Professional Learning Day at IMSA: STEM Education for the Future
March 4, 2016

7:30-8:00 AM	Check in, Coffee – Front Entry, Rear of Auditorium
8:00-8:15 AM	**Welcome** - Auditorium
8:15-9:00 AM	**Keynote Address -** Auditorium
9:00-9:15 AM	Move to Morning Sessions

9:15-10:15 AM	**A-1** Teaching Fields in Introductory Physics **Dong MS/HS**	**A-2** Using Stories to Enhance Learning and Student Engagement in the Biology Classroom **Traina MