethnic group will constitute a majority of the U.S population. These statistics have enormous significance for all educators. If the goal of an environmental education program is to create a positive connection between children and the environment, not taking diverse factors into account can sabotage the goal.

What are the benefits of diverse learning?

Providing experiences that children can connect to prior knowledge increases their learning.

We know from research in educational psychology and brain function that children learn new things based on what is already established. New knowledge is categorized into what already makes sense. Learning that is isolated from what is familiar or known is less likely to be long term.

Early childhood pioneer Lev Vygotsky stated the idea of socio-cultural development, in which learning and psychological development occur through experiences that happen in a social and cultural context. Although this is now a widely accepted concept, many educators overlook the experience of a student that may be different from their own experiences. By making an extra effort to provide an inclusive experience, the learning becomes more meaningful for all students.

READING 2.2 - continued

Diverse Learners

Why don't educators take diversity into account more often?

Educators may see multicultural education as a separate field from environmental education.

This couldn't be farther from the truth. The future of our planet is a concern for all people and learning to make connections with the natural world is crucial for all people to ensure its survival.

Educators think that a great deal of background knowledge is needed.

While there is a wealth of information about diverse populations and about how to work most effectively with diversity, the most important piece is awareness. Educators who are aware that diversity exists and who make an effort to be inclusive are taking an essential first step. Educators feel uncomfortable talking about diversity.

Young children are aware of differences in people. When these differences are ignored or overlooked, they get the message there is something wrong with the differences. The more that human diversity is discussed and celebrated, the more children will understand and feel comfortable with the diversity around them. Educators think taking diversity into account is only necessary if there is a noticeably diverse group.

Inclusive education is the best practice no matter what the group. A child in summer camp

may be in a much more homogeneous group during summer than she is in her public school during the rest of the year.

What does representing diversity look like?

Represent reality and avoid stereotypes.

Books and materials used (posters, photographs, music, props and so forth) should show a diverse group of people. Addressing diversity does not mean that every program and every project has to have a specific cultural focus, but the underlying message must be one of inclusion.

Varying levels of comfort and knowledge are accepted.

For example, a child living in an apartment building may have had minimal contact with the world outside of his or her apartment. Venturing out into a nonurban area might be frightening. Another child from the same building may have no fears of the same area.

Inclusive instructors provide a variety of ways to participate and value all kinds of knowledge.

Welcome diversity.

Educators should find out as much as possible about the children attending a program and adapt accordingly. This could be as simple as learning some common Hmong pronunciations of children's names or giving a welcome greeting in one of the children's home languages.

READING 2.3 - Project WILD Activity

What Did Your Lunch Cost Wildlife?



Objectives

Students will (1) trace some foods from their source to the consumer; (2) identify the impact those foods and their processing have on wildlife and the environment in general; and (3) recommend, with explanations, some food habits that could benefit wildlife and the rest of the environment.

Method

Students trace food sources, diagram environmental impacts, and apply the knowledge they gain by making changes in some of their consumer choices.

Materials

Writing and drawing materials

Background

Lifestyle choices made each day have some impact on wildlife and the environment. Many of those impacts are indirect and are, therefore, less

obvious. The types of food people eat each day, for example, have many implications for wildlife and the environment.

The places and ways in which foods are grown have impact. Research has indicated that loss of habitat is one of the most critical problems facing wildlife. Habitat may be lost to agricultural use or development as well as to industrial, commercial, and residential uses. Given that people need food, the ways in which food is grown—and the ways that the land is cared for in the process—are very important. Eroded soil is a major nonpoint source pollution in the United States. This lost sediment can be detrimental to aquatic and terrestrial habitats. Farmers take measures to maintain and improve wildlife habitat as they grow and harvest their crops. They also pay close attention to the impact of their growing practices. Both inorganic and organic fertilizers commonly are used in industrial agriculture. These compounds may runoff or leach into water supplies. In lakes, for example, this run-off may increase nutrients that make algae grow.

The food transportation, processing, packaging, and marketing industries also are involved. Questions about the natural resources involved in getting the food from its source of origin to the consumer are critically important. One example is increased exploration for and development of fossil fuels used to transport the food from growing site to consumer, used often to fuel the processing, and frequently used in the packaging, as in the case of fossil-fuel-derived plastics.

Ethical considerations can also be raised concerning the impact on individual animals and plants by the methods used to produce food for people, as well as choices of which foods to eat.

Grade Level: 5–8

Subject Areas: Social Studies, Language Arts, Science, Environmental Education

Duration: one to three 45-minute sessions

Group Size: any

Setting: indoors

Conceptual Framework Topic Reference: HNIIA2

Key Terms: organic, inorganic, source, renewable, nonrenewable, impact

Appendices: Taking Action

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READING 2.3 - continued

Project WILD Activity

Procedure

1. Select a food item. Identify the item's ingredients. In a discussion with students, trace the item's ingredients all the way back to their origins. Include where and how they grew or were formed and how they were harvested, processed, transported, packaged, and made available to the consumer.
2. Ask students to generate a list of foods they either brought or bought for lunch. Be sure to include any packaging materials the foods came in.
3. Ask each student to pick one food to trace all the way back to its origins, including where and how it grew and how it was harvested, processed, transported, packaged, and made available to the consumer—the student. Ask students to make simple flow diagrams of the path the food takes. (Students may want to do some research to obtain some additional information.)
4. Next, ask students to create a picture, diagram, or chart to illustrate how food transportation affects wildlife and the environment.
5. Ask students to report—using the diagrams as a visual aid as they describe the path taken by their food and its effects on wildlife and the environment along the way.
6. Ask students to discuss and summarize their findings.
7. Ask students to think of changes they could make in their own lunch-time eating habits that would be likely to have a beneficial—or at least less harmful—effect on wildlife and the environment. Describe the reasoning for this change, and evaluate its consequences. If, after examination, each change seems to be helpful, suggest that students try making their changes for a week. At the end of the week, ask students to report. Were they able to stick with the change? What happened? If they didn't make the change, why not? Did they forget? If they did make the change, did they find themselves making or thinking about any other possible changes? If yes, what were they?

Technology Connections

- Use the Internet to research the route of a particular food back to its origins, including where and how it grew and how it was harvested, processed, transported, packaged, and made available to the consumer. (See page 532 for a link to information on maximizing web searches.)
- Use the Internet to research how food production and/or transport affects wildlife and the environment.

Extensions

1. Map the energy used to grow and transport the food to the consumer.
2. Include the impact on other specified natural resources along the way.
3. Distinguish between renewable and nonrenewable resources.
4. Research genetically modified organisms (GMOs) and their impact on agricultural practices such as pesticide, fertilizer, and irrigation use. Debate the “pros” and “cons” of GMOs.

Aquatic Extension

Conduct this activity again asking the question, “What Did Your Lunch Cost Aquatic Wildlife?” Think of whole populations of species of aquatic animals and aquatic habitats.

Evaluation

1. Trace the possible route that a container of milk might take back to its probable source. What effect does this journey have on wildlife?
2. Identify three food habits that could reduce or increase effects on wildlife and the environment. Explain the reasoning behind your suggestions.

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WORKSHEET 2.3 -

Reflection on *What Did Your Lunch Cost Wildlife* and Diverse Learners

1. What are some controversial or sensitive issues that could arise with students during this lesson? Why is it important to know your audience when doing lessons on environmental issues?

2. Reflect on how your current teaching approach conveys a message of inclusion.

3. What are some ways you can plan for addressing diverse learners?

4. How can you connect what a child learns in your program/classroom to their community?

SECTION III

CREATING THE LEARNING ENVIRONMENT



This section is about setting the tone for the learning experience through group management, safety and common teaching tips. First you will learn about the “4 Ps” of creating a positive learning environment and will apply them to a humorous outdoor teaching mistakes video. You and the other participants will then do a teaching tips activity. Finally, you and the other participants will interact in a group management skit.

Notes and Additional Reflections:

READING 3.1 - the 4 “P’s”

Presenter

You will teach based on who you are and what your learning style is like. Your passion, enthusiasm, knowledge and skills all help to set the stage for learning. You have a BIG responsibility for safety, both emotionally and physically for your students, as well as for the cognitive learning that happens. Take time to think about YOUR strengths and weaknesses before you teach and ask for help if you need it. Your role is the **motivator**. If you are not motivated, your students won't be either.

1. Set the stage for **exciting learning opportunities**. Guide students to learn through personal discovery.
2. Plan ahead so you will be ready for **facilitating learning**, not just lecturing.
3. **Prepare**, but allow room for spontaneity, based on YOUR strengths.

Pupils

Each student will bring a unique set of interests, motivations and expectations to your lesson. Your task is to relate to them at their level. It is important that you build rapport with your students as soon as you meet them. Learn their names, find out a little about who they are and what they are expecting. This will give you a chance to connect with them as you teach.

1. GAMEFACE before they come. If possible find out their G- gender, A - age, M- medical conditions, E - experience, F - familiarity with each other, A - abilities, C – culture and E - ethnicity before they come.
2. Use the students' names and directly involve them . . . “John, feels this. Sue, what do you feel?”
3. Keep the comfort level and needs of your students in mind at all times, ex. If they are cold, get them warm. No learning will happen if basic needs are not taken care of.
4. Pull students in at the beginning of your lesson, by starting with an attention grabber, something that excites them, or sets them up for learning.
5. Set up direct experiences for learning. Example: If you are trying to learn differences in tree bark, be sure to have them touch it or make a rubbing of the bark.
6. Challenge and encourage students by using incentives and expecting success. Students like to feel good about what they are doing.

Process

You are in charge of the time that the students are in your class; in essence, you are in the driver's seat choosing the route. In general, begin strong, take charge (without being overbearing), focus on enjoyment and learning, and conclude well. Have a plan and follow it!

1. **Use advanced organizers.** Describe what the students can expect. Example: There are three things that I want you to know about our time together.
2. **Relate to the audience.** Use analogies to connect ideas and concepts to the students' world.
3. **Connect experiences, weave them together.** Refer back to any experience that you have had at an earlier time with the group. Example: Compare forest smells and sounds to field smells and sounds as they move from one environment to the other.
4. **Use the teachable moment** when you have encountered something of interest, stop and look.
5. **Use the sensory approach** when appropriate.
6. **Manage students' needs.**
 - a. Establish expectations and guidelines for behavior.
 - b. Set expectations, alleviate anxiety.
 - c. Reward and acknowledge acceptable behavior.
7. **Ask good questions.** Encourage higher levels of thinking, ask open-ended instead of closed-ended questions. Use the Socratic Method.

Place

Determine what your classroom environment will be. Is it best to teach this lesson inside or outside? If outside, have you visited the spot before? Do you know where you are going? Is it safe? If inside, do you have the space you will need? Can you move tables and chairs?

1. Determine any **learning barriers**, before you begin – sounds, sun, wind, temperature extremes, water, etc.
2. Be sure to bring all the **teaching aids** that you need, whether blindfolds, a small white board, field guides, binoculars, specimens, first aid kit, etc.
3. **Keep safety in mind**, set boundaries if needed.
4. If outside – the **environment is everything** – use it, don't just talk about it, or play in it, EXPLORE it!!

*Adapted from: Gilbertson, K; Bates, T.; McLaughlin, T; and Ewert, A. (2005). *Outdoor Education, Methods and Strategies*.

WORKSHEET 3.1 - How Not to Teach Outdoor Education

1. Make a comprehensive list of the mistakes you see in the lesson. Later, in a group, you will think of solutions to the mistakes you observed.

MISTAKES OBSERVED	POTENTIAL SOLUTION FOR MISTAKE
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READING 3.2 - Teaching Tips



Consider Safety and Comfort First

Safety should always take priority over “success.” Consider weather conditions, physical abilities, sunlight, distractions, etc. Be sure to keep them well fed, hydrated, warm or cool (depending on season), etc. Try to discreetly determine if your participants have any allergies that you need to be aware of before they arrive. Discuss any safety issues they will need to be aware of before starting an activity, i.e. avoiding sunburn, bee stings and snake bites, hygiene, who to alert in the event of an accident/emergency, etc. Tailor this to the age of your group in an appropriate and positive way. The point is not to scare anyone, but to make them aware of their surroundings and what procedures to use. Don’t assume that everyone has basic common sense about safety.

Communication is Key

Speak with clarity. Non-verbal communication speaks loudly (eye contact, body language). Use inflection and vary pitch and tone to get and keep the audience’s attention. Communicate right off the bat about expectations, guidelines and procedures. Tell your group the objectives or learning goals of the day so they know what to expect. You can’t get somewhere without knowing where you are going!

