

Meeting Booklet
for the

2017

**NATIONAL ASTRONOMY
TEACHING SUMMIT**

Florida Gulf Coast University

**Schedule and
Program Booklet
with Abstracts**

Editors

Timothy F. Slater, University of Wyoming
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& Physics Education Research

The 2017

NATIONAL ASTRONOMY TEACHING SUMMIT

August 7-9, 2017
Florida Gulf Coast University

The National Astronomy Teaching Summit is a professional conference bringing together dedicated astronomy and planetary sciences educators to share innovative teaching techniques and successful instructional strategies that increase students' engagement, achievement, and motivation. Traditionally focused on improving teaching and learning for the introductory college astronomy survey courses for non-science majoring undergraduates, the growing Summit event now brings together a wider variety of astronomy educators and outreach enthusiasts at all levels where astronomy and planetary science is taught: K-12, College-101, Graduate School, Planetariums/Museums, and Amateur Astronomy Groups. The summit includes formal presentations, interactive workshops, and round-table discussions all designed around astronomy teaching innovations. Submitted abstracts have been peer-reviewed and conference is organized by a respected program committee, listed on the following pages.

2017 Scientific Program Organizing Committee

Ken Brandt, Robeson Planetarium and Science Center
International Planetarium Society Committee on Education

Derek Buzasi, Florida Gulf Coast University
Local Organizing Committee Chair

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Education Research, Conference SOC Program Committee Chair

Stephanie Slater, CAPER Center for Astronomy & Physics
Education Research, *AAPT Space Science & Astronomy Committee*

Tim Slater, University of Wyoming
Summit Organizing Chair

BLOCK SCHEDULE

Monday, Aug 7, 2017			
8:30am-9:00am	Registration & Coffee	Marieb Hall Room 203	Marieb Hall Room 205
9:00am-10:30am	30-min presentations	<ul style="list-style-type: none"> •900: Young-Imaging ExoPlanets •930: Buzasi-Doing Science w/Kepler •1000 Fernandez-Discovering Comets 	<ul style="list-style-type: none"> •900: S.Slater-Radically Revising Diversity Policies •930: Grundstrom-Poster Sessions for NonMajors •1000 Thomas-Using the Solar Projector
10:30am-11:00am	<i>Morning Coffee Break</i>		
11:00am-12:00pm	Plenary - Marieb 200	Paul Hewitt Plenary – Teaching the Equations of Physics in Astronomy	
12:00-1:30pm	<i>Lunch</i>		
1:30pm-3:00pm	Afternoon 90-min Workshops	Grundstrom -Are We Doing Science in ASTRO Lab today?	McDonald-Using Formative Assessment to Improve Learning
3:00pm-3:30pm	<i>Afternoon Coffee Break</i>		
3:30pm-5:00pm	Late Afternoon 90-min Workshops	Berryhill-Best Practices for Surviving Online Astronomy Teaching	Hewitt-How to Improve Learning by Creating Cartoon Sketches
5:00pm-7:00pm	<i>Evening Special Interest Groups</i>		

BLOCK SCHEDULE

Tuesday, August 8, 2017			
8:30am-9:00am	Registration & Coffee	Marieb Hall Room 203	Marieb Hall Room 205
9:00am-10:30am	30-min presentations	Whitt, Bell, Turner, Schultz- <i>LIPS Panel: What Can Planetariums Offer Astronomy Classes?</i>	<ul style="list-style-type: none"> •900: Faison-Observational Astronomy Lab •930: Saul-Using Web Simulations' •1000 Decierdo-Teaching w/ Ethnoastronomy
10:30am-11:00am	<i>Morning Coffee Break</i>		
11:00am-12:00pm	Plenary - Marieb 200	Karrie Berglund Plenary-The Power of People: Helping the World's Planetariums Use More Interactive Teaching Strategies	
12:00-1:30pm	<i>Lunch</i>		
1:30pm-3:00pm	Afternoon 90-min Workshops	Noel-Storr-Inspiring Learners, Families & Communities	Lindell-Engaging in the Scholarship of Teaching & Learning SOTL
3:00pm-3:30pm	<i>Afternoon Coffee Break</i>		
3:30pm-5:00pm	Late Afternoon 90-min Workshops	Bell-Songs of Space & Time	T.Slater-First Small Steps to Getting Out of Lecture-mode
5:00pm-7:00pm	<i>Evening Special Interest Groups</i>		

BLOCK SCHEDULE

Wednesday, August 9, 2017			
8:30am-9:00am	Registration & Coffee	Marieb Hall Room 203	Marieb Hall Room 205
9:00am-10:30am	30-min presentations	<ul style="list-style-type: none"> •900: Schultz & Turner-Planetarium Research •930: Noel-Storr-Evaluating the Eclipse •1000 T.Slater-Teaching w/SyFy Clips 	<ul style="list-style-type: none"> •900: Ramirez-Teaching w/Moodle •930: Lindell-Teaching w/TheCN.com •1000 Jeter-Astronomy INC
10:30am-11:00am	<i>Morning Coffee Break</i>		
11:00am-12:00pm	Plenary - Marieb 200	Lou Mayo Plenary – Leveraging Celestial Events to Teach Astronomy	
12:00-1:30pm	<i>Lunch</i>		
1:30pm-3:00pm	Afternoon 90-min Workshops	Schleigh-Using a Scientific Argumentation Approach to Teaching AST	S.Slater – Giant Leaps for Getting Farther Out of Lecture-mode
3:30pm-5:00pm	Closing Reception 3:00-5:00pm		

Presentation Schedule with Abstracts

MONDAY, AUGUST 7, 2017

<p>Session 71 – Current Events in Science FGCU Marieb Hall Room 203 – 9:00am-10:30am</p>
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9:00am-9:30am, Marieb Hall 203

How To Directly Image An Exoplanet In Three Steps.

Elizabeth Young, Rhodes College

The first publication of a directly imaged exoplanet was in November 2008. This field is rapidly advancing in a quest to image Earth-like planets and look for signs of life. This presentation will discuss the three main components needed to directly image an exoplanet: a coronagraph, a deformable mirror, and an algorithm. This presentation is an overview of each step with emphasis on the algorithm step. A significant challenge in the field is the fact that quasi-static speckles and planets appear to be similar within an image. However, speckles are derived from a single coherent source (the star), and are incoherent with the light from a planet. Therefore, the speckle pattern in an image can be changed, while leaving any planet light unaffected, by moving a deformable mirror within the coronagraphic system. I will present a technique to analyze a series of images containing different speckle patterns in order to confidently identify planets.

9:30am-10:00am, Marieb Hall 203

New Science from the Kepler Mission

Derek Buzasi, Florida Gulf Coast University

Although active observations with Kepler have been lacking in the past few years, new analysis routines are making new news out of old data, with surprisingly fruitful results.

10:00am-10:30am, Marieb Hall 203

A New Perspective on Comets

Yan Fernandez, University of Central Florida

Comets hold an intriguing place in the history of Earth and in the history of human civilization. We now live in the era where some of the mysteries about comets -- and about how they helped turn Earth into what it is today -- are starting to be solved. The recently-concluded Rosetta rendezvous mission gave us an unprecedented view of a comet that has revolutionized our understanding of these Solar System objects. In this review I will summarize what our new picture of comets is like, what it means for broader questions of Solar System origin and evolution, and what the future of comet studies could be like.

<p>Session 72 – Novel Ways of Engaging Astronomy Students FGCU Marieb Hall Room 205 – 9:00am-10:30am</p>
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9:00am-9:30am, Marieb Hall 205

Breaking the Dogma: New Ways of Conceptualizing Diversity in Astronomy and the STEM Career Pipeline

Stephanie J. Slater, CAPER Center for Astronomy & Physics Education Research

A narrow lens of focusing on diversity as skin color and biological sex limits the broader community's ability to make a difference in education and outreach programs designed to expand the STEM career pipeline. What if we tried something completely different? What are the ramifications of considering diversity as being far richer and more actionable than earlier narrow views?

