

# **BIOLOGY IN A BOX PROJECT OVERVIEW**

## **What is *Biology in a Box*?**

- *Biology in a Box* is a fun and challenging way for entire schools to enhance their life sciences curriculum at all grade levels, and to encourage student interest in STEM (science, technology, engineering, and mathematics) disciplines. The program employs a hands-on, inquiry-based approach to teach the wonders of the living world, as well as introduces the scientific methods and math skills we use to understand that world.
- Each thematic unit has exercises that are designed to enrich science curriculum content for students from the elementary grades through high school. The exercises often have separate versions for lower and higher grades, although, most exercises can be easily tailored to fit any grade level. The goal of each unit is to pique the interest of even low-ability students, however advanced activities are included that have been designed as curriculum enrichment for very bright students who need an additional challenge.
- The *Biology in a Box* program is especially valuable to teachers in schools that have limited resources. The materials needed for completion of the exercises, presented in each thematic trunk, are totally reusable and are generally not commercially available. It is also an excellent program for schools with a limited science faculty, since no prior knowledge of the subject matter is needed for a teacher to explore a box theme with his or her students.
- We are presently limited to serving counties in Tennessee (teachers can check the partnership page to see if their school system is enrolled in the project). Anyone can access the ideas, exercises, and concepts on our website, however.

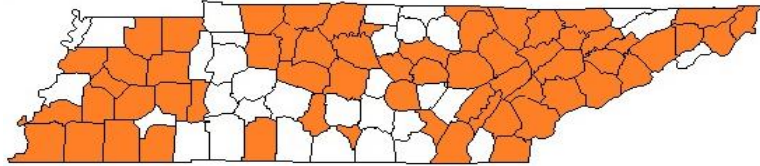
## **History**

- Professor Susan Riechert, from the Division of Biology in UT's Department of Ecology & Evolutionary Biology, developed *Biology in a Box* in 1993 as a science education outreach project. She recognized the need for supplementary science resources in East Tennessee schools, and saw *Biology in a Box* as an effective means of meeting that need.
- At the program's outset, the boxes were circulated only in the Knox County school system. Since then, the project has expanded and currently serves thousands of students in school systems across most of the state (and four systems in adjoining states), with a primary goal to provision all of Tennessee. The program materials are also now available to a global audience via the newly-updated website. A recent partnership with the National Institute for Mathematical and Biological Synthesis (NIMBioS) has resulted in exciting additions to existing learning units through the incorporation of more mathematics at all grade levels (further enhancing the integrative STEM approach of the program), revision and supplementation of the materials and exercises, as well as supporting the development of new units

<b>Currently Available Units &amp; Topics Covered</b>	
<b>Unit 1: Fossils</b>	The fossil record, geological time scale, identification of fossils, fossil dating methods, change in organisms over time
<b>Unit 2: Of Skulls &amp; Teeth</b>	Functional anatomy, the skeletal system, diet types & adaptation, qualitative & quantitative methods, morphometrics – shape has meaning
<b>Unit 3: Fur, Feathers, Scales: Insulation</b>	Body coverings (structure & function), insulating mechanisms of body coverings & other materials, adaptation, thermodynamics
<b>Unit 4: Simple Measures</b>	Physical properties of objects (mass, volume, density) & their significance to biology, Newtonian physics
<b>Unit 5: It's In Your Genes</b>	DNA structure & function, Mendelian genetics, mechanisms of inheritance, basic probability, epistasis (interaction between genes)
<b>Unit 6: Animal Kingdom</b>	Biodiversity, animal body plans, development, & life cycles; taxonomy/classification; phylogenetic relationships
<b>Unit 7: Backyard Naturalist</b>	Organisms of Tennessee; using taxonomic keys; identifying animal signs (scats, tracks, bird songs); biomechanics; the science of sound
<b>Unit 8: Everything Varies</b>	Variability in nature; basic statistics; comparing populations; partitioning organisms into groups based on trait similarities
<b>Unit 9: Forestry</b>	Trees & forests (wildlife importance, economic importance, structure & growth, identification of common species, succession, forest pests)
<b>Unit 10: Behavior</b>	Stimuli & responses; sensory capabilities; the scientific method; animal communication; analyzing behavior; mimicry; learning & memory; environmental influences
<b>Unit 11: Biomechanics</b> (in progress)	Biomimetics; skeletons and bridges; jaws, beaks, and levers, projectile motion, aerodynamics, and seed dispersal; sound production

Math and science content indices, as well as curriculum standards, are available for each unit on our website!

**Participating Counties in Tennessee  
(as of March 2014)**



**Additional School Systems Served:**

- Alcoa City
- Bradford SSD
- Bristol City
- Catholic Diocese of Memphis (serving Bartlett area)
- Central Elementary
- Clarksville City
- Clinton City
- Collierville Elementary
- Collierville Middle
- Collierville High
- E.A. Harrold
- Ellendale Elementary
- Fayette Academy
- Harriman City
- Humbolt City SSD
- Johnson City
- Kingsport City
- Kingston City
- Lenoir City
- Lexington City
- Maryville City
- Milan SSD
- Oak Ridge City
- Sweetwater City
- Tennessee School for the Deaf
- Trenton SSD
- Rutledge City
- Washington County University School  
(also serving Gray Fossil Site Museum)
- Washburn City
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- Fulton County (GA)
- Middlesboro Independent (KY)
- Avery County (NC)
- George Mason University (Washington, D.C.)

**What does it mean to be a participating school system?**

- Each school system receives at least 1 set of thematic units consisting of reusable materials & exercises housed in wooden trunks.
- A 'Box Keeper' in each system is identified that keeps track of where the units are, arranges pick up/delivery to teachers requesting them, and reports breakage and loss of materials needing replacement.
- Funds permitting, participating school systems:
  - 1) Receive regular upgrades of new exercises and themes, revised State science and math standards for each exercise, and suggested readings and links for each unit.
  - 2) Are offered teacher training in the role of community learning, where the teacher acts as facilitator of student exploration.

**The *Biology in a Box* program works!**

- In class TCAP performance data from Knox County schools, all teachers showed improvement in their students' science test scores.
- Increases across individual classes ranged from 2-12% better than their classes' performance compared to a year prior to teacher participation in a *Biology in a Box* Summer Institute.
- The positive change in student test performance for grade level implementation\* of *Biology in a Box* exercises in schools following a teacher's participation in the project's Summer Institute was markedly higher than the State average of +0.9 for 2006, with five reporting school systems showing a mean increase of +5.7.

\* Grade level implementation of the project occurs when a teacher participating in a *Biology in a Box* workshop transfers the experience to fellow teachers in her/his school.)

**Contact Information**

<p><b>Program Director:</b> Dr. Susan E. Riechert  <b>E-mail:</b> <a href="mailto:rieichert@utk.edu">rieichert@utk.edu</a>  <b>Telephone:</b> (865) 974-6187, 974-6041, 974-2371</p>	<p><b>Production Manager:</b> Lisa B. LaForest. Ph.D  <b>E-mail:</b> <a href="mailto:BioBox@tennessee.edu">BioBox@tennessee.edu</a></p>
<p><b>Mailing Address:</b> Division of Biology,                  University of Tennessee, 569 Dabney Hall,                  1416 Circle Drive, Knoxville TN 37996-1610</p>	<p><b>Fax:</b> (865) 974-3067  <b>Website:</b> <a href="http://biologyinabox.utk.edu">biologyinabox.utk.edu</a></p>

Further information regarding our program can be viewed on our website. There, you can find the content of all of our current learning units, how to become an extended part of our team by becoming a Box Keeper, contact information for the rest of our team, and much more!