Attitude is Everything

“Learning is caught, not taught.” As leader, facilitator, or teacher, you will set the pace with your attitude. Enthusiasm is contagious. If you are having fun, chances are that your students will as well. One caution: don’t let your enthusiasm for the topic being taught determine the pace at which you are moving. Slow down when necessary to get the point across.

Give Feedback

Students need positive and constructive feedback. Encourage the people in your group. It is best to give it as soon after the experience as possible. Don’t offer “false feedback,” for example telling a student that they gave a great presentation when you really don’t believe this to be true. It undermines your credibility and might inhibit them from receiving positive comments that you really do mean.

The “Sandwich” or “Oreo” technique can be useful here: Begin with positive feedback on what the group/individual did well, progress to the areas which could be improved upon, then end by returning to one or two of the major positives. Leave them with the incentive to build on what they have already done. Remember that feedback does not have to be in the form of statements. Drawing his or her own self-critique out via the Socratic Method can be very effective.

Get Students Involved

Students often learn the most from what they teach themselves and what they teach each other. This is a central tenet of learning by doing. Teach others to be teachers. Be familiar with the strengths of your students. A good teacher is also willing to let go of his or her ego (defined here as the positive sense of self derived from being seen as the “expert”) in order to optimize the learning for the students.

Empathize with the Students/Participants

Remind yourself of what it feels like to learn new things. I sometimes imagine myself sitting in the group listening to the presentation I’m giving while asking myself if I would be interested in the way it was being put forth. Listen carefully to the questions being asked but try to “listen” to those not being asked for fear of embarrassment. Create a relaxed atmosphere whereby students feel comfortable asking any question.

Use a Variety of Teaching Methods

Be creative; surprise people. Create an atmosphere whereby the student goes into the experience asking “I wonder what will happen today.” Create an atmosphere of anticipation. “I wonder what lives in that log.” The easiest way to teach a subject is not necessarily the best way. Any group will have students or participants with a wide variety of learning styles. Utilize a wide array of teaching methods in order to reach a larger number of students. If you can touch on the dominant learning style of a student, it can sometimes open doors to learning through other, less developed styles.

Utilize Teachable Moments

Be observant of what is going on around you as you teach, particularly of what is capturing students’ attention. Deviate from your plan or schedule as the opportunity arises. Encourage epiphany. Help students to realize that you cannot separate the classroom and life, for they both contain uncertainty and unscheduled events. Emphasize that learning is a lifelong process.

Be Organized but Flexible

Most people don’t plan to fail, they just fail to plan. If teachers/leaders are not prepared, it can communicate to students that they are unimportant. Never be so tied to your plan that you refuse to deviate from it as the situation requires. A good teacher has developed a “barometer” for the mood of the group and will respond to those “readings” accordingly.

Humor

Humor can be effective in creating a relaxed atmosphere provided it is not in poor taste. Humor grabs our attention. Everybody likes to laugh.

Know your Subject

Substance is important. Great teaching is not simply a function of method. You should know what you are talking about because you have done YOUR homework. Some experts say that you should know up to seven times as much as you will actually teach. I have found that this varies depending on the subject taught. For example, if I am teaching a lesson on Techniques of River Rescue, I want them to know practically everything I know about the subject. Never bluff your way through an answer when you are asked a question about which you do not know the answer. It is fine for a teacher to say "I don't know." It demonstrates integrity and can help to close the perceived gap between the "expert" and the learner.

Be Yourself

Develop your own style around your gifts and talents. Don't be fake. Students will appreciate the fact that you are true to yourself, and it sets a positive example for them to be genuine in their work and in their everyday lives.

Teach the Pupils, not the Subject

Be concerned with your students' needs. Meet people where they are. At the same time, recognize that you may have a few students who will attempt to use this aspect of your teaching against you by manipulating you. Sometimes, love must be tough. Some of the more important "lessons" may come from how you choose to respond to these situations.

Read the Pupils, not the Text

Determine the interests of the group. Pay attention to non-verbal clues. Take short breaks or use creative activities to break up long periods of sitting. Draw out information from the students whenever possible instead of simply telling or reading them the information.

Be Willing to Take Risks

Environmental educators of any type are often asking their students to take physical, mental, or emotional risks through the activities in which they are involved. A good teacher is willing to take risks, to try new things in order to find a more effective way to teach.

READING 3.3 - Behavior Management

Read the following tips for preventing misbehavior and reflect on your own experiences. Record any other tips or helpful tidbits from the class discussion.

- Set clear expectations right at the beginning so there is no time for misbehavior before you have established consequences. Don't assume that proper behavior is common sense. Most kids need to be told directly or they will test your boundaries!
- Create "buy in" for your expectations. If students understand why you have certain expectations, they are more likely to follow them. Explain that even adults have to follow similar rules on the job and if they don't, they get fired! Consider having them come up with conduct expectations and consequences and add any that they missed.
- Create a good rapport with students. Smile, look them in the eye, have interest in them as individuals, display excitement and enthusiasm.
- Show them the same respect that you expect from them. Avoid being an authoritarian, yelling, or calling students out in front of the group.
- Motivate them. Keep it fun, keep them on task, and keep them engaged. Remind them of fun activities ahead if they are getting squirmy or take it as a sign that it is time to move on.
- Provide positive reinforcement of good behavior. Misbehavior is often attention seeking, so provide individualized attention for positive behavior early on in the program.
- Assert yourself. Act confident in your behavior, decisions and actions. Be a leader.
- Be consistent. If you have to change a rule, explain why. Require the same rules for all students.
- Give the students ownership. Ask them what sort of behaviors should be exhibited and what behaviors should be avoided. Wait for answers and then ask what should happen if they don't follow rules.
- Follow through. If you say that throwing mud is unacceptable and after one warning you will have to sit out of the activity, and someone throws mud, you must follow through.

Notes from group discussion:

READING 3.4 -

Safety Considerations when Teaching Outdoors

There are two main factors that increase the risk of accidents in the outdoors. They are **environmental hazards** such as terrain and weather and **human factor hazards** such as experience level and skill. Some people just don't know how to avoid risks. So when planning an outdoor lesson, we must assess the area for environmental hazards and inform our participants how to best avoid these hazards. Remember to be sensitive to how you deliver safety information. It is important for participants to learn how to avoid risks, but we certainly don't want to instill unnecessary fear of the outdoors.

Before your participants arrive, provide them with information so they can be prepared for an outdoor experience. You have to decide, depending on the group and the activity if you are going to allow students to participate if they don't come prepared.

1. Wear light colored, long sleeve clothing to avoid mosquitoes, ticks, and other insects.
2. Wear closed toed shoes and long socks to protect your feet and ankles.
3. Apply sunscreen before going out to avoid sunburn.

Always carefully survey your outdoor study sites for potential hazards before you take participants outside.

1. Plan your route to and from your study site ahead of time. Walk through it and evaluate the route with safety considerations in mind.
2. Determine and define the boundaries of the study area. Make sure students know the boundaries. Consider using brightly colored flags or surveyor's tape to mark boundaries.
3. Check for bee or wasp nests and for flowering plants that may attract large numbers of pollinating bees and wasps.
4. Learn how to identify Poison Ivy and check for it.
5. Know how to contact your nearest poison control center to find out what to do if a student eats a poisonous plant.
6. Be aware of any student allergies and become familiar with the techniques for responding to allergic reactions.
7. Be aware of potential human-generated hazards such as trash, broken bottles, or other sharp objects.
8. Have quick access to a basic first aid kit, and know basic first aid procedures.

READING 3.4 - continued

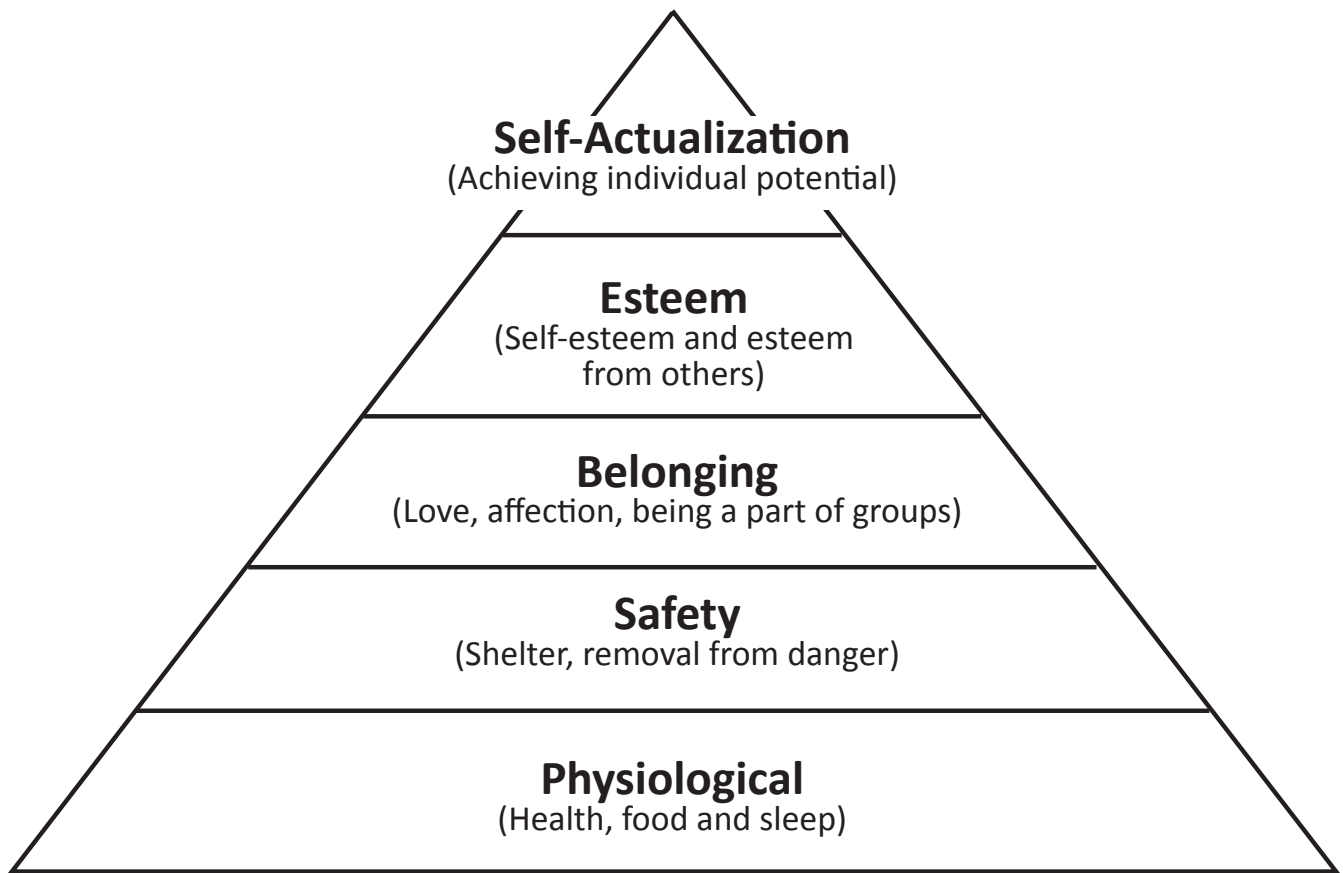
Safety Considerations when Teaching Outdoors

When your participants arrive, before going outside, review some basic safety skills:

1. Describe the site to them and inform them of the boundaries.
2. Explain to them the importance of not disturbing wildlife, such as snakes and stinging insects. Remind them to observe rather than grab.
3. Warn students not to eat plants or anything else they find outside for that matter. This seems like common sense, but you would be surprised what kids will do!
4. Tell students to inform you if they have allergic reactions to plants or bee stings in case you weren't given all the information before hand.
5. Remind them to slowly move away from flying, stinging insects, rather than swatting.
6. Most importantly, if someone does get hurt or stung, even if it doesn't seem like a big deal, tell them to inform you or another adult with the group immediately.
7. Remind them to have fun, be smart, and use common sense!

Adapted from "Chapter 1. Planning a Schoolyard Inquiry Lesson." *Model Inquiries into Nature in the Schoolyard- The MINTS Book: An Inquiry Field Guide to the Natural History of Southwestern Virginia Schoolyards*. Frank Taylor, Alan Raflo, and Llyn Sharp. Virginia Tech Museum of Natural History, 1997, p. 3-4.

READING 3.5 - Maslow's Hierarchy of Needs



SECTION IV TEACHING METHODS



Estimated Time: 1 Hour

This section provides participants with a sampling of teaching methods that are specifically helpful in environmental education and outdoor teaching situations. In interest of time, you will focus on the concepts of the teachable moment and inquiry learning. We will also use the “5E Learning Cycle” as an example on how to organize and sequence instruction.