9:30am-10:00am, Marieb Hall 205

Running Student-led Science Poster Sessions for Non-Science Majors

Erika Grundstrom, Vanderbilt University

Some instructors like to have a culminating poster/presentation session but they can be difficult to run efficiently. I'll describe the way we in the Vanderbilt non-majors Astronomy Lab run a poster session for up to 24 students in a 90-110 minute session. Our technique involves one instructor per 12 students, semi-

strict timekeeping, each student presenting at least one 4-minute presentation (and several one-minute ones) plus completing a thorough evaluation of three other students, and a way to have non-presenting students experience as many posters as possible.

10:00-10:30am, Marieb Hall 205 and outside

Using a Solar Projector

Bart Thomas, Naples High School, Florida

The solar projector consists of a mirror and huge lens that projects a 15 inch image of the sun so the observer can view sunspots, transits, and eclipses. It is ideal for a group of students, teachers, etc. to all view the sun safely.

The projector is mounted on a wooden rotating platform. The 48 inch square wooden screen is painted white and assembled with 2x4's and stabilized with braces. The screen is placed 135 ft from the projector. The image is fairly sharp so the umbra and penumbra of a sunspot is visible. There are other small projectors that display a 5 or 6 inch solar image, but my one of a kind device projects a 15 inch solar image.

MONDAY INVITED PLENARY LECTURE

11:00-12:00, Marieb Lecture Hall 200

Teaching the Equations of Physics in Astronomy

Paul Hewitt, City College of San Francisco

Instead of showing an equation in seconds and spending many minutes on algebraic manipulation and number crunching, I recommend the opposite: more time on explaining the meaning of the symbols, and how they relate to one another: more time on comprehension, less on computation. We can teach students to read equations in a way similar to musicians reading sheet music. Equations can be seen as guides to thinking. By minimizing algebraic manipulation and numerical problem solving, class coverage can provide the foundation needed for learning astronomy. A short video just created by Paul and his wife Lillian, not yet viewed elsewhere, will be shown to illustrate how simple mathematics and ingenious thinking led Eratosthenes to measuring the size of Earth.

Paul Hewitt retired from teaching physics at City College of San Francisco in 2000. He is well-known for helping to change how physics is taught internationally. His textbook *Conceptual Physics* is in its 12th edition with translations that reach world wide. His website hewittdrewit.com offers 148 tutorials of basic physics. He and his wife Lillian live in Saint Petersburg, FL, where they continue creating ways to teach physics. They also reside part time in San Francisco with family and friends.

<p>Session 73 – Novel Ways of Engaging Astronomy Students FGCU Marieb Hall – 1:30pm-3:00pm</p>
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1:30pm-3:30pm, Marieb Hall 203

Are We Doing Science in ASTRO Lab Today?

Erika Grundstrom, Vanderbilt University

Students are always curious about what the lab will entail and hope that it's interesting. We'll start with a discussion of labs used at Vanderbilt University for the non-majors Astronomy Lab where we do both indoor and outdoor labs for both evening and daytime sections with several inquiry-based labs. Then we'll move on to discuss several other lab topics that are available and perhaps engage in some lab swapping! Bring your favorite lab you'd like to share or just bring your desire for something different.

1:30pm-3:30pm, Marieb Hall 205

Active Learning and Formative Assessment Strategies for Astronomy Instruction

Jim McDonald, Central Michigan University

Starting with misconceptions that students have about moon phases, participants will learn formative assessment activities (probes, facts, and assessments) to find out what their students already know. We will discuss when to use probes effectively. After simulating their students conducting observations of moon phases, participants will be introduced to evidence circles to have students use observational evidence to provide evidence, and listen to the thoughts of others. Discussion will be done in small groups of how participants are already using practices while listening to the ideas of others. Finally, participants will formulate a plan to implement formative assessment and work toward using effective science practices. As a result of participating in this session, participants will be able to conceptualize how to use formative assessment with their students to find out what they know and to adjust teaching based upon assessment results; will learn hands-on active learning strategies and activities how to use questioning strategies to maximize understanding; and will be able to use

the Claims-Evidence-Reasoning framework to have their students demonstrate the science practices of engaging in argument with evidence, creating explanations, developing models, and analyzing and interpreting data.

