

***The Science of Life: Exploration through Agriculture***  
**IPM/Agricultural curriculum for elementary school students**

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***Abstract:***

The NYS IPM Program is collaborating with the NY Agriculture in the Classroom Program to produce elementary school curricula that teach children agricultural concepts through an IPM, science-based approach. The curriculum, titled *The Science of Life: Exploration through Agriculture*, consists of a yearlong series of classroom lessons and activities, with extensive teacher support materials.

***Background and Justification:***

“Agriculture in the Classroom” (AITC) is a national program that aims to promote agricultural understanding, literacy and awareness to students of both urban and rural backgrounds. The New York State Integrated Pest Management (IPM) Program strives to raise the awareness of all New Yorkers to IPM concepts and applications in agricultural, home and community settings. Both programs were pursuing curriculum approaches to deliver their messages to elementary school children, and recognized the advantages of working together. Therefore, in 2005, we formed a partnership to create *The Science of Life: Exploration through Agriculture* curriculum.

It is a sad fact that American school children lag behind those in many other countries in the maths and sciences. Increasing the availability of science-based activities in the classrooms at earlier grades may spur more interest. Primary and elementary children generally are still curious and enjoy hands-on learning and the intricacies of the natural world. By the junior high levels, many students, especially females, tend to lose interest or dislike science because they see it as not being important in their lives. The AITC/IPM lessons demonstrate that science is in everywhere in the world around us.

*The Science of Life: Exploration through Agriculture* curriculum was motivated and guided by interaction with elementary school classes, teachers and other educators. Teachers, not just students, need to find lessons fun and interesting. Teachers have pressure to pack each minute of classroom instruction—and many do not want to add any new curriculum to their already full plates. Our lessons are designed to be flexible so they can be used one page at a time, or for larger blocks of the time. To fulfill the structure of curriculum needs, teachers must teach a designated number of hours of language skills and math skills per week. Our lessons provide activities that incorporate these categories without leaving the science of the natural world. Building cross-curriculum lessons helps teachers! Teachers can expand on the activities in the books or put in minimal preparation time and still have successful results.

***Objective:***

Produce elementary school curricula that teach children agricultural concepts through an IPM, science-based approach.

***Procedures:***

AITC and NYS IPM worked together to set overall objectives of the curriculum, and determine 34 specific lessons to be included. The lessons are initially researched and drafted by NYS IPM, including comprehensive background materials for teachers. AITC then reviews lessons for overall content, age-appropriateness, and adherence to NYS learning standards, and puts the lessons into a standard format. The final step is pilot testing with classroom teachers, which began in the fall of 2006.

Elementary teachers sometimes don't receive adequate pre-service training in science, and therefore don't feel comfortable teaching it. They generally go into teaching because they like to work with students as opposed to secondary teachers who tend to pursue teaching in a subject they enjoy. To encourage elementary teachers, each lesson booklet has an accompanying teacher guide that matches, page by page, the student lesson. The teacher's booklets include basic science facts and background to gently remind teachers of things they once learned, but may have forgotten. Teachers are given suggestions on additional information, optional ways to use the lessons, and specific connections of lesson activities to New York State Learning Standards.

Lessons are designed to get children thinking and discussing concepts that feed on their natural curiosity. All aspects of curriculum needs are addressed in lesson activities—not just science, but language arts, mathematics, history and creative arts as well as encouragement of common sense 'thinking skills'. Lesson titles and "essential questions" are created to get students and teachers thinking about their preconceptions of the subjects and feed their interest.

Lessons correspond with the school year, and seasons. Lesson booklets include activities to do as individuals or as groups. They often include take home activities to encourage student-family interaction. Lesson activities that can be worked on together have a better chance of influencing other family members. One goal of the IPM program is to reach a large portion of the state's citizens with the message of increased awareness and responsibility in our interactions with the natural world around us. Family members as well as teachers who may not be interested in science may respond to the way lessons teach environmental awareness.

***Results and discussion:***

Many years ago, students spent a lot of time outdoors playing and more families lived in rural areas. Our lessons try to encourage an appreciation of the environment in ways that city, suburban and rural students and teachers can find. Lessons offer a variety of activities that should be practical for students in all types of school and neighborhood locales.

For those of us who enjoy being out of doors and look for the beauty and wonders of the natural world, we understand the way it improves our wellbeing. If we can use agricultural and natural world activities to encourage science in the classroom, we might be able to spark new interests for students and life long interests. Spending time outdoors, and learning an appreciation of it can be good for the psyche, yet is completely foreign to too many students!

The NYS IPM Program began collaborating with NY AITC in 2005, to produce elementary school curricula that teach children agricultural concepts through an IPM, science-based

approach. The curriculum consists of a yearlong series of classroom lessons and activities, with extensive teacher support materials. As of January 2007, 80% of the lessons have been completed, with the final seven lessons scheduled for completion in February 2007. To date, trials and examinations by teachers and superintendents have yielded good reviews. Looking ahead, AITC has received a grant to publish and promote the new curricula and train teachers in its use in 2007.

\*The lesson titles and essential questions addressed are listed below.

### ***The Science of Life: Exploration through Agriculture* curriculum List of Lesson Titles and Essential Questions**

#### *Let's Explore Agriculture*

What is Agriculture?

Why should I care about it?

Where does the grocery store get food from?

What does it mean to be a farmer?

Is there more to Agriculture than the work of growing food?

#### *Miss Moo and You*

What do you know about cows?

What products do we get from cows?

What foods do you like to eat?

Are all cows the same?

What is special about you?

#### *Corn You Believe It*

Where does corn come from?

What kinds of corn are there?

What is a kernel?

How does corn grow?

What do we get from corn?

Why does popcorn pop?

What is ethanol?

#### *Harvesting the Garden*

How do we harvest what we grow?

What does harvesting have to do with me?

What are some problems with harvesting?

What can I do with the food I grew?

Can I make money selling my harvest?

### *Celebrate the Garden Year*

How did the ancient Greeks explain the changing seasons?

What jobs does the farmer have in each season?

What can we do to handle our food safely?

Why should we cook food safely?

### *Learning About IPM – I Protect Myself*

What is IPM?

What is a pest?

Why should IPM be important to me?

What is a pesticide?

What are toxic substances?

If I have a pest in my house or garden, what should I do?

### *Let's Learn About Soil*

What is soil?

Is soil dirt?

How is soil formed?

What does organic mean?

What is in soil?

How can we collect soil?

Can soils be different? Why?

What can we learn by examining soil?

Why is soil important?

Is soil part of the food chain?

### *Erosion and Water Quality*

What do you know about erosion and water quality?

What is erosion?

How does erosion occur?

Can we prevent erosion?

What is a watershed?

How does the water cycle work?

What is water quality?

How can we protect soils?

How can we protect water quality?

### *What's Living in My Soil*

What's going on down there?

What are micro-organisms?

### *Can Soil Be Sweet*

Can soil be sweet?

What are atoms and molecules?

What is pH?

Why are water molecules so important?

How does pH affect plants and soil?

### *The Three Sisters*

- What's in a name?
- What plants did they eat?
- How did they use the whole plant?
- Who are the three sisters?

### *Gardens of the Settlers*

- Who were the early American settlers?
- How did the Native Americans help them?
- What did the settlers do with their harvest?
- What were their meals like?
- What method did some settlers use in their gardening?

### *Many Types of Farms*

- How big or small can a farm be?
- Are cows, pigs, and chickens the only kinds of farm animals?
- Can we farm fish and insects?
- What kinds of crops can we grow?
- How can farmers get rid of pests?

### *Dairy Farms*

- What is so "dairy" about New York State?
- Which crops might dairy farmers grow and why?
- What does a dairy farmer do all day?
- What pests can bother cattle?
- How can Integrated Pest Management can be used on dairy farms?