Notes and Additional Reflections:

READING 4.1 - Teachable Moments and Inquiry Quotes

Teachable Moments

Beth Lewis, a teacher from California and the former Elementary Education Guide on About.com offers this often quoted definition:

A teachable moment is an unplanned opportunity that arises in the classroom where a teacher has an ideal chance to offer insight to his or her students.

Inquiry

*Inquiry-based learning is a learning process through questions generated from the interests, curiosities, and perspectives/experiences of the learner. When investigations grow from our own questions, curiosities, and experiences, learning is an organic and motivating process that is intrinsically enjoyable.**

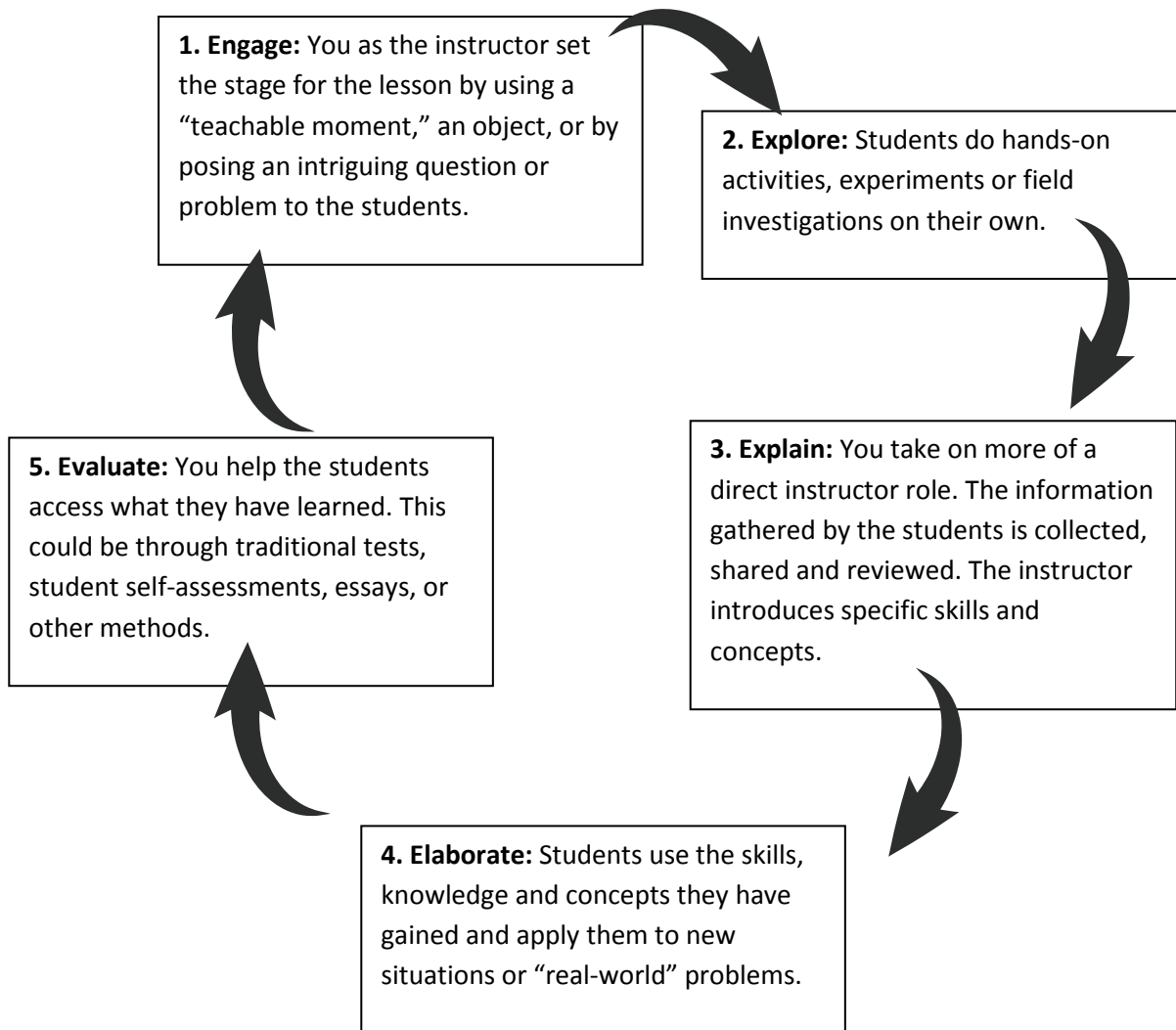
Inquiry Learning:

- *Leads to asking questions, making discoveries, and testing those discoveries...*
- *Is driven by one's own curiosity, wonder or interest...*
- *Begins when the learner notices something that intrigues, surprises, or stimulates a question...*
- *Takes action through continued observing, raising questions, making predictions, testing hypotheses...+*

*Quoted from Paula Sincero <http://www.inquirylearn.com/Inquirydef.htm>

+Based on excerpt from *Inquire Within: Implementing Inquiry-Based Science Standards in Grades 3-8*

READING 4.2 - The 5E Learning Cycle



Adapted from *Inquire Within: Implementing Inquiry-Based Science Standards in Grades 3-8*,
Second Edition (134-163) and
<http://faculty.mwsu.edu/west/maryann.coe/coe/inquire/inquiry.htm>)

WORKSHEET 4.1 - The 5E Learning Cycle

***Note to participants:** Please keep this worksheet handy. You will be using this lesson plan throughout the workshop.

LESSON TOPIC:	In the blocks below, briefly explain how you would address each "E"
<p>Engage</p> <p>Set the stage for the lesson by using a "teachable moment," an object, or by posing an intriguing question or problem to the students.</p>	
<p>Explore</p> <p>Students do hands-on activities, experiments, field investigations, etc. on their own.</p>	
<p>Explain</p> <p>Take on the role of direct instruction. The information gathered by the students is collected, shared and reviewed. The instructor introduces specific skills and concepts. Several of the listed teaching methods could be used to accomplish this.</p>	
<p>Elaborate</p> <p>Students use the skills, knowledge and concepts they have gained and apply them to new situations or "real-world" problems.</p>	
<p>Evaluate</p> <p>Help the students assess what they have learned. This could be through traditional tests, student self-assessments, essays, demonstrations or other methods.</p>	

Note: Reading 4.4 provides an example of a 5E lesson.

READING 4.3 - Longleaf Pine Ecosystem

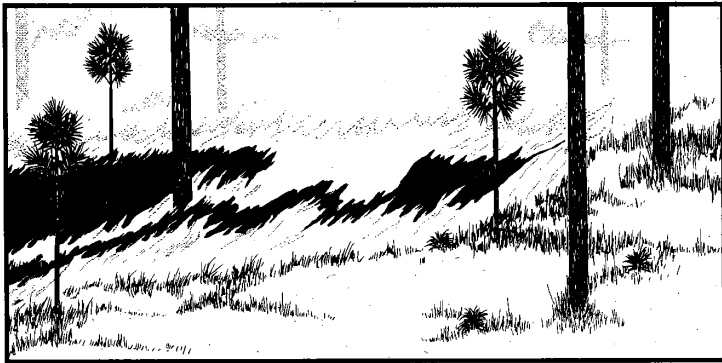


illustration by Consie Powell

The Ecology of the Sandhills

This activity focuses on the **habitat** of the Sandhills' **plant communities**. In this exercise, you will observe the habitat of specialized plant communities and recognize the positive effects **prescribed burns** have on these plants. **Ecology** refers to the interrelationship between living beings and their surroundings. The ecology of the **Sandhills** is therefore the relationship between the plants and animals and the soil, water and air upon which they depend. Ecology also includes the relationships with natural phenomena, such as wildfires, tornadoes and hurricanes.

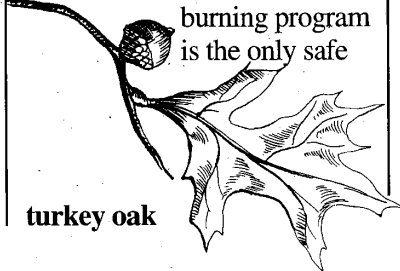
An important part of the ecology of the Sandhills is fire. Fire helps keep the **longleaf pine** forest open by limiting the growth of shrubs and hardwoods. It opens up the understory and allows a rich array of wildflowers and grasses to quickly resprout from their underground roots. They thrive

in the abundant sunlight and **nutrients** released from the ash of burned plants. Fire also prepares seed beds for longleaf pine by removing fallen leaves and exposing the mineral soil necessary for successful longleaf seed germination.

Many animals found in the Sandhills region depend on fires to maintain the open longleaf pine habitat. One interesting example is the red-cockaded woodpecker, a federally endangered **species**. A full-time resident, the bird makes its home only in the **heartwood** of living, old-growth longleaf pine trees. Another example is the fox squirrel. This large, secretive squirrel varies in color from gray to black and is rarely found outside of the longleaf pine, turkey oak and wiregrass **ecosystem**. A prescribed

burning program is the only safe

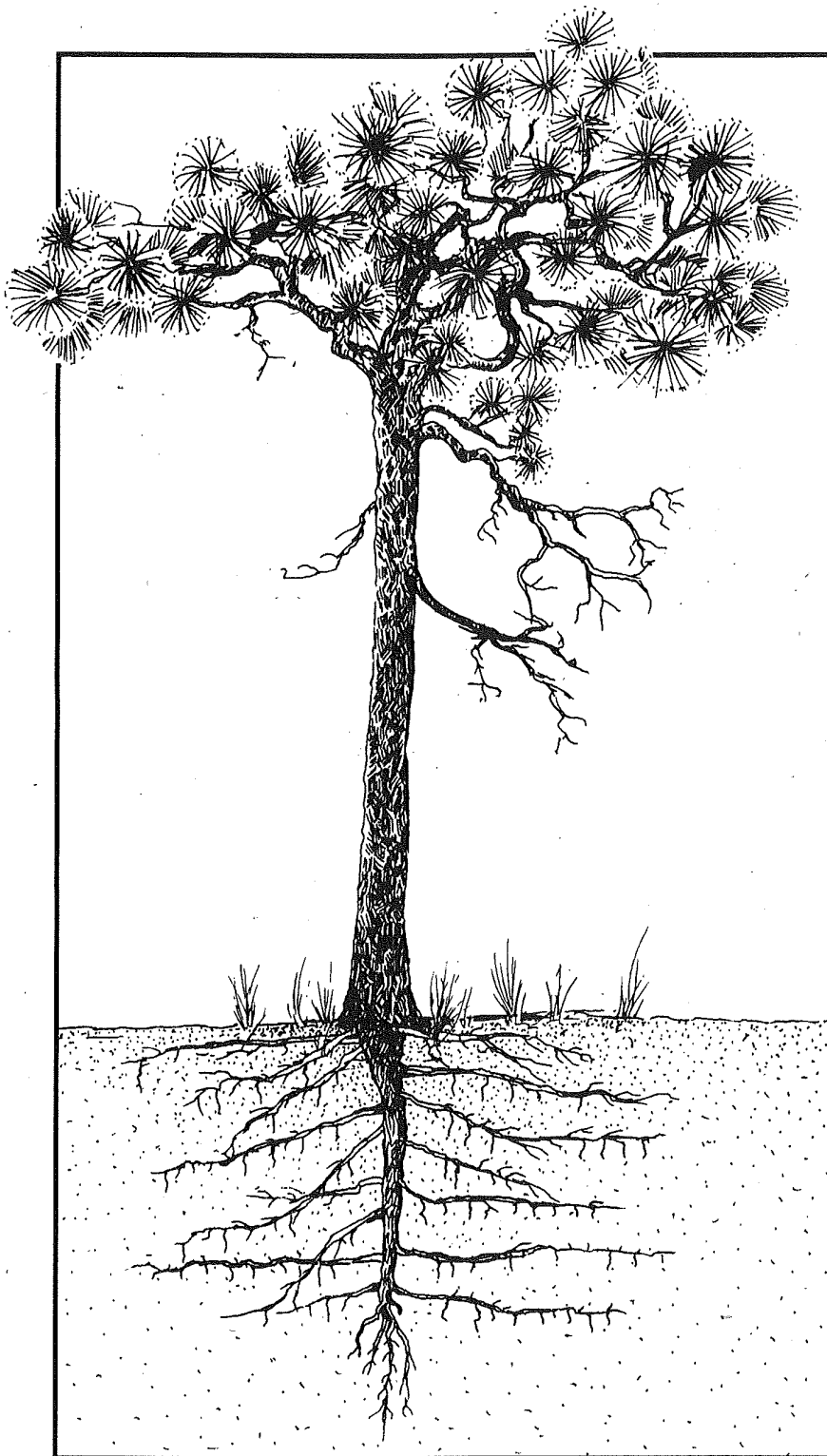
turkey oak



and effective way to maintain the habitat needed by both of these beautiful creatures.