Session 74 – New Roles for Astronomy Educators FGCU Marieb Hall – 3:30pm-5:00pm
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3:30pm-5:00pm, Marieb Hall 203

Best Practices for Surviving Online Astronomy Teaching

Katie Berryhill, American Public University System

As the number of online courses increases, it is vitally important to ensure that these courses are focused on effective student learning. The ever-growing number of online astronomy resources opens up many opportunities for creating vibrant, engaging distance learning opportunities for students. These include online textbooks, videos, interactive tutorials, labs, and access to robotic telescopes. It can be difficult to keep up with the resources as new materials become available while others may go offline or encounter technical issues as technology changes. Are you an experienced online instructor? Are you new to online learning? Share and learn best practices and updated resources in online astronomy education. This interactive workshop will explore tools and ideas for increasing student learning and engagement in online general education astronomy courses. Bring URLs and success stories to share (cautionary tales welcome, too).

3:30pm-5:00pm, Marieb Hall 205

How to Improve Learning by Creating Cartoon Sketches

Paul Hewitt, City College of San Francisco

Hewitt was a cartoonist before becoming a physics teacher. He will show you how to increase class interest by drawing simple cartoons, one step beyond stick figures. In this participatory workshop – no experience or talent required – Hewitt will provide step-by-step lessons for you in drawing your own common physics and astronomy illustrations that you can be proud of!

TUESDAY, AUGUST 8, 2017

**Session 81 – The Planetarium-Classroom Interface
FGCU Marieb Hall Room 203 – 9:00am-10:30am**

9:00am-10:30am, Marieb Hall Room 203

Expert Panel Discussion: *What Can Planetariums Offer Astronomy Classes Now?*

April Whitt, Fernbank Science Center and Planetarium

Jon Bell, Indian River State College Hallstrom Planetarium

Keith Turner, Carmel Clay Schools Planetarium, Indiana

Sara Schultz, Minnesota State Univ-Moorhead Planetarium

Elementary school classrooms often make a field-trip to a planetarium an annual tradition. But other classes – like college courses – rarely take full advantage of what contemporary planetariums have to offer. Learn from the experts from the Live Interactive Planetarium Symposium LIPS about the possibilities for leveraging such an important resource for your teaching.

**Session 82 – Modernizing Astronomy Education
FGCU Marieb Hall Room 205 – 9:00am-10:30am**

9:00am-9:30am, Marieb Hall Room 205

A Hands-on Observational Astronomy Lab Course: Doing "Real" Science with Non-Science Majors

Michael Faison, Yale University

All science courses, even courses intended for non-majors, should have a hands-on lab component. At Yale, all of our intro astronomy courses use our campus observatory for one-session, "eyeballs-to-eyepieces" labs, but we have also developed an optional, stand-alone, half-credit independent lab course on observational astronomy intended for non-science majors. Students in this course complete six lab projects over the course of the semester using our campus observatory (as well as some remote observing) that teach them the basics of CCD color imaging, photometry, and spectroscopy. They also learn how to perform data analysis using both spreadsheets and python, how to write a lab report in the form of a scientific

paper, and how to propose and execute an independent project. In some years, some students in this lab have worked on projects that are sometimes called "real science", i.e., new measurements of asteroid astrometry or variable star photometry. I have been teaching and tweaking this course at Yale for 12 years, and in this presentation, I will discuss some of the successes and failures I've encountered as well as what I think are the essential components of a stand-alone observational lab course for non-majors taking Astro 101.

9:30am-10:00am, Marieb Hall Room 205

Using Interactive Java-free web-based interactive simulations in Astro 101 labs

Jeff Saul, Tiliadal STEM Education Solutions

Rebecca Lindell, Tiliadal STEM Education Solutions

Astronomy 101 instructors often find creation of indoor laboratories activities that allow students to take data, analyze data, and visualize key ideas challenging. We developed a web-based laboratory curriculum with most activities online making heavy use of interactive simulations (applets embedded within webpages) and simulated photometry. These labs are either completed in the laboratory classroom or as an online course. In 2014, we modified the scripts for the applets to run reliably using modern network browsers of Chrome, Firefox, and Safari. This required reprogramming the applets in JavaScript and HTML 5. Our applets include simulations for the inverse square law of light for stars of differing luminosity, retrograde motion, and the structure of the Milky Way galaxy, and identifying Cepheid Variable stars. This presentation will examine the simulations, discuss their use as demonstrations and as laboratory activities, and the difficulties of creating the Java-free simulations. The applets are available online at <http://physics.unm.edu/Courses/Rand/applets/>.

