Morning Breakout Session Abstracts

10:30 Ranking Tasks for Astronomy – Ranking tasks are a powerful example of curricular materials for promoting active engagement and they have a long history of usage in physics. A ranking task typically provides the learner with a series of pictures or diagrams that describe several slightly different variations of a basic physical situation. The student is then asked to make a comparative judgment and order or rank the various situations based on some physical outcome or result. These novel and intellectually challenging tasks effectively probe student understanding at a deep conceptual level.

This workshop will expose participants to two libraries of ranking tasks for use in introductory astronomy at either the college or high school level: 1) pencil-and-paper versions appropriate for group work in the classroom or assigned as homework, and 2) computerized versions that contain extensive randomization, background material, and feedback. Participants will work through several ranking tasks in both formats and then discuss implementation of ranking tasks in their classroom. All materials on the web at http://astro.unl.edu. This material is based upon work supported by the National Science Foundation under Grants #0737376 and #0715517, a CCLI Phase III Grant for the Collaboration of Astronomy Teaching Scholars (CATS).

10:30 Mastering Astronomy – The Mastering platform is the most effective and widely used online tutorial, homework and assessment system for the sciences. It helps instructors maximize class time with customizable, easy-to-assign, and automatically graded assessments that motivate students to learn outside of class and arrive prepared for lecture. These assessments can easily be customized and personalized for an instructor's individual teaching style. The powerful gradebook provides unique insight into student and class performance even before the first test. As a result, instructors can spend class time where students need it most. The Mastering system empowers students to take charge of their learning through activities aimed at different learning styles, and engages them in learning science through practice and step-by-step guidance–at their convenience, 24/7.

10:30 Dimensional Analysis Tools in Chemistry – Most college science courses have not made appropriate use of currently available computer tools. *Stoichy* is a chemist's tool that performs most of the tasks that confront chemists (reaction amounts, preparing solutions, figuring yields, and even the rarely used task of balancing chemical equations). Since all of these tasks tend to be very algorithmic, creating a tool is straightforward. The tool includes the ability to complete dimensional analysis (aka the factor label method), and can be applied in physics, engineering, and anywhere such analysis is appropriate. For each task, the tool acquires information from the inputs and processes that it uses to make tutoring information available for the user.

10:30 & 11:00 Spectra in the Classroom – Classroom demonstrations of blackbody, line and absorption spectra will be shown using various types of spectrometers. We will also look at the solar spectrum. Online resources for demonstrations will be referenced.

11:00 ExoPlanet Demonstrations – This session will look at a variety of demonstrations useful for teaching concepts related to extrasolar planets. These include the JPL Planet-finding Activity Kit, the Kepler Lego Orrery, and a variety of web resources.

11:00 Cooperative Group Problem Solving in Physics (and Astronomy) – There is substantial evidence that students learn problem most effectively by working cooperatively in small groups. This is the conclusion of a comprehensive study led by the University of Minnesota Physics Education Research group led by Patricia and Kenneth Heller. Their guide, Cooperative Group Problem Solving in Physics, is a comprehensive instruction manual for implementing and managing cooperative group problem solving in physics classes of all sizes, using a well-documented method of Interactive Engagement instruction.

This workshop will provide a working introduction to this highly successful method so that you can begin using it in your classroom at the next opportunity. To prepare for this session, you should read the following web page, and browse the links.

http://groups.physics.umn.edu/physed/Research/CGPS/CGPSintro.htm

For more extensive preparation, or for follow-up, you can download Cooperative Group Problem Solving in Physics from the following web page. Chapters 1-3 explain the essentials.

http://groups.physics.umn.edu/physed/Research/CGPS/GreenBook.html

11:00 & 11:30 Video Analysis – Video Analysis has been around for a number of years now but until recently it wasn't nearly as simple or accessible to everybody who teaches physics. A video analysis software program like, Video Point, Logger Pro, or Tracker and a mechanism for recording or collecting digital video is all you need to do video analysis. Depending upon the platform at UNL I will demonstrate the "fundamentals" of Video Analysis and will also briefly discuss a collection of interesting videos that students in my classes have examined during the past couple of years. These videos have come from many sources including using an IPod touch as the digital recording device. Model Trains, Swimming Fish, and Wind Turbines are just a few of the projects that will be looked at during this talk/interactive tutorial presentation. Additionally, I will try and show participants some sites where they can find good video projects and hopefully will allow them to try and analyze a video of their own choosing.

11:30 Planetary Science Lecture Tutorials – Lecture Tutorials are paper-based exercises that challenge students with a series of questions. Each 15-minute activity targets a topic for which students are known to have reasoning difficulties from educational research. The activities engage students in critical reasoning and spark classroom discussion. A book of 38 Lecture Tutorials is available for purchase from Pearson Publishing. This workshop will focus on additional lecture tutorials in planetary science and cosmology that are presently freely available.

11:30 Evaluating Clicker Systems – This session will provide a comprehensive methodology to aid in selecting and implementing the correct Student Response System for specific campus needs. It will provide a structural framework for avoiding missteps that frequently occur when new technology is deployed in the classroom environment. Topics *will include instructional requirements, campus wide adoptions, acquisition costs, student management, infrastructure needs and provisions for continued support and training after deployment.* These topics all center on crafting an instructional tool that increases the ability to involve students in each others educational motives.

11:30 Using Stellarium – Stellarium is a free open source planetarium for personal computers. It shows a realistic sky and contains numerous features, including: over 600,000 stars; asterisms and illustrations of the constellations; the planets and their satellites; time controls; zoom controls; shooting stars; equatorial and azimuthal grids; they ability to add deep sky objects, landscapes, constellation images; and more. Explore some of these many features as you use Stellarium to learn some history of and mythology about Halloween and its precursors.

Afternoon (Student) Session Descriptions

4:00 Kinesthetic Astronomy – This curriculum comes from the Space Science Institute and emphasizes using your body to demonstrate concepts in astronomy. We will be focusing on a module entitled Sky Time that encompasses rotation, revolution, orbital tilt, and seasons. Participants will discuss the learning goals of the materials from an instructor's vantage point before being led through the activity as students. This session is led by undergraduate student Dominic Ryan in partial fulfillment of the requirements for Astronomy 204H.

Materials are available on the web at:
http://www.spacescience.org/education/extra/kinesthetic_astronomy/

4:00 Solar Observing – Weather permitting, the UNL astronomy majors will set up several pieces of equipment for safe viewing of the sun. These include Sunspotters (image is viewed on a paper screen) and a Coronado Personal Solar Telescope (built-in H-α filter).