Before European settlers came to this country, the Sandhills burned periodically due to lightning strikes and fires set by Native Americans. The European settlers extinguished all fires to protect their settlements. Soon, the longleaf pine forest filled in with hardwoods and shrubs, and all of the beautiful wildflowers and grasses began to disappear. Scientists discovered that by setting prescribed fires, which mimic natural fires, the native animals, wildflowers and grasses of the Sandhills could be restored.

Weymouth Woods - Sandhills Nature Preserve has a prescribed burning program to manage its longleaf pine forest. The preserve is broken into small sections that are surrounded by **firebreaks** which are mowed and raked to ensure that the fire will remain in the desired areas. These areas are burned approximately every two years when conditions, such as moisture and wind are favorable, and when trained personnel are available. This **resource management** program maintains the unique plant and animal communities of the longleaf pine forest.



Soil Moisture Measurement

The amount of moisture found in the soil is one of the determining factors in the type of plant communities that will grow in an area. Different species of plants have **adapted** to the amount of water needed for survival. The Sandhills region is known for its deep, sandy soils and large amounts of rainfall. However, rain water flows very quickly through these sandy soils and is not held near the surface for long. The Sandhills' plants have adapted by developing extensive root systems. For example, longleaf pine trees develop a long **tap root** that can reach water far underground, even in the dry, hot summer. Other plants, such as wiregrass, develop a root system that is shallow, but very wide and dense. Any water moving down from the surface is soaked up quickly and stored for use in dryer times.

Some Sandhills' plants also have ways to conserve water. For example, young turkey oaks twist their leaves so that the surface of the leaf is not facing towards the sun. This reduces the amount of water lost to **transpiration**.

NOTE:

While you are working on this project, remember that all plants and animals in state parks and recreation areas are protected. Do not disturb the plants by picking or trampling them.

There are different groups of plants just like there are different groups of animals. We group animals into birds, mammals, reptiles and so on. Similarly, we can place trees into one of two large groups: hardwoods or **conifers**. Hardwood trees have flat leaves of varying width and produce flowers. Many, but not all, hardwood trees are deciduous. In the spring, they sprout new leaves from buds that were dormant during the winter, and

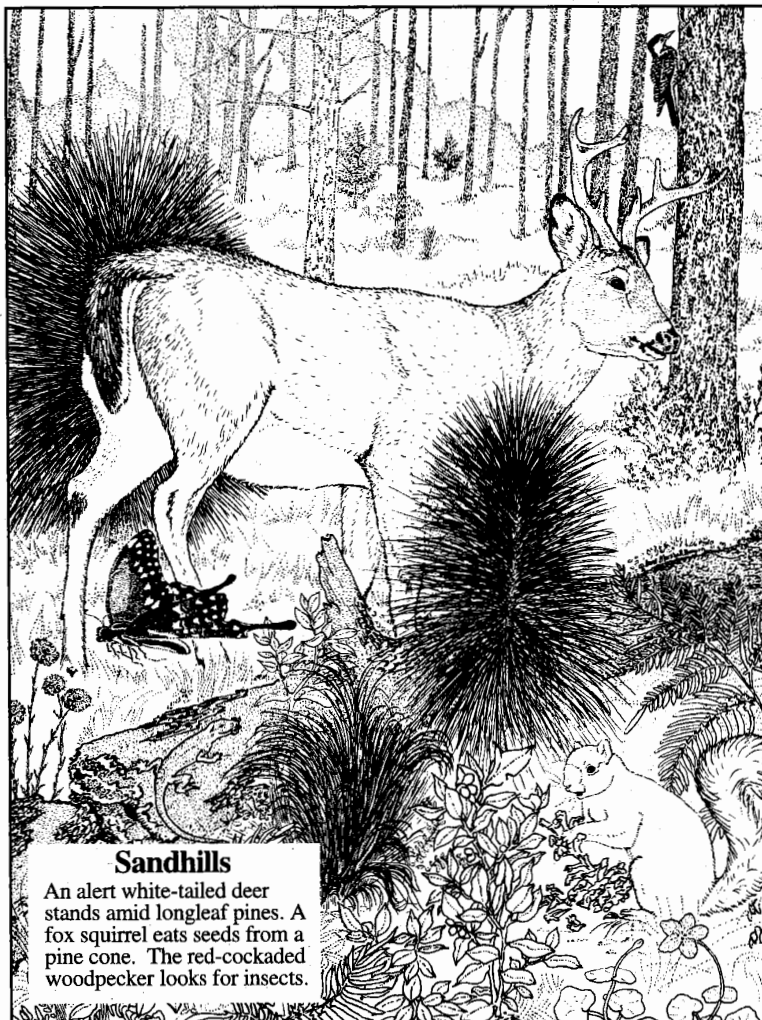
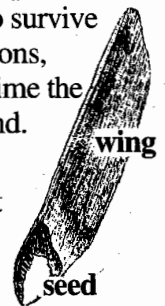
in the fall, the leaves change color and drop to the ground. **Coniferous** trees have scaly or needle-like leaves and produce cones. Many conifers are also called evergreens because the trees appear to remain green throughout the year.

Within each of these large groups there are family groups of trees, such as the oak family in the hardwoods and the pine family in the conifers. The families can be broken down into individual members with

their individual names just like your own family. The individual family members are called **species** such as the turkey oak species in the oak family and the **longleaf pine** species in the pine family. The longleaf pine species will be the focus of this exercise.

The longleaf pine is a special species of pine because of its ability to prosper in the area known as the **Sandhills** region of North Carolina. The Sandhills is a sometimes harsh environment in which to live because any plant growing there must have the ability to find or store water and also be able to survive the wildfires that once burned across the land. The longleaf pine has developed ways to survive such harsh conditions, starting from the time the seeds hit the ground.

The seed has a wing attached to it so that the wind can carry it to an area away from the main tree (see illustration). When these seeds start to fall, they are sometimes called "helicopters" because they spin like a helicopter propeller. Very soon after landing on suitable soil, the seed germinates. In the Sandhills there are basically two types of soil. One is called organic soil and is composed of peat (dead decaying plant material). The other is mineral soil and is composed



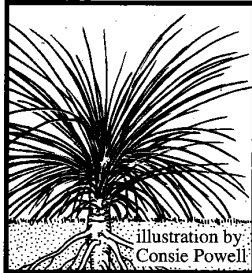
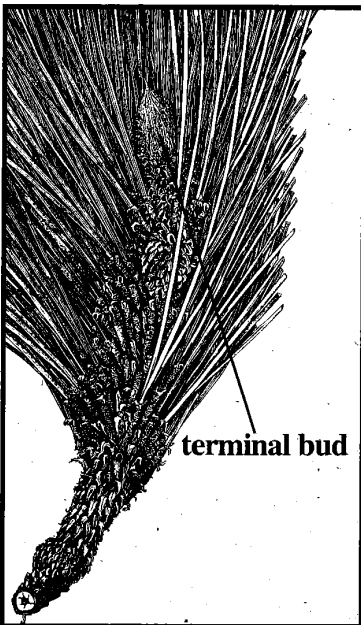
Sandhills
An alert white-tailed deer stands amid longleaf pines. A fox squirrel eats seeds from a pine cone. The red-cockaded woodpecker looks for insects.

illustration by ©Anne Marshall Runyon

of sand. Longleaf pine seeds grow best when they land on mineral soil.

After germination, the young pine consists of a few small pine leaves and a developing root system. In this stage of life, the longleaf pine's root system is basically the only part of the tree that grows. This first stage of growth is

called the seedling stage, or grass stage, because the longleaf pine looks like a clump of grass. Most of the growth is taking place underground where the **tap root** is growing longer and longer. This long root will help the tree survive periods of dry weather by reaching deeper and moister soil and also storing water. The needles above the ground grow to their full size of 10 to 15 inches, but there is no stem

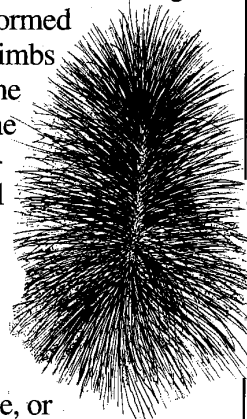


or tree trunk yet. In the winter and early spring, these long needles protect the **terminal bud** (see illustration) from wildfires that burn across the land. The longleaf pine may stay in this stage for three to seven years.

After the initial period of root system growth, the longleaf pine is well established and now begins to grow upwards. The terminal bud begins to shoot upwards, creating

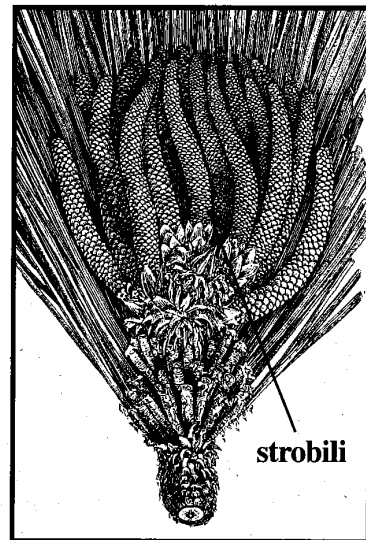
the stem or trunk of the tree. The needles stick out along the newly formed trunk. No limbs appear on the longleaf pine until the environmental conditions are just right. This stage is called the sapling stage, or "bottlebrush," because the tree looks like a brush that is used to clean bottles (see illustration). It may take a few years before the longleaf pine begins to grow limbs and many years before it is old enough to produce its first pine cone.

The first pine cone may not be produced until the longleaf pine is 20 to 25 years old. This stage is called the mature growth stage and may last until the tree reaches its last stage at 100+ years. The thin limbs of the longleaf pine will be near the top of the tree as the lower limbs fall off. All the



long needles are located at the end of each stem creating a cheerleader's "pom-pom" effect. During this period, the tree is very productive and is producing pine cones full of seeds.

Pine cone production is very important for the longleaf pine tree and the animals that eat the seeds. This makes the mature growth stage important for **reproduction** and survival of the longleaf pine forest **ecosystem**. The longleaf pines that make it to this stage will grow two kinds of pine cones: **pollen cones** and **seed cones**. The pollen cones or male cones called **strobili**, produce **pollen** and can be found growing as a group on the end of each limb in the spring (see illustration). In most other species of pines, pollen cones are yellow, but the male cones of the longleaf pine are purple.



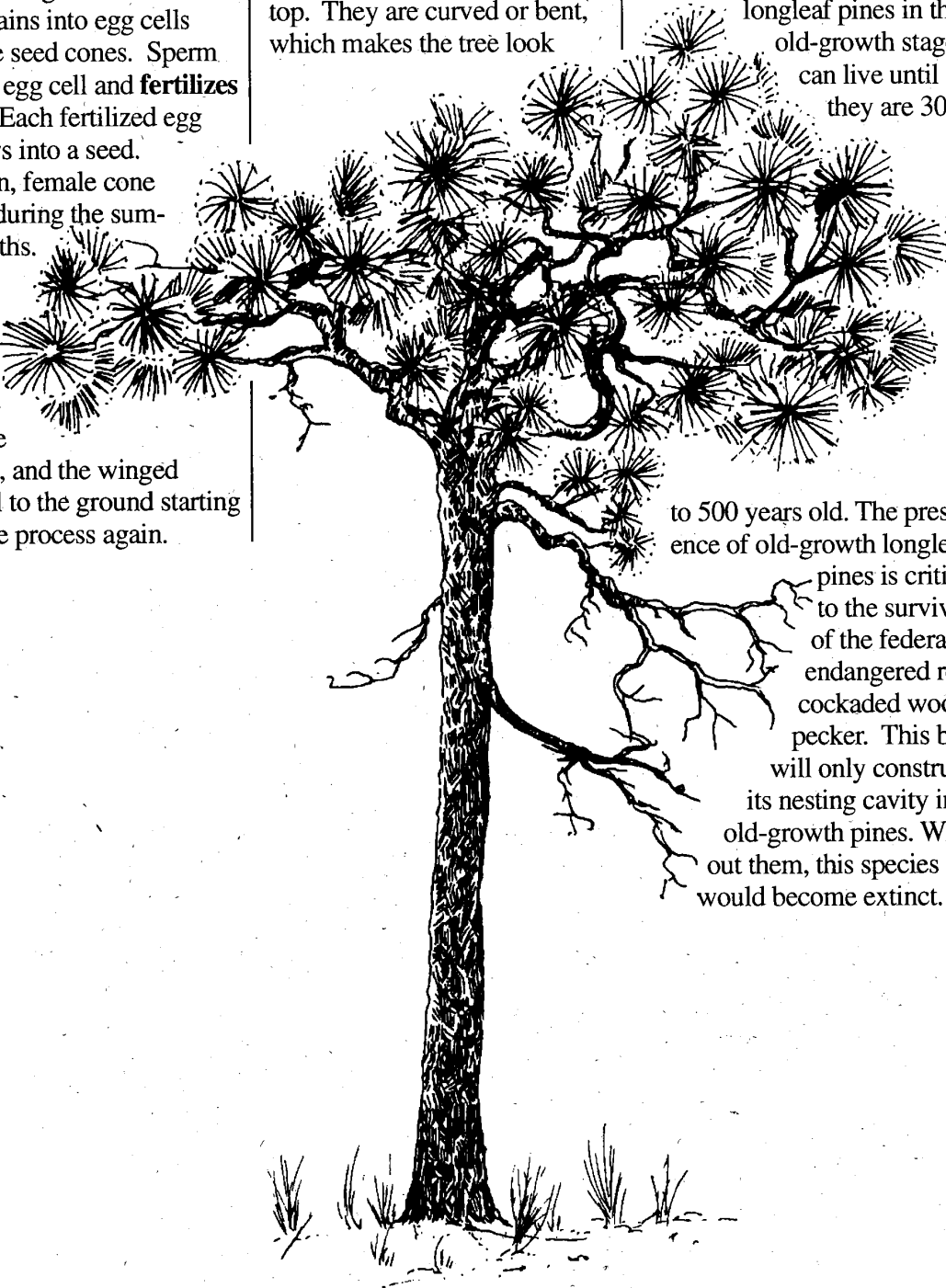
The yellow pollen that comes from the strobili spreads through the air like dust. Once all the pollen is shed from the