10:00am-10:30am, Marieb Hall Room 205

**Teaching Astronomy in the Philippine Context Through
Enthoastronomy and Art**

Paul Pecier Decierdo, The Mind Museum - Bonifacio Art
Foundation, Inc.

The sky can serve as a canvass for storytellers from different cultures to tell the story of their people. Teaching the basics of stargazing and celestial navigation using the Western star lore can be effective in certain contexts. However, in other contexts, using the local star lore can be more effective in making stargazing culturally relevant. It reveals the fact that the scientific aspects of astronomy bleed into its cultural relevance. Using the local star lore as a starting point has the added advantage of making people realize that sky observation is a universal human activity, one that crosses the boundaries of culture, one that everyone and everywhere can participate in. This then serves as an excellent way to introduce stargazing and astronomy as rich sources of inspiration for art. In my work at The Mind Museum, I have used the local Philippine star lore as a starting point to introduce the link between cultural practice and astronomical observation. To make the link more salient, we partnered with Pinto Art Gallery, a popular local art museum, to host several overnight activities that aim to show the link between culture, art, and astronomy. We opened up these events to participants ages 6 and up. Participants were encouraged to tour the art museum during the day, and then take part in hands-on arts and craft activities and night sky observation during the evening. Telescopes were also set up to give the participants a taste of the thrills of observing through a telescope. In the 3 years that we have facilitated these events, we have received mostly positive reviews and even invitations to host events in different locations throughout the Philippines. We nonetheless wish to improve upon the existing program to give it more impact and a wider reach.

TUESDAY INVITED PLENARY LECTURE

The Power of People: Helping the World's Planetariums Use More Interactive Teaching Strategies

Karrie Berglund, Digitalis Planetarium Education Solutions

As in many other fields, the planetarium world has been undergoing a digital revolution over the past 20 or so years. There are now at least 1,300 fixed and portable digital systems in use around the world. Digital planetariums offer tremendous flexibility and teaching power, with the ability to transport audiences out to the edge of the known universe in an immersive 3D environment. However, despite these advanced functions, many organizations use their digital planetariums primarily or exclusively to play full dome movies, ignoring the educational power of the planetarium software. Planetarium conferences typically emphasize digital movie playback, with little dedicated to interactive programming. LIPS, the Live Interactive Planetarium Symposium, was designed as a counterpoint to the typical planetarium conference, focusing on all aspects of live programming. Digitalis organized and hosted the first LIPS in 2011, at their headquarters in Bremerton, Washington. LIPS is an annual event, with the seventh symposium taking place from July 18-20, 2017 at Ball State University in Muncie, Indiana. This invited plenary presentation will (i) describe the LIPS movement; (ii) Provide an overview of past LIPS sessions and workshops; (iii) Share feedback from attendees over the years; and (iv) discuss future plans for LIPS.

Karrie Berglund has a background in informal science education. She spent more than 12 years at Seattle's Pacific Science Center in the *Science On Wheels* outreach program, Willard Smith Planetarium, and several other positions. In 2003, Karrie co-founded Digitalis Education Solutions, Inc., a manufacturer of digital planetarium systems and portable domes, and she serves as Director of Education for Digitalis. She is an outspoken proponent of live, interactive planetarium

programs, and she organized and hosted the first-ever LIPS (Live Interactive Planetarium Symposium) in 2011. She is still heavily involved in coordinating and organizing the annual LIPS, and she also leads the professional development team for the International Planetarium Society's Vision 2020 initiative.

Session 83 – Improving Student Learning FGCU Marieb Hall – 1:30pm-3:00pm

1:30pm-3:00pm, Marieb Hall 203

Inspiring your Learners, their Families, and Communities to Explore STEM Knowledge

Jacob Noel-Storr, InsightSTEM.org

Don't confine your students learning to the walls of your classroom -- instead, plan to help them explore knowledge out in the Universe alongside their families and communities. Develop your own plans to use astronomy to inspire STEM knowledge exploration in after school programs, family and community events, summer camps, or more for learners of all ages from elementary school to college.