### *The Fruit Belt*

- What are some of the many fruits grown in New York?
- Is there only one variety of apple, grape, or strawberry?
- How do farmers get plants to produce more fruit?
- What makes apples, grapes, and strawberries healthy?

### *Sugar Maple Days*

- What do you know about sugar maple trees?
- What is special about the Sugar and Black maple trees?
- What is the wood best used for?
- What food products do we get from sugar maples?
- How do we get those food products from the sugar maple tree?
- How does the watery sap become thick and sugary?

### *Earthworms on the Job*

- How do they move?
- What do they eat?
- How do they see at night?
- How many hearts do they have?

### *Composting for Better Soil*

- What do you know about composting?
- What is going on in that compost pile or bin?
- What are micro-organisms?
- What does healthy soil have to do with me?
- Why is compost good for plants?
- How can I make compost?
- What lives in a compost pile?

### *Vermiposting*

- What is vermiposting?
- What do you know about worms?
- How much do worms eat? What do they eat?
- What happens to your food garbage?
- How do I make a worm bin?
- Is it going to smell?

### *TLC for Soil*

- Why do soils need to be cared for?
- What is a steward?
- Does it matter how a farmer tills the soil, or what he plants?
- Can farmers improve soil?
- What is a cover crop and what is crop rotation?

### *Experiments with Seeds / What Do Plants Need to Grow*

- What do plants need in order to grow?
- What is an experiment?
- What is the Scientific Method?
- Can seeds survive if they are missing water, air, sun, or soil?
- What does fertilizer do?

### *The Right Plants*

- What is the right plant?
- How do I know if the plant is right for the spot?
- Why does it matter?

### *A Seed of Knowledge*

- How do I write a letter?
- What are the five parts of a letter?
- Why should I write a letter?

### *Grow an Indoor Salad Garden*

- What do plants need to grow?
- Do indoor plants have different needs than outdoor plants?
- How do plants interact?
- Are plants easy to grow?

### *Insect Anatomy*

- Is there a difference between a bug and an insect?
- What makes something an insect?
- How many legs does an insect have?
- What does anatomy mean?
- Do all insects have the same body parts?
- What is symmetry?
- Are insect wings like other animal wings?
- What kind of mouthparts do insects have?
- How do insects see?

### *Metamorphosis*

- What is a life cycle?
- What is metamorphosis?
- Do all insects have the same metamorphosis?
- What insects have a complete metamorphosis?
- What insects have a gradual metamorphosis?

### *Biological Control*

- What is biological control?
- What is an insect 'natural enemy'?
- How does biological control work?
- What is a predator? a parasitoid? a pathogen?
- What is a beneficial?
- What can I do to help?
- What is a food chain?
- What are some natural enemies of pests I might find in my garden?
- What is tolerance? What is a threshold?
- When does a good bug become a bad bug?
- What kinds of ladybugs are found in New York state?

### *Let's Raise Lacewings*

- What is a Lacewing?
- Why is the lacewing a beneficial insect?
- Can insects be raised in the classroom?

### *Plant Anatomy*

- What makes a plant a plant?
- What are the important plant parts?
- How do plant roots work?
- What is a stem?
- Why do plants have leaves?
- What does photosynthesis have to do with me?
- Is a mushroom a plant?
- What plant parts do we eat?
- Is it a tree, a shrub, or just a plant?

*Life Cycle of Plants* – currently in development

*Make Your Bed!* (choosing and preparing a vegetable or garden bed)

*Student Scientists* (examine the site conditions of your garden and yard before you plant)

*IPM and the Decision Making Process* (how the IPM steps work in the natural world and how they can teach us to make good choices in our own lives)

*Healthy Eating Habits*

What are healthy eating habits?

Why does what we eat matter?

What if I don't like vegetables?

Can we eat too much or too little?

How do I know if I'm eating the right foods?

*Outdoor Composting* (Supplement based on the Cornell Guide)

*Insect Inventory* (Supplement – photographs and description to identify insects found in the yard and garden)