male cones, they fall to the ground.

Seed cones, or female cones, are at first very small and sticky. Pollen grains carried by the wind stick to a seed cone. Tubes grow from the pollen grains into egg cells inside the seed cones. Sperm enters an egg cell and **fertilizes** the egg. Each fertilized egg cell grows into a seed. The green, female cone matures during the summer months. Once the seeds are formed, the now brown pine cone opens up, and the winged seeds fall to the ground starting the whole process again.

The longleaf pine enters its last stage of growth when it reaches over 100 years of age. This stage, called the old-growth stage, can be recognized because all the limbs, now thick, are near the tree's top. They are curved or bent, which makes the tree look

flat-topped (see illustration). The trees that make it to this stage are called "flat-tops." Flat-topped trees do not grow any taller but grow thicker trunks and limbs. They can still produce pine cones. The longleaf pines in the old-growth stage can live until they are 300



to 500 years old. The presence of old-growth longleaf pines is critical to the survival of the federally endangered red-cockaded woodpecker. This bird will only construct its nesting cavity in old-growth pines. Without them, this species would become extinct.

READING 4.4 - The 5E Learning Cycle Example

Lesson Topic: Meal Worm Investigation. This lesson is based on Investigating Mealworms, pages 137-43 in <i>Inquire Within</i>	In the blocks below, briefly explain how you would address each “E”:
<p>Engage</p> <p>Set the stage for the lesson by using a “teachable moment,” an object, or by posing an intriguing question or problem to the students.</p>	<p>Show students live and dried mealworms and ask if they know what they are, allowing for students to guess. Explain what mealworms are as well as some of their uses (bird food for birds that prefer live prey, pet food, etc.)</p>
<p>Explore</p> <p>Students do hands-on activities, experiments, field investigations, etc. on their own.</p>	<p>Students will collaborate in small groups to raise mealworms in the classroom. (To shorten this activity, students could observe various mealworm life cycles)</p>
<p>Explain</p> <p>Take on the role of direct instruction. The information gathered by the students is collected, shared and reviewed. The instructor introduces specific skills and concepts. Several of the listed teaching methods could be used to accomplish this.</p>	<p>Students will log their observations in journals and will report to the other groups and teacher. Make sure the life cycle observations are correct, and follow up with direct instruction about their life cycle. Groups could also create simple posters of their findings.</p>
<p>Elaborate</p> <p>Students use the skills, knowledge and concepts they have gained and apply them to new situations or “real-world” problems.</p>	<p>Each student group will develop ideas to use the mealworms they have raised. Possible outcomes could be sharing the mealworms with a nature center to feed birds or educational animals, or sharing their worms with another school to do similar projects. Students will then devise the plan, including letters to the school, nature center, etc. and working out the logistics of transporting the worms.</p>
<p>Evaluate</p> <p>Help the students assess what they have learned. This could be through traditional tests, student self-assessments, essays, demonstrations or other methods.</p>	<p>Students have a choice of making a tri-fold brochure that describes what they learned about mealworms or writing a one page essay about their experience.</p>

READING 4.5 - A Variety of Teaching Methods

Action Projects

- Description:** Students take leadership on a specific project for the school or the broader community.
- Uses:** Good final project
Can lead to public recognition
- Advantages:** Allows students a chance to put into practice what they have learned
Enhances critical thinking
- To Consider:** Can be time consuming or controversial



Audio-Visuals (Transparencies, Models, Music)

- Description:** Utilizing a variety of tools to aid in teaching such as videos, television, slides, audiotapes.
- Uses:** To illustrate concepts which are difficult to comprehend by describing them
- Advantages:** Gets students involved with media they may already know
Can create an environment
Keeps attention
Aids visual learners (picture people)
- To Consider:** Less interaction
Time factor

Community Studies/Case Studies/Issue Analysis

Description: Students study real life situations that they can learn from

Uses: To understand actual problems encountered in the world

Advantages: Students learn research, inference and application skills
Enhances critical thinking

To Consider: Can be time consuming
Students may miss the point of the study if not similar enough to what they are studying

Debate/Dialectic

Description: Teacher assigns roles and a specific problem
Students learn from interacting and understanding different points of view

Uses: Learning to understand and respect different points of view
Learning to synthesize opposing positions

Advantages: Students are totally involved
Research is needed for the debate to be successful
Enhances critical thinking
Encourages verbal skills
Serves as a laboratory for many lessons involving group communication.

Demonstration

- Description:** Stand before class, show something and describe
- Uses:** Difficult concepts that are hard to visualize
- Advantages:** Works well if the demo is too difficult for the students to do
Provides a visual; Can be very dramatic and have a substantial impact
- To Consider:** It may not work (for example a chemistry experiment)
Visual only
Length of time: Students may get restless

Discovery Demonstration

- Description:** Teacher conducts silently and the students describe
Students get to watch but are encouraged to make verbal observations
- Uses:** Follow up to a regular demonstration
Students get a chance to share what they know or as the main demonstration
- Advantages:** Work well if demonstration is too difficult for the students
Can have a lot of impact
Good for problem solving, critical thinking
- To Consider:** What if it doesn't work? Have alternative method ready to roll
Only some students will make verbal comments
-

Discussion

Description: Open Forum with two way communication. The teacher acts as chairperson, guide, initiator, summarizer, and referee.

Uses: Help students to make inferences, draw conclusions, and communicate

Advantages: Develops a sense of group
Provides a means for clarification
Retains interest
Draws ideas from students and makes them think

To Consider: Verbal Only
Students must have prior information
Some students may dominate
Time consuming
Threatening for some to speak out

Experience

Description: Non-directive learning. Students learn from their success and failures through direct real-life experience.

Beyond planning the activity, there is an absence of teacher involvement.

Questionable as to whether this really constitutes a method.

Advantages: No teacher is required
Students can learn from mistakes
Great transfer of learning

To Consider: Safety could be a problem
Students may learn the wrong behavior
No interaction with teacher

Exposition

- Description:** Lecture, conveying information via one way communication, very little dialog if any.
- Uses:** Introductions, Directions, Short Explanations
Conclusions
- Advantages:** Much information in a short period of time
Helps students learn to listen
Easy for the professor
- To Consider:** Verbal only
Limited attention spans
Passive Learning
Student logic not equal to teacher logic
What is said may not be equal to what is heard
-

Exposition with Interaction

- Description:** Lecture/Discussion with questions encouraged
- Uses:** Review
Introducing New Information
- Advantages:** Can get much information across
Students learn to listen
Students can get clarification.
- To Consider:** Verbal only, Passive
Questions may be limited to a few students
-

Facilitation

Description: Teacher acts as facilitator for a particular experience by setting it up, allowing it to happen, and processing it afterwards through a series of sequenced questions.

Uses: To maximize the learning potential of an experience

Advantages: Learning comes from the experience, making it more tangible
Better retention

To Consider: Teacher must be able to sequence the questions
Teacher must be skilled at reading groups

Games

Description: To teach facts, ideas, or concepts through a game

Uses: To illustrate concepts by group interaction or to break up the routine of a class.

Advantages: Fun; Burns off excess energy; Involves whole person

To Consider: Some may feel silly playing the game

Guest Speaker

Description: Having someone with expert information present information to the students

Uses: When the topic centers on specific areas of expertise (space exploration, medicine, etc.)

Advantages: Renews the interest of students
Students may be eager to hear “expert”
Breaks up routine

To Consider: Speaker may be boring
Speaker not aware of audience/or needs of students
May not cover what you would like for him to.

Guided Discovery or Exploratory Learning

Description: Students are directing the learning with only slight directions from the teacher

Uses: When you can have direct contact with the materials

Advantages: Students are totally involved in the material
Students manipulate and make new discoveries

To Consider: Must have discovery questions prepared
Must have enough equipment for everyone
Sometimes noisy and chaotic
Different end times

Moral Dilemmas

Description: Teacher presents difficult questions/dilemmas for students to consider

Uses: Used to develop personal views about issues.

Advantages: Enhances critical thinking and understanding of personal philosophy

To Consider: Some may not wish to share their personal philosophies publicly

Open Inquiry

Description: Teacher presents a starting problem, students work toward solution

Uses: To enhance critical thinking about a problem

Advantages: Students are totally involved
Content is focused by students
Good for problem solving and critical thinking

To Consider: Not easy to teach specific content
Noisy
Teacher must be willing to say "I don't know"
Different end times

Peer Teaching

- Description:** Teacher allows students to teach and share their knowledge
- Uses:** Used toward the end of a lesson or unit
Good preparation for the real world
- Advantages:** If you can successfully teach someone else, you have really learned the concept.
Allows students the chance to practice presentation skills
- To Consider:** Takes time for everyone to have an opportunity
Difficult when someone isn't prepared
Some students have difficulty speaking in front of their peers.
-

Projects: Individual/Group

- Description:** Teacher provides a problem or situation that the group must solve
- Uses:** To provide time for further depth
To foster group cooperation
- Advantages:** Students gain depth
Good example of what the real world is like
Enhances critical thinking
- To Consider:** Students learn a lot about only one topic
Group dynamics may overshadow group project.
-

Skits or Role Plays

Description: Acting out a story or scenarios in the hopes of conveying to the audience certain facts or ideas

Uses: To illustrate concepts or historical events

Advantages: Active: gets students involved

Humor

Helps students visualize

To Consider: Can flop

Must be entertaining

Time consuming

Socratic Method/Inquiry

Description: To facilitate learning by asking questions

Uses: To develop content, definitions, and concepts

Advantages: Works from what students already know

Makes a formal connection

Better retention rate

Encourages students to think

To Consider: Must know audience

Must sequence questions

Problem when students aren't prepared

Must have alternative plan ready

Summarization important

Story-telling

Description: Relating facts, concepts, or ideas through the use of story

Uses: As a lead in to a topic or to give an illustration/example

Advantages: Grabs interest

Can relate to a real life scenario

Stories hit home

To Consider: Time consuming

Need to be a good reader or storyteller

Can get bored

Teachable Moment

Description: Teacher utilizes an event caused, initiated, or discovered by the students to share insight and information.

Uses: Wide variety of settings in nature

Advantages: Real-life learning

Provides immediate insight

Students learn through experience

Students learn to observe and to be more attentive to surroundings

To Consider: Teacher must be alert and in control. Can draw conclusions for the student instead of letting them make their own. Teacher must be flexible and sensitive

SECTION V PRACTICING DEVELOPMENTALLY APPROPRIATE EDUCATION



In this section you and the other participants will discuss what developmentally appropriate practice means and why it is so important to environmental education. You will also explore developmental stages and resources to help you plan developmentally appropriate programs.