1:30pm-3:00pm, Marieb Hall 205

Engaging in the Scholarship Of Teaching & Learning – SOTL

Rebecca Lindell, Tiliadal STEM Education Solutions

Jeff Saul, Tiliadal STEM Education Solutions

The Scholarship of Teaching and Learning – SOTL – simply means approaching your teaching and your students learning in a scholarly manner. In this workshop, participants will be guided through the process of starting a SOTL project, making key decisions on your project, different ways for analyzing your data, as well as where you can present your project and publish your results. Participants should bring their project ideas as well as any ongoing SOTL projects they are working on.

Session 84 – Improving Student Learning
FGCU Marieb Hall – 3:30pm-5:00pm

3:30pm-5:00pm, Marieb Hall 203

Songs of Space & Time

Jon Bell, Indian River State College Hallstrom Planetarium

In this workshop, participants will learn how to write good, memorable songs about astronomy, outer space and science. Several songs by the author will be presented live, and karaoke-style pieces will be offered up to sing along to as well. The participants will then work in groups to create new astronomy and science songs, using familiar tunes. Jon U. Bell, Associate Professor of Astronomy and Hallstrom Planetarium Director at Indian River State College, is, "The Singing Astronomer." Over the years he has written many songs about astronomy, outer space, and other sciences too. He is the author of "The Astronomers Songbook, available at Amazon.com; to hear one of his songs, "Universe Calling," go to Youtube: <https://www.youtube.com/watch?v=Gav1BbXYeZ0>

3:30pm-5:00pm, Marieb Hall 203

First Small Steps to Getting Out of Lecture-Mode

Tim Slater, University of Wyoming

Lecturers can motivate, inspire, and build a series of experiences that make the discipline more accessible; but, professors cannot do the learning for students. In fact, this notion has encouraged us to promote the perspective, "it's not what the teacher does that matters; rather, it is what the students do." But, don't worry, there is still plenty for the professor to do!! The role of lecture in a learner-centered class perspective still exists, but is radically shifted from dispensing knowledge in a conventional course to a focus on guiding students through meaningful learning experiences as a learner-centered experience. So, the pathway to giving great lectures is actually to say less during class and change listener behavior from passive to active! This is not terribly difficult to do, nor does it dramatically reduce the amount of information you can cover; but, it does take a intentional pre-planning and

a commitment to it being important. This works incredibly well and professors who have gone down this road toward more active student engagement rarely back to the old way of just teaching by telling. The key feature of any learner-centered approach is to ask questions. To be sure, a pointed suggestion of asking some questions during a lecture might seem a tad silly. However, the number of professors who actually pose non-rhetorical questions during their lecture is astonishingly small. An even smaller portion of professors actually pause and wait long enough for students to answer! Probably the biggest mistake that professors make when posing questions to the class is to pose cognitively low-level questions that are too easily answered by the students relying on preexisting declarative knowledge. Classrooms of students responding quickly, and in unison, is often mistaken for meaningful dialogue. This is widely known as choral-response. If all the students in the class can recite and answer without thinking about it, it's probably a waste of valuable class time.

WEDNESDAY, AUGUST 9, 2017

**Session 91 – Contemporary Astronomy Education
FGCU Marieb Hall Room 203 – 9:00am-10:30am**

9:00am-9:30am, Marieb 203

Invitational Planetarium Education Research

Sara Schultz, Minnesota State University Moorhead

Keith Turner, Carmel Clay County Schools

Ken Brandt, Robeson County Schools

Planetarium educators have long pondered and debated the advantages of live, interactive planetarium presentations and high-production quality pre-recorded planetarium shows. Although many of us would tacitly accept the notion that live must be more educational than pre-recorded, there is little data to support such an assertion. Moreover, the definition of what it means to be “interactive” in the planetarium is far from well defined. This session describes an early stages, ongoing planetarium education research study to describe and document the range and domain of live planetarium presentations and tie those observations to extant learning sciences education theory.

9:30am-10:00am, Marieb 203

Join the Evaluation of the #NationalEclipse of 2017!

