

HOW IT WORKS

There is much evidence, anecdotal and research-based, that indicates that one-shot experiences do not provide ample conceptual change or knowledge gain. The workshops here are designed to be a series of experiences, based upon Georgia Performance Standards and others, that together through repeat and weekly visits cause the teachers to become knowledgeable and confident in their knowledge.

How The Workshops Are Arranged

1. An anonymous pre-visit content questionnaire and a survey to determine concerns and topics that you, the teachers, want to go over are sent in advance..
2. An appropriate set of lessons, covering 1-2 hours per day after-school, or more on 'off days,' is created. These include correcting misconceptions and pointing out (the numerous) textbook errors. All lessons are interactive, hands-on, full of content and useful pedagogy, with between visit assignments.
3. A post-visit questionnaire and certificate of attendance will be given to document learning and participation.

We will gladly come to your school to meet with you and discuss our workshops, to arrange visits and PLUs. Costs vary with time and numbers of teachers. An average after-school in-service of 90-120 minutes and <20 teachers begins at around \$200.

WHO IS DR. K?

DR. LARRY KRUMENAKER...

has been an astronomer, DeKalb County high school science teacher, college astronomy instructor (Agnes Scott College, Georgia Perimeter College, Mercer University) and planetarium instructor. His BS and MS astronomy degrees are from Case Western Reserve University, an MAT in Planetarium Education from Michigan State University, and Ph.D. in Science Education from the University of Georgia. His dissertation was a nationwide survey of high school astronomy courses and the effects of No Child Left Behind on them.

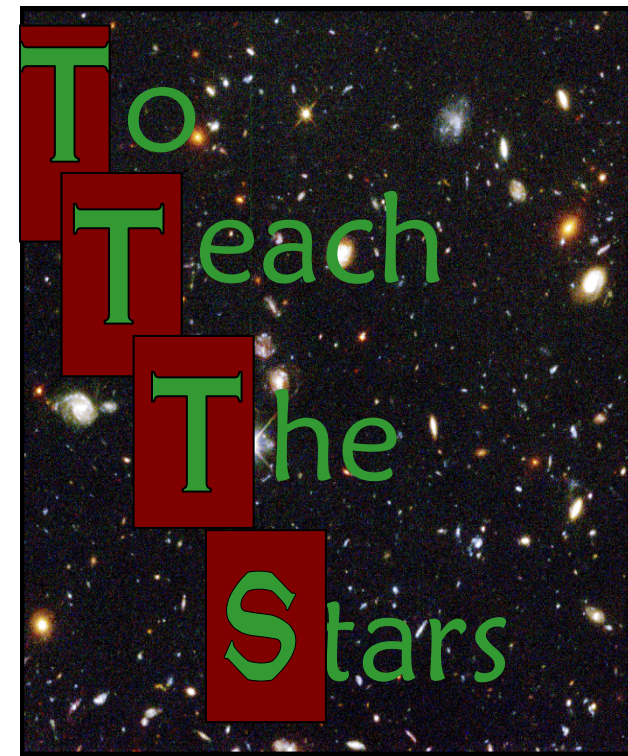


A well published author (*Astronomy Education Review*, *Science*, *Sky and Telescope*, and others), Dr. Krumenaker is the publisher/editor of *The Classroom Astronomer* magazine and author of the forthcoming book *To Teach The Stars*. He has been a speaker at such diverse meetings sites as the Southeastern Planetarium Association, AAPT, NSTA, GSTA, and the Hungarian Academy of Sciences.

Larry Krumenaker is an incredible resource. He provides everything one would want from an in-service workshop: depth of experience in his field, engaging as a presenter, flexible for and responsive to his audience.

I attended one of Larry's presentations at a GSTA regional conference. He showed me how to relate some of the more perplexing concepts of astronomy in ways my students easily grasped. Had I not been able to use Larry's experience to inform my teaching I would have wasted valuable time looking for the solutions he so clearly provided.