Notes and Additional Reflections:

READING 5.1 -

Save the Elephants: Don't Buy Ivory Soap

Katie Slivovsky
Brookfield Zoo
Brookfield, Illinois

“Young Kids Don't Get It” Though it's important for older kids to explore these concepts, many environmental problems are too abstract and complex for kids who are just learning to button their own coats. As an example, the title of this paper, “Save the Elephants: Don't Buy Ivory Soap,” came from a campaign slogan written by an eight-year-old girl who had studied elephant poaching in school. She was old enough to hear the message but too young to really make sense of it.

What happens when we talk to little kids about big problems?

Interpreters are passionate people. We care about preserving and protecting what we love-- and we hope to motivate others to care, too. But sometimes I wonder if we care so much that we do more harm than good. Here's an example of what I mean:

A female interpreter was in the Elephant House at a zoo, talking with a man and his five-year-old son. The boy remarked, “The elephants sure have big tusks.” The interpreter replied, “Yes, and did you know that elephants are being killed for their tusks? The males have the biggest tusks, so they're targeted first, then the oldest females are shot, which can really mess things up because the females are in charge, and without them the herds don't know what to do. Killing elephants for their tusks is a huge problem for elephant families.” The man and the boy said, “Thanks, we sure learned a lot today.” And the interpreter smiled.

I wonder what the interpreter really accomplished by talking about elephant poaching with a five-year-old. Though her language was developmentally appropriate, her message was not. How does a child reconcile feelings of awe and wonder about an animal he or she is looking at while hearing about how its relatives are being shot right and left?

Today, messages about endangered animals are reaching even the youngest kids. TV, children's magazines, computer games, cereal boxes, and even well-meaning zoo educators and teachers sometimes tell tales of environmental woe. This is problematic for two reasons:

1) Young kids don't “get it.”

Though it's important for older kids to explore these concepts, many environmental problems are too abstract and complex for kids who are just learning to button their own coats. As an example, the title of this paper, “Save the Elephants: Don't Buy Ivory Soap,” came from a campaign slogan written by an eight-year-old girl who had studied elephant poaching in school. She was old enough to hear the message but too young to really make sense of it.

2) It can turn kids off to nature.

Research suggests that when kids are overwhelmed with bad news, they cope by “disassociating” from it or tuning it out. Hearing about poaching, pollution, and habitat loss can be depressing and turn young kids off to nature just when they should be enjoying it most.

David Sobel, in his article “Beyond Ecophobia: Reclaiming the Heart in Nature Education” (*Orion, Autumn 1995*), theorizes that this kind of distancing is exactly what we force kids to do when we overwhelm them with bad news. Who wants to form an emotional attachment to

an elephant that might disappear tomorrow? Children survive by distancing themselves from what they find overwhelming. Sobel coined a term, “ecophobia,” to describe the fear of nature kids can develop when prematurely asked to deal with the environmental problems of an adult world.

As interpreters, we’re masters at using language and techniques that are developmentally appropriate. For example, we know we can captivate a room full of preschoolers by mentioning poop. We know if we’re studying owl pellets with third-graders, we’d better let them dissect one. Above all, we know not to ask a mixed-gender group of fifth graders to stand in a circle and hold hands. But along with our interpretive language and techniques, we must put our interpretive messages through the age-appropriate filter.

It’s not a cop-out to save big, complex issues like poaching, mass habitat destruction, and global warming for middle schoolers who are better equipped to handle them. Early and middle childhood is the time to lay the foundation for future caring by providing kids lots of positive, meaningful, joyful experiences. Louise Chawla of Kentucky State University found that most environmentalists attributed their commitment to “many hours spent outdoors in a keenly remembered wild or semi-wild place in childhood or adolescence, and an adult who taught a respect for nature.” Not a tough prescription to fill.

You may be surprised that educators from Brookfield Zoo suggest backing off from teaching young kids about endangered animals. After all, much of Brookfield Zoo’s work is about protecting animals around the world. It is a conservation organization with a mission: “to help people live more sustainably with nature.”

However, the zoo has come to interpret this mission much differently for younger kids than for teens and adults. Research shows that many environmentally active adults today have one thing in common: a childhood filled with fun, positive nature experiences. That’s why the focus of Brookfield Zoo’s new Hamill Family Play Zoo is all about providing these experiences for children from infants to 10-year-olds and their families. There won’t be information about endangered animals in sight.

So what if kids ask me about endangered animals?

Even if you don’t bring up an animal’s population status in the wild, a child may ask you whether or not it’s endangered. How you respond depends on the child’s development and age. For all ages, find out what the child has heard and let the child tell you the details. Ask about and acknowledge the child’s feelings. Here are some other suggestions by age level:

7 and under:

- Answer questions briefly and honestly: “Yes, tigers are endangered, and that’s not good. People are working to protect them, but it’s a tough situation.”
- Lift the burden from the child without disempowering him or her: “I know you are concerned about animals.
- There are grown-ups working hard on this problem, and maybe when you grow up, you can help out, too.”

- Sometimes a young child gets the impression that all animals are endangered. You might say, “Some animals have problems finding homes, but many don’t. Robins, squirrels, and raccoons live right around here, and they’re doing great!”

7 to 11:

- Acknowledge the child’s feelings: “Where did you hear about elephant poaching? How did you feel when you heard about the problem? I know it’s a sad story, but people are trying to help.”
- Redirect to something more local and concrete: “I know it’s hard to think of what to do to help elephants. What can we do to help animals around here? That’s important, too--and it’s probably going to be easier for us!” Suggestions include picking up litter in natural areas, maintaining bat houses and birdbaths, planting native shrubs and flowers to attract local wildlife, and asking friends to help.

11 to 14 and up:

- Discuss ways to get involved locally like adopting an animal at a nearby zoo or aquarium or volunteering at an animal shelter.
- Initiate or help with recycling programs at school or in the community.
- Communicate concerns about the environment to legislators at the local, state, and national levels.
- Get involved with national and international conservation groups, such as The National Audubon Society, World Wildlife Fund, Defenders of Wildlife, and the African Wildlife Foundation.
- Be a model: share your thoughts about conservation actions you have taken or would like to take.

Keep in mind that the way you respond to a child’s question can be a subtle indicator to parents of how they might handle future conversations with their children about these issues.

If we want young children to grow into environmentally-conscious adults, let’s encourage them to play in nature and learn easy tasks like shutting off the water when they brush their teeth. Even Rachel Carson--and I can’t think of a more impassioned environmentalist--wrote *Silent Spring* for adults and *The Sense of Wonder* for families with young children.

As David Sobel puts it, *“If we want children to flourish, to really feel empowered, let us allow them to love the earth before we ask them to save it.”*

READING 5.2 - Developmentally Appropriate Practice

Understanding Young Children

Developmentally Appropriate Practice - What does it mean?

Developmentally appropriate practice (DAP) is an early childhood education standard that was first described by the National Association for the Education of Young Children (NAEYC). According to NAEYC, developmentally appropriate practice is matching the learning environment—the physical set-up, materials, schedule, curriculum, teaching methods and so forth—to the developmental levels of children. It means understanding the developmental changes that typically occur from birth through age eight (and beyond), variations in development for individuals and how we can best support their learning and development during these years.

There is no magic formula for developmentally appropriate practice. Educators make decisions day by day, minute by minute, based on knowledge of how children develop and learn, the individual children and families in question and the environmental, social and cultural context (Bredekamp & Copple, 1997).

Developmentally appropriate practice in early childhood environmental education means making program choices that emphasize and support both the individual and collective abilities of children.

Why is it important?

Developmentally appropriate practice is based on decades of research and knowledge of how children grow and develop and are guidelines by which we can measure our effectiveness. The power of developmentally appropriate practice lies in the educator's ability to make choices and decisions about what is best for the children and families he or she serves. We all know that educational practices are most effective when they are attuned to the way children develop and learn—that is, when they are developmentally appropriate.

What are the benefits of using developmentally appropriate practice?

Children have better comprehension and retention.

Because material is presented in a manner best suited to their developmental stage, the material is absorbed better than it would have been if it was designed for older children.

There are fewer struggles to get children to engage in the program.

Material presented in a developmentally appropriate manner is more interesting to students and naturally grabs their attention.

Children and adults can learn together.

Following a child's lead often takes us in a much more interesting direction than any adult prescribed curriculum.

More diverse programming can reach more students.

Creating developmentally appropriate materials requires more diverse forms of interaction and presentation and reaches more diverse learning styles.

Why don't educators use developmentally appropriate practices?

We tend to stay with a teaching style we are most comfortable with.

We tend to rely heavily on props, scripts or visual aids to do the teaching instead of allowing for more personal discovery, interaction and relationship building.

We tend to focus more on sharing facts about nature than on the process of learning.

What are possible behavior issues related to developmentally appropriate practice?




Often there are perceived behavior concerns when, in fact, the opposite is usually the case.

In developmentally appropriate programs, children have more freedom to think and do for themselves. Providing well-structured programs with the freedom to make choices actually keeps behavioral issues to a minimum. There are usually more behavior-based problems in programs that are rigidly didactic, require children to sit and listen for long periods of time or don't encourage open-ended exploration. However, it may be necessary to change approaches for certain individuals, cultures and or abilities. Some children may require more structure, fewer options or less stimulation. Developmentally appropriate practice is by definition, tailoring programs to meet the needs of particular individuals and groups.

Want to know more? Bredekamp, S & Copple, C. 1997. *Developmentally Appropriate Practice in Early Childhood Programs*, revised edition. Washington D.C.: National Association for the Education of Young Children. ISBN 0-935989-79-x. Excerpts available at newhorizons.org/naeyc.html

READING 5.2 - continued

Developmentally Appropriate Practice

Developmentally Appropriate Practice: Constructivism		
		
MOST DEVELOPMENTALLY APPROPRIATE	SOMEWHAT DEVELOPMENTALLY APPROPRIATE	LEAST DEVELOPMENTALLY APPROPRIATE
Activities are attuned to the child's level of cognitive, physical and social development including props, setting, language and timing. Learning is easier for the child and teacher.	Programs are presented at an appropriate level in language but other aspects may be inappropriate. There is some struggle but most of the concepts are comprehended.	Information is presented at an inappropriate level involving props, setting, language and timing. Children learn little and are either bored or overwhelmed.
▼ E X A M P L E S ▼		
Various learning stations such as water table with pond life, painting table with water colors, pond puppets and costumes and so forth are set up around the gathering area. Children are encouraged to choose at will between the activities offered. They are free to move about the area, play alone or with others, and explore materials at their own pace.	Various learning stations are set-up around the gathering area and children rotate from station to station at the teacher's direction. Specific outcomes are expected at each station.	Children sit quietly while a naturalist explains the water cycle using words like <i>transpiration</i> and <i>precipitation</i> .

Source: *Natural Wonders, A Guide to Early Childhood for Environmental Educators*. Marcie Oltman. 2002. (Download at: http://www.seek.state.mn.us/classrm_e.cfm)

READING 5.3 - Developmental Stages

Developmental Stages

What does it mean?

Psychologist Jean Piaget first described young children as having a unique set of physical, cognitive, social and emotional attributes that differentiates them from any other age group. He described the *constructivist theory*—that children construct knowledge out of their exploratory actions on the environment. This theory forms the basis of the modern interactive, *hands-on* approach to learning. Piaget also described how children’s thinking changed over time. By observing children’s behavior, he noted four distinct stages: sensorimotor, preoperational, concrete operational and formal operational. (See accompanying chart.)

Why is it important?

Young children think differently than adults. Because of this, we have difficulty interpreting their actions, emotions and reactions. They have little concept of the past, present and future; they confuse reality with fantasy; they think that everyone feels, thinks and acts like they do. It is essential for us to understand not only how young children think but why they think what they do and change our methods accordingly.

What are the benefits to recognizing developmental stages and characteristics?

Knowing your audience.

Knowing how young children think and feel is essential to developmentally appropriate practice and good teaching in any setting. *It helps us respond to children appropriately.* Our first response to a child’s burst of illogical thought is too often to either correct them or dismiss it as cute. However, if we respond by asking questions, we can find out a lot about the mysteries of learning and thought. What are the challenges to recognizing developmental stages and characteristics? *It’s difficult for adults to really think like children.*

Once you’ve gone through the developmental stages yourself, it’s nearly impossible to backtrack. Try to imagine having no concept of the past, present and future or believing in the tooth fairy. The best we can do is to incorporate theory into our teaching practices and try to remember what life was like without logical thought.

Why don’t we recognize developmental stages and characteristics more?

We weren’t taught to recognize these stages.