Jacob Noel-Storr, InsightSTEM.org

We are "Evaluating the Eclipse"(!) on behalf of the National Science Foundation and American Astronomical Society to learn what and how people learn at large multi-site inspirational events. Are you planning an event for the eclipse? If so, learn how you can contribute to the national evaluation project -- get reliable data about the outcomes of your event, and contribute to the understanding of how the public are inspired and engaged in learning!

10:00am-10:30am, Marieb 203

Practical Strategies for Using Science Fiction Movies in Teaching

Tim Slater, University of Wyoming

Science fiction video clips have never before been more frequently accessed by students. For many, mobile cell phones, tablets, computers, and Internet-linked smart televisions makes access a nearly daily activity. As a result, students naturally expect video and popular media to be a part of the contemporary learning experience. At the same time, discipline-based science education research clearly shows that it is irresponsible simply to turn to popular media as a classroom babysitter and hope that learner will gain something transformative from the experience. Instead, science fiction video clips need to have a clearly specified and explicitly specific purpose that is explained to students. One approach to highly structure the learning experience is to pose three different styles of questions: 4-8 factual questions (How far away from Earth is Hubble?); 2-4 synthesis & evaluation questions (Which observations were most scientifically useful?); and 1-2 self-reflection questions (Which 12 HST images would you pick for a calendar & why?).

**Session 92 – Innovations in Digital Astronomy Education
FGCU Marieb Hall Room 205 – 9:00am-10:30am**

9:00am-9:30am, Marieb 205

Design and implementation of an online course on the Moodle platform, for the *Learning of Cosmology* in secondary students

María Julieta Argüello Ramírez, National Polytechnic Institute
The incorporation of Information and Communication Technologies (ICT) in educational environments is not a new trend, but is still not well defined. The interaction between teachers and students in these environments is not yet well established to make the most of their potential. In order to go one step forward in the understanding of this form of interaction, we consider the subject of Cosmology in Science II course of Secondary education in Mexico to design and evaluate a didactic sequence in a virtual environment. In this paper the effectiveness of the implementation of this strategy is reported using a Moodle course designed for this purpose. We implement this course in three groups, the first one is a group has already taken the course a year earlier. The second group will take this course the following year. And, the third one, is taking the course at this time. An analysis of normalized conceptual gain and factor concentration was performed and it was found that all groups begin the course in the same conditions of understanding about cosmology. After implementation, the three groups achieved a good understanding of the concepts involved in the course. However, students who are about to finish secondary school achieved better results, we think due to the maturity they reach having already taken the full course a year earlier. According to these results, it is intended to design a MOOC course on cosmology in secondary school to go a step further in using digital tools for teaching physics.

9:30am-10:00am, Marieb 205

Using CourseNetworking to increase student engagement outside of the Astronomy classroom

Rebecca Lindell, Tiliadal STEM Education Solutions,
Andrew Gavrin Indiana University Purdue University
Indianapolis

Course Networking, <http://thecn.com>, (CN) is a social media platform designed for the academic environment. It combines many features common among Learning Management Systems (LMS) such as Canvas or Blackboard. Unlike the traditional LMS, the interface for the CN looks and feels more like Facebook than a typical academic system. Since 2014, we have researched how to successfully implement the CN into our courses as well as the effect the CN has on student engagement outside the classroom. Particularly, we have found that the CN does increase engagement outside the classroom and that underrepresented minorities including women are more likely to participate on CN as compared to male students within the courses. In this talk, I will present an overview of our research on the CN. In addition, I will present the CN and how it can easily be implemented in your classroom.

10:00am-10:30am, Marieb 205

Astronomy, Incorporated - "Where We Put the Universe in Your Hands..."