I highly recommend a "Larry" workshop for anyone interested in an efficient way to increase the content and pedagogical depth in the astronomy classroom. —Kevin McReynolds, high school science teacher, Winder, GA



Astronomy Workshops for Teachers —Content and Pedagogy

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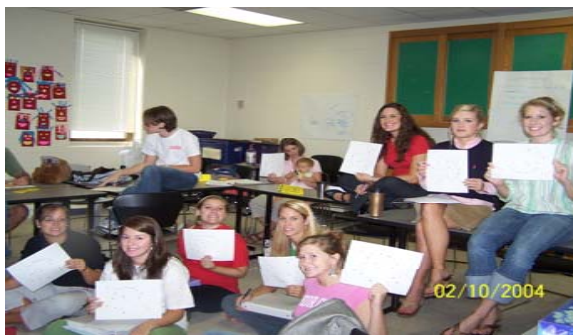
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WHY TEACH ASTRONOMY WELL?

Astronomy is the **most interdisciplinary** science, covering topics from physics to biology to chemistry, math to language to history. It is in our various **world cultures**, from the calendar to myths to today's **modern technology**. Kepler's 17th century laws of planetary motion govern GPS and communication satellites and your remote's infrared light was discovered by William Herschel, the discoverer of Uranus. In addition, astronomy is the rare science that even non-professionals can **make a contribution**, it can be a **life-long** hobby, and students always love to do things involving astronomy even in other classes and lessons. Knowledge of astronomy will help you understand more about science works.

Finally, teach astronomy because it is THE science that can **capture and inspire** nearly every child's interest and imagination. Even if astronomy isn't in your particular grade or course standards, it CAN be incorporated, to make students spark!



Dr. Larry Krumenaker's extensive background experience and expertise in the science of astronomy, physical sciences, and science education was the backbone of our collaborative work with teachers, students and administrators at Taliaferro County K-12 school as part of a DOE Improving Teacher Quality Grant. — Deborah J. Tippins, Ph.D., Professor of Science Education, University of Georgia

ASTRONOMY WORKSHOP OFFERINGS

THIS SET OF TOPICS IS A SAMPLING; LIKE THE UNIVERSE, TOPICS ARE UNLIMITED!

THE SUN

- Safe Observing
- Sunspots
- Effects on Earth – Magnetometers
- Sun Size – a Primer in Measuring

THE MOON

- Phases – Causes and Misconceptions
- The Moon's surface during its phases - rotation
- Details of the Moon's surface – craters and Moon maps

THE PLANETS

- Kepler's Laws
- The Orbits of the Planets, and When Can You See One?
- Heliocentric vs. Geocentric & Retrograde Motion
- Categorizing – A science skill to use on planets

STARS

- Star Distances and Lives of the Stars
- The H-R diagram- How it is like your classroom
- The Speed of Light and Supernovae
- Astrobiology – Life on Other Worlds (with chemistry, too)
- Three Pieces of Data Tell Us Everything

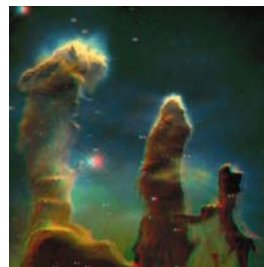
THE SCALE OF THE UNIVERSE

EARTH MOTIONS

- Rotation, Revolution- units of time
- The Zodiac (ha ha ha)

CONSTELLATIONS

- Current Night Sky (we can do it real or simulated)
- Star Legends (Cherokee, Hindi, and others)
- Sky Maps and Body Angles



OTHER WORKSHOP OFFERINGS

PEDAGOGICAL INSIGHTS

- Science is Tentative
- Reasoning Skill processes
- The errors in your textbook
- Inquiry investigations in Astronomy
- Techniques – Think-Pair-Share and “clickers”
 - Bloom Taxonomy, a way to improve inquiry questions
 - Using Movies
 - Tutorials in Astronomy, and things that rank

PHYSICS

- Newton's Laws and the orbits and “weights” of planets
- Spectroscopy without emission gas tubes

NO CHILD LEFT BEHIND AND ASTRONOMY

- How to Create, Insert, and Run Astronomy Courses in Your School (MS and HS)
- Georgia's Astronomy standards-What to Do with Them
- How to Use Astronomy to Improve AYP!

MISCELLANEOUS

- How to Use a Telescope, Day or Night

Dr. Krumenaker helped me to learn new information and to change some misconceptions that I had about topics relating to astronomy! His knowledge about astronomy and ideas about how to teach it make him an incredibly valuable resource. I would recommend Dr. Krumenaker and his services to any teacher who teaches astronomy at any level. — Lindsay Phillips, Fourth Grade Teacher, DeKalb County, Atlanta, GA