Unless you’ve taken classes specifically for early childhood education, it’s likely you weren’t exposed to the developmental theories of learning in young children. It takes practice to recognize certain characteristics. It’s hard to master the mysteries of young children when you teach them infrequently. But once you catch on, the payoffs are immense.

What are possible behavior issues related to not recognizing developmental characteristics?

Unrealistic expectations.

Expecting too much or too little from children almost guarantees difficult or “inappropriate” behavior. The more you know about children’s abilities the better chance you’ll have for a successful program.

Want to know more? Miller, Karen. 2001. *Ages and Stages: Developmental Descriptions And Activities, Birth through Eight Years*. Beltsville, MD: Telshare Publishing. ISBN: 0-910287-16-3.

READING 5.3 - continued

Developmental Stages

Piaget's Four Stages of Development According to this concept, there are four stages of cognitive development:	
SENSORIMOTOR STAGE Babies and toddlers, birth to 2	<ul style="list-style-type: none"> • Babies are a bundle of reflexes. • Very little intention to their movements. • Rely on adults and environment for stimulation. • Cannot think of an object when it is out of sight. • Increasing awareness of relation between own actions, objects and environment. • Major milestone is object permanence—holding an image or event in memory.
PREOPERATIONAL STAGE Preschoolers, 2 to 6	<ul style="list-style-type: none"> • Little knowledge of cause and effect. • Difficulty taking another's point of view. • Think inanimate objects have human feelings. • Cannot understand that something remains the same even though it changes form. For example, a peanut butter sandwich cut into four pieces is <i>more</i> than one cut into two pieces. • Lack logical thought. For example, a child might think that the moon follows him wherever he goes. • Major milestone is the emergence of logical thought—thinking is no longer limited by perception.
CONCRETE OPERATIONAL STAGE Ages 6 to 11 Elementary, Grades K-5	<ul style="list-style-type: none"> • Begin to think more logically. • Begin to reason and understand abstract concepts. • Understand moral concepts of rules, intentionality and justice. • Major milestone of this stage is the mastery of logical thought.
FORMAL OPERATIONAL STAGE Ages 12-19 Middle and High School, Grades 6-12	<ul style="list-style-type: none"> • Can reason about the past, present and future. • Can think about their own thoughts and feelings as if they were objects. • Major milestone is the development of hypothetical and deductive reasoning abilities.

Source: *Natural Wonders, A Guide to Early Childhood for Environmental Educators*. Marcie Oltman. 2002. (Download at: http://www.seek.state.mn.us/classrm_e.cfm)

READING 5.4 -

Developmental Characteristics and Interests of School-Age Children

Transition Years Grades K-1 (5-6 years)

Physical

- Enjoy long periods of free play
- Developing eye-hand coordination
- Enjoy small group cooperative games
- May require rest after high energy play
- Improved body coordination; yet still can fall easily

Social-Emotional

- Eager to receive adult praise
- Enjoy dramatic play
- Eager to engage in new activities/adventures led by involved adult
- Eager to identify with older children
- Enjoy exploring new materials and equipment
- Can be easily frightened by novel or strange events
- Prefer play in small groups
- Like responsibilities they can handle
- Learning to cooperate with others, but may at times display selfish behavior

Cognitive

- Understand language better than they speak
- Are interested in present; vague concepts of past/future
- Eager to learn
- Ask many questions
- Define things by their use
- Developing a sense of humor
- Communicate best within a small group of peers
- May need guidance of adult when starting a new task

Middle Years Grades 2-3 (7-9 years)

Physical

- Enthusiastic about games
- Experiencing improvement in both gross and fine motor skills
- Possess a high activity level
- Practice to most variations of movement for physical activities
- Enjoy games that allow for comparison of skills
- Enjoy games that allow for self-improvement

Social-Emotional

- Have a strong drive toward independence
- Develop a strong sense of loyalty to friends
- Need to belong to a group
- Play with and are friends with same-sex peers
- Like to take on responsibility
- Live in a world of games, rituals and humor inhabited only by children
- Like to have a best friend
- Have a rigid sense of right and wrong
- Need help accepting peers who are different or left out of a group

Cognitive

- Like to talk; use language to express feelings/tell stories
- Developing a sense of time
- Enjoy collecting things
- Enjoy problem-solving games like treasure hunts
- Can plan and carry out projects with adult support
- Becoming more self-directed in activities
- Better able to understand and appreciate differences of opinion

Pre-Adolescent Years Grades 4-6 (10-12 years)

Physical

- May be careless about their clothes, room and body cleanliness
- Girls may have sudden growth spurt and beginning signs of puberty
- Enjoy physical activities that master specific skills
- Enjoy competitive games
- Possess a high activity level
- Enjoy games that allow for comparison of skills
- Enjoy games that allow for self-improvement

Social-Emotional

- Enjoy small, peer-dominated group discussions
- Like to join organized groups
- Are anxious to grow up
- Are intensely loyal to their peer group
- Form a close one-on-one friendship
- Have a growing desire to assert individuality and independence
- Can be daring and competitive
- Can be critical of peers and adults
- Are self-conscious of their abilities

Cognitive

- Ask many questions and want thoughtful answers
- Can often understand other points of view
- Developing strong interests, hobbies and collections
- Engage in daydreaming
- Enjoy problem-solving games and puzzles, etc.
- Enjoy rule-based games
- Are beginning to develop view about social/global issues
- Beginning to enjoy humor by telling jokes and understanding sarcasm.

Early Teens Grades 7-8 (13-14 years)

Physical

- May appear awkward as result of rapid physical growth
- Experiencing the beginning of puberty
- Differ greatly in rate of maturation
- Need to become familiar with changing body with strong drives
- Tend to tire easily
- Have a high activity level and appetite
- Enjoy cooperative games and competitive sports

Social-Emotional

- Sensitive to their appearance
- Establishing a personal moral code
- Unsure of their place in society
- Depend on their peer group to develop identity
- Critical of their parents and home
- May adopt extremes and fads in clothing, speech, handwriting and mannerisms
- Form close one-to-one friendships
- Enjoy small, peer-dominated group discussions
- Have a strong desire to assert individuality and independence

Cognitive

- Capable of high level of abstract thought
- Beginning to think about their future life roles
- Need time and freedom to engage in self-reflection
- Are able to postpone gratification
- Can plan ahead and organize tasks with little or no guidance from adults
- Beginning to develop views about social issues

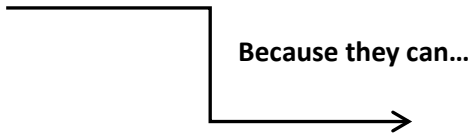
READING 6.1 - Bloom's Taxonomy

Bloom's taxonomy is used to categorize ways of learning and thinking in a hierarchical structure. You can employ the revised Bloom's Taxonomy to help plan effective instruction. Challenge students to move from the most basic skills (remembering) to more complex learning which leads to higher order thinking (creating). Bloom's Taxonomy will be used for learning objectives.

Cognitive Process Domain	Learner Outcomes/Verbs for Writing Objectives
6. Create Put elements together to form a coherent or functional whole, create a new product or point of view	Generate, Produce, Plan, Assemble, Construct, Create, Design, Develop, Formulate, Write
5. Evaluate Decide or judge using criteria	Check, Critique, Appraise, Argue, Defend, Judge, Select, Support, Value, Evaluate, Justify
4. Analyze Understand parts and their relationships to each other and overall structure or "big picture"	Differentiate, Attribute, Organize, Appraise, Compare, Contrast, Criticize, Discriminate, Distinguish, Examine, Experiment, Question, Test
3. Apply Carry out or use a procedure in known or new tasks, use the information in a new way	Execute, Implement, Choose, Demonstrate, Dramatize, Employ, Illustrate, Interpret, Operate, Schedule, Sketch, Solve, Use, Write
2. Understand Construct meaning from oral, written, or graphic messages, explain ideas or concepts	Interpret, Classify, Explain, Infer, Exemplify, Summarize, Compare, Describe, Discuss, Identify, Locate, Recognize, Report, Select, Translate, Paraphrase
1. Remember Retrieve knowledge from long-term memory	Recognize, Recall, Define, Duplicate, List, Memorize, Repeat, Reproduce, State

WORKSHEET 6.1 - Writing Objectives

I want students to be able to:	Specific Objectives
Know Learn Understand Appreciate Value Perform Create	Analyze Solve Compare Critique Respect Diagnose Evaluate

How do you know???


Because they can...

Objectives:

Review the objectives below and then practice writing your own learning objective for the lesson you created for the 5E Lesson in **Section IV**. Remember, objectives should be specific and measurable. Use the learning outcome verbs from Bloom's Taxonomy.

1. Students will be able to describe three characteristics of a longleaf pine ecosystem.
2. Students will be able to identify four different trees by using tree identification techniques.

Write your own objective(s) for your 5E Lesson Plan:

WORKSHEET 6.2 -

Types of Assessment

Assessment is an essential element of teaching a good class or managing a good educational program. You may be most familiar with tests that occur after a lesson. A traditional classroom post-test would be a type of **formal assessment**. It is also **summative**, meaning it is done after the activity or class has occurred. Formal and summative assessments are useful, but in environmental education settings, you may find that **nonformal** and **formative** assessments are also essential for success.

Formal/Conventional Assessment: Most conventional tests have limited ability to measure certain skills and thinking abilities students have gained. Nonetheless, they can be an important component of assessment because they can be quickly and easily administered.

- Completion Items
- Multiple Choice
- Short Answer
- Pre- and Post- Tests

Alternative or Informal Assessments: These assessments are generally carried out while students are engaged in learning. An assessment done during the educational activity is a **formative** assessment. Some can be easily administered in a short period of time with learners, while others require a more extended engagement. One technique that lends itself well to environmental education situations is called “**dipsticking**.” Broadly, it refers to frequently checking with students during instruction to see if they are understanding the material. More specifically, according to famous educator Madeline Hunter’s model, dipsticking should include:

- Checking students frequently during the lesson
- Checking broadly, as many students as possible, simultaneously
- Checking on the same concept or topic
- Checking during instruction

An easy way to “dipstick,” especially while outdoors, is to use signals such as thumbs up or thumbs down to gauge if students understand a concept. This may be more orderly than asking questions, as it gauges the whole group and allows all to give input. In an indoor setting, students could color coded, or cards with symbols, such as “yes/no” or “true/false” that they display when asked a question. Or, for example, you could quiz students on native versus nonnative plants, having them hold up one finger for native and two fingers for non-native, etc.

Here are some other nonformal forms of assessment:

- Games: Jeopardy or other fact-questioning games
- Questioning: A lot can be learned about what your students know and how far they have come by simply engaging them in questioning. Rather than telling them the answers and lecturing, try and draw out their knowledge by questions that lead to conceptual understanding. Make sure to allow plenty of wait time (at least 3-5 seconds) from when you ask a question to when you solicit a response. You can continuously gauge their understanding by asking questions throughout the lesson. Use Bloom’s Taxonomy to prepare questions before the lesson.

WORKSHEET 6.3 - S.M.A.R.T. Objectives

“SMART” Objectives strive to be Specific, Measurable, Achievable, Relevant, and Time-Oriented. This “formula” for the components of an objective may help you in crafting your own:

Specific:	Expectations are clear and observable.
Measurable:	The goal is realistic, can be attained and can be measured by a practical standard.
Achievable:	While it should be rigorous and push the learner, it should still be realistic and age or skill appropriate.
Relevant:	The behavior or skill should have a “real world” application or be relevant to established learning goals or standards.
Time-oriented:	The objective should have a realistic timeframe or duration.

Example of a SMART objective:

By the end of the “Little Herpetologists” Camp for 2nd Grade, student participants will be able to identify 2 native herps and explain their life cycles.

This objective has a specific, observable expectation that can be measured by a formal or informal assessment. It is an achievable goal for that age group, is relevant to the 2nd grade Essential Standards for Science (ES 2.L.1 and ES 2.L.2) and is described for a specific timeframe.

1. Write your own S.M.A.R.T objective for your 5E lesson plan:

READING 6.2 - The NAAEE Guidelines for Learning

Excellence in Environmental Education: Guidelines for Learning (Pre K-12). North American Association for Environmental Education, 2004.

<http://eelinked.naaee.net/n/guidelines/topics/Excellence-in-EE-Guidelines-for-Learning-K-12>

The National Project for Excellence in Environmental Education, initiated by The North American Association for Environmental Education (NAAEE) has developed a set of guidelines that can be used to structure and evaluate environmental education programs and materials. The guidelines can be viewed as national standards for environmental literacy.