Kyle Jeter, Marjory Stoneman Douglas High School, Florida
In 2013 I decided to make the transition to a more student-centered classroom environment. After a few years of trial-and-error, I developed a program I call "Astronomy, Incorporated". Students work in small groups with the goal of creating astronomy-related digital and physical "products". For example, each group is asked to author a textbook on Astronomy through the iBooks Author program. The iBooks contain pictures, videos, links, etc... Students then work to fill their book with their own creations. They create artwork to illustrate key points. They produce short films to explain difficult concepts. They build and manage a website that supports their book. They learn some basic techniques of

astrophotography and populate their book with their own pictures. The goal is to create a workplace-like environment that not only teaches them the wonders of Astronomy, but also helps them develop people and technical skills to enhance their chance for success in a future career. During this brief presentation, I will showcase student work and discuss both our successes and the challenges of such a program.

WEDNESDAY INVITED PLENARY LECTURE

Leveraging Celestial Events to Teach Astronomy

Lou Mayo, NASA Goddard Space Flight Center

Capturing the attention and interest of the astronomy 101 student can be challenging even for the best professors. The number one reason, students take astronomy 101 is to fulfill college science requirements. Many lack basic math skills; still more approach science courses with trepidation, as a necessary evil. You all know what I'm talking about, right? So, what to do? Event based science can provide a solution. Bringing current celestial events – eclipses, transits and occultations, meteor showers, and space mission events such as launches, landings, passovers, and new discoveries, into the classroom setting; can change the student's experience of astronomy from a distant, unapproachable, and theoretical subject that ends when the class is over, to something accessible, meaningful, and understandable that can be observed and experienced beyond the scope of the astronomy course. In addition, many celestial events have gained national attention that creates a shared experience for students beyond the classroom. In this way, students can become involved in a larger dialogue and can even take on the role of ambassadors, communicating the event science to others in their family and community. In this talk, Professor Lou Mayo will discuss models for leveraging event based science in the astronomy 101 classroom and will present a few examples including the upcoming August 21st total solar eclipse.

Lou Mayo is a planetary scientist working at NASA's Goddard Space Flight Center in Greenbelt, MD and professor of astronomy at Marymount University where he teaches astronomy 101 for non-majors. His research interests involve studying the atmospheres of the outer planets including Saturn's largest moon, Titan. Lou is program manager for NASA's Heliophysics Education Consortium, responsible for bringing big event science to the nation including the MSL/Curiosity landing, Transit of Venus, and the August 21st

total solar eclipse. He is a frequent author of articles on astronomy and nationally recognized speaker on astronomy and space science education.

Session 93 – Improving Student Learning FGCU Marieb Hall – 1:30pm-3:00pm

1:30-3:00pm, Marieb 203

Using a Scientific Argumentation Approach to Teaching Astronomy

Sharon Schleigh, CAPER Center for Astronomy & Physics Education Research

Educators committed to teaching their students how to be successful in learning astronomy often struggle with how to teach students about the fundamental nature and processes of science. Workshop participants will learn how to engage their students in scientific discourse with the goal of deeply engaging students in the doing of astronomy.

1:30-3:00pm, Marieb 205

Giant Leaps for Getting Even Farther Out of Lecture-mode

Stephanie Slater, CAPER Center for Astronomy & Physics Education Research

Once professors become adept at using voting and discussion approaches, there are unlimited variants that work well. One alternative is instead of using two or three questions per week, to instead use four or five questions per day. Increasing the number of questions can be inadvertently too taxing on the students if questions are too dissimilar. Professors who use numerous voting questions usually only change one OBVIOUS part of each question, thereby giving students more practice and do so without much student-to-student discussion. A second, but similar approach is to use calculator-free mathematical reasoning tasks. Questions like these ask students to quickly judge or rank magnitudes emphasizing the quantitative nature of astronomy. The underlying hope of the think-pair-share, clicker-voting questions approach is that through social conversations with peers, students will develop a more complete and nuanced understanding and the voting allows professor to carefully monitor the students' conceptual growth. Certainly, some questions work better than others: We find that vocabulary questions rarely work because there is nothing conceptual to discuss. Among many places, libraries of voting questions, sometimes called "clicker questions" are

widely available through publisher's websites of instructor resources and its usually more efficient time wise to borrow other's created questions instead of always devising your own. So, how might one infuse the learning of astronomy with opportunities for students to practice "talking astronomy?" Using Mini-debates consistently engage students in scientific thinking and discourse. The general idea is to challenge students to critically review a given and highly-structured "student debate," which expresses common naïve ideas in student's natural language.