The NAAEE Guidelines for Learning (K-12) are organized into four strands and provide a baseline for the knowledge and skills that students should have to be environmentally literate. These guidelines also stress age-appropriate topics. These strands are adapted from NAAEE's Guidelines Learning (K-12):

1. Questioning, Analysis and Interpretation Skills

Learners should be able to ask questions, speculate and hypothesize about the world around them, seek information and develop answers to their questions. Learners should be familiar with inquiry, master fundamental skills for gathering and organizing information, and how to interpret and synthesize information to develop and communicate explanations.

2. Knowledge of Environmental Processes and Systems

Learners should understand the processes and systems that constitute the environment, including human social systems and influences. That understanding is based on knowledge synthesized from across traditional disciplines and includes a base knowledge of the earth as a physical system, the living environment, humans and their societies, and the relationship between environment and society.

3. Skills for Understanding and Addressing Environmental Issues

Skills and knowledge are refined and applied in the context of real-life environmental issues where differing viewpoints about environmental problems and their potential solutions are played out. Environmental literacy includes the abilities to define, learn about, evaluate and act on environmental issues and requires that students possess skills for analyzing and investigating environmental issues and decision-making and citizenship skills.

4. Personal and Civic Responsibility

Environmentally literate citizens are willing and able to act on their own conclusions about what should be done to ensure environmental quality while balancing cultural, economic and other concerns. Learners understand that what they do individually and in groups can make a difference.

The NAAEE guidelines can be ordered from their website, <http://www.naaee.net/publications>

SECTION VII CORRELATING TO THE NORTH CAROLINA ESSENTIAL STANDARDS



In this section you will be introduced to the importance of using the North Carolina Essential Standards. You and the other participants will practice by correlating your 5E lesson plans to the Essential Standards.

Notes and Additional Reflections:

READING 7.1 -



A Guide to Correlating



Non-Formal EE Programming in NC

WHY CORRELATE NON-FORMAL PROGRAMMING?

Non-formal environmental education programs offer enriching hands-on learning experiences often at little cost, but it is difficult for teachers to gain field trip or guest speaker approval without attaching documentation of what is going to take place during the program or demonstrating clear alignment to the standards. Thus, correlations help non-formal programs **gain credibility** with local schools, offer teachers suggestions for **age-appropriate programming**, ensure programs have **developmentally appropriate content**, and **provide support and equal access** for all interested groups. In order to continue to attract and partner with public formal educators, EE must adapt to standards-based education.

For an in-depth look at the history of standards based reform, the natural connections between EE and standards-based curriculum, and nationwide correlations in practice, please read EETAP's "Standard Practice" document [found here](http://bit.ly/OYJfEw): <http://bit.ly/OYJfEw>

Correlations are hugely important. Everything teachers and administrators do has to align to the standards because that is what they are being held accountable for.
— Benita Tipton, DPI Science Consultant

WHAT ARE THE STANDARDS IN NORTH CAROLINA?

The NC Essential Standards – NC specific standards for all other subjects (i.e. **science, social studies, arts education, healthful living**, etc.). Taught and assessed beginning in 2012-2013. Testing for science begins in 5th grade —<http://www.ncpublicschools.org/acre/standards/new-standards/>

For more helpful terminology relevant to NC public schools, [see a full list of DPI acronyms here](http://www.ncpublicschools.org/acronyms/):
<http://www.ncpublicschools.org/acronyms/>



HELPFUL RESOURCES

If you have previously correlated to the NC Standard Course of Study, [these crosswalks](http://bit.ly/1op4Kse) (<http://bit.ly/1op4Kse>) can help facilitate connections to the new standards.

For the NC Essential Standards in Science, [this page](http://bit.ly/1eU8GAH) (<http://bit.ly/1eU8GAH>) on the DPI Science Wiki has many resources:

- an Excel spreadsheet of all K-12 science standards organized by strand, to see all the science standards at once
- a glossary explaining key terms, making it easier to incorporate these terms into your programs
- the unpacked content documents for each grade, explaining in more detail and depth each Essential Standard
- And more!

Unpacked content documents for all subjects in the NC Essential Standards [can be found here](http://bit.ly/1fz8bVX) (<http://bit.ly/1fz8bVX>)



THE PROCESS



1. Make a plan and familiarize yourself

- Construct a team. Ideally, the staff members who most frequently do the program should do the correlations. Designate others as levels of review to check accuracy. If possible, involve local teachers, who already have a working knowledge of the standards. Set a timeline.
- Start with only a few programs, perhaps those that are mostly frequently requested. Know exactly how these programs are executed, so that they are replicable by any program staff member. Correlations should be based on what is consistently done every time the program is run.
- Read through the standards with your programs in mind. Delve further into the standards by familiarizing yourself with other resources from the Dept. of Public Instruction (DPI) (refer back to the “Helpful Resources” section).

2. Correlate!


- Move systematically through the relevant standards for each program, one program at a time. Look at the standards and your program description simultaneously, swapping back and forth to compare. Keep good records in Microsoft Excel or Word.
- Don’t limit yourself to only one area of the curriculum; the NC Essential Standards for Social Studies contain a “Geography and Environmental Literacy” strand that is highly relevant to many EE programs.
- Avoid stretching it! Use the “Unpacked Content” documents to ensure that you understand exactly what the standards mean and how your program fits.
- Take your time and don’t be discouraged! It is a time-consuming process.

3. Review, Synthesize, and Disseminate

- Verify the correlations are accurate through as many levels of review as feasible.
- Add each program’s correlations to the program notes/script used by staff, providing a reminder of these goals each time the program is run.
- Format an overview of the programs and their correlations that is easy to understand and also easily maintained. Although searchable databases are generally preferred, both tables and lists organized by grade/standard work well. Look at correlations by other EE organizations to get lots of great ideas!
- Ensure teachers have access to the correlations, whether in print, online, or both.
- Ask for feedback!

4. Move beyond the standards

- Adjust programs to hit more grade levels or subjects (but only if it makes sense).
- Offer pre- and post- activities for the classroom that delve deeper into relevant topics, address additional standards, and/or ask test prep questions.



Compiled by Sarah Ludwig—with a huge thanks to all the educators who have been trailblazers for this process, especially to Holly Denham, Dana Fitz-Simons, D’Nise Hefner, Kelly Hoke, Tanya Poole, Renee Strnad, Benita Tipton, Lisa Tolley, Jackie Trickel, and Sarah Yelton for the input and expertise that made this document possible.

READING 7.2 - Essential Standards: Grade 5 Science – Unpacked Content Standards

The North Carolina Department of Public Instruction has produced documents to help educators teach the Essential Standards. This is an excerpt from the “Unpacked Content” support document for the same essential standards from **Worksheet 6.1**.

The unpacked content provides descriptions of what each standard means a student will know, understand and be able to do. The “unpacking” of the standards done in this document is an effort to answer a simple question “What does this standard mean that a student must know and be able to do?” and to ensure the description is helpful, specific and comprehensive for educators.

The unpacked content and other support tools are located on DPI’s website at <http://www.ncpublicschools.org/acre/standards/support-tools>

Ecosystems
Essential Standard and Clarifying Objectives
5.L.2 Understand the interdependence of plants and animals with their ecosystem.
5.L.2.1 Compare the characteristics of several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests and grasslands.
5.L.2.2 Classify the organisms within an ecosystem according to the function they serve: producers, consumers, or decomposers (biotic factors).
5.L.2.3 Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem.
Unpacking
What does this standard mean a child will know, understand and be able to do?
5.L.2.1 Students know that there are different types of ecosystems (terrestrial and aquatic). These ecosystems can be divided into two types according to their characteristics: Terrestrial Land-based ecosystems include forests and grasslands. <i>Forests</i> have many trees (with needles or with leaves), shrubs, grasses and ferns, and a variety of animals. They usually get more rain than grasslands. Diverse types of animals can be found in forests, depending on their type. Deciduous: black bear, deer, red fox, vole, rabbit, cardinal. Rain forest: panther, monkeys, capybara, snakes, spiders. Temperatures in the forests may vary depending on where the forest is located. <i>Grasslands</i> have fertile soil and are covered with tall grasses. They usually get a medium amount of rain, but less than forests. Temperatures may also vary

depending on where the grassland is located. Some examples of animals that live in the grasslands are prairie dogs, bison and grasshoppers.

Aquatic

Water-based ecosystems may be fresh water (lakes and ponds) or saltwater (oceans, estuaries and saltwater marshes).

Lakes and ponds are bodies of freshwater that are surrounded by land. Ponds are usually shallower than lakes and the temperature of the water usually stays the same from top to bottom. Plants and algae usually grow along the edges where the water is shallow. Some examples of animals may be different types of fish, amphibians, ducks, turtles or beavers.

Oceans are large bodies of saltwater divided by continents. Oceans have many types of ecosystems depending on the conditions (sunlight, temperature, depth, salinity) of that part of the ocean.

Most organisms live where the ocean is shallow (from the shoreline of the continental shelf) because sunlight can reach deep and the water is warm making food abundant. Some examples of organisms that live in the shallow ocean are drifters (jellyfish or seaweed), swimmers (fish), crawlers (crabs), and those anchored to the ocean floor (corals). Some organisms live in the open ocean, near the surface or down to the deep ocean bottom. Plankton float in the upper regions of the water. Some organisms swim to the surface to find food or for air (whales, turtles, sharks) while others live closer to the bottom (certain fish, octopus, tubeworms). Students know typical visual representations of the various ecosystems, as well as graphic representations of the food chains and webs, cycles and energy pyramids that are commonly associated with ecosystems.

5.L.2.2.

Students know that organisms in an ecosystem can be producers, consumers, or decomposers. Students know that producers convert energy from the sun into organic matter through the process of photosynthesis. This organic matter is used by producers and consumers as a food source. Producers and consumers produce wastes as they perform their life processes, and become waste organic matter when they die. Decomposers use these waste materials and other non-living organic matter to fuel their life processes and recycle nutrients that are necessary for producers to carry out their life processes.

5.L.2.3

Students know that all of the organisms in an ecosystem have interconnected relationships. Students know that because of this, factors that impact one population within an ecosystem may impact other populations within that ecosystem.

SECTION VIII

REFLECTION



Notes and Additional Reflections:

Workshop Evaluation

Facilitator(s): _____ Date: ___/___/___ Location: _____

If you find a question that is not relevant, please circle N/A. If you do not know the answer, please circle D/K.

FACILITATOR'S ORGANIZATION OF WORKSHOP	Very Poor ←————→ Excellent						
1. How would you rate the facilitator's explanation of the workshop goals?	1	2	3	4	5	N/A	D/K
2. Did the workshop content relate clearly to the goals?	1	2	3	4	5	N/A	D/K
TEACHING/FACILITATION SKILLS	Very Poor ←————→ Excellent						
3. Was the facilitator willing to hear feedback?	1	2	3	4	5	N/A	D/K
4. Was the facilitator able to clarify material which needed elaboration?	1	2	3	4	5	N/A	D/K
5. Did the facilitator answer questions clearly and concisely?	1	2	3	4	5	N/A	D/K
6. Rate the facilitator's overall effectiveness as a discussion leader.	1	2	3	4	5	N/A	D/K
7. Did the facilitator promote participation in discussions?	1	2	3	4	5	N/A	D/K
8. Was the facilitator able to wrap things up before moving on?	1	2	3	4	5	N/A	D/K
9. How would you rate the facilitator's competence in the content covered in the workshop?	1	2	3	4	5	N/A	D/K
LEARNING ENVIRONMENT	Very Poor ←————→ Excellent						
10. Did the facilitator maintain an atmosphere that encouraged learning?	1	2	3	4	5	N/A	D/K
11. Could you relate/apply the subject matter to everyday career situations?	1	2	3	4	5	N/A	D/K

12. Were the facilities adequate for the workshop?	1	2	3	4	5	N/A	D/K
PARTICIPANT/FACILITATOR RELATIONSHIP	Very Poor ←————→ Excellent						
13. Was the facilitator willing to listen to other points of view?	1	2	3	4	5	N/A	D/K
14. Did you feel the facilitator was open to consideration of individual needs or requirements?	1	2	3	4	5	N/A	D/K
WORKSHOP CONTENT	Very Poor ←————→ Excellent						
15. Was the workshop content relevant to the knowledge/skill base needed in the field?	1	2	3	4	5	N/A	D/K
16. Were the topics covered in the workshop arranged and sequenced in a way that facilitated your learning style?	1	2	3	4	5	N/A	D/K
17. Was the format of this workshop conducive to your learning (i.e., structured enough, needs more structure, etc.)?							
18. Would you have changed or added to the workshop content in any way? Please explain.							
19. What did you find most useful about the workshop?							
20. Did you feel that you took an active and responsible role in the learning process in this workshop?							
21. Reflect on one lesson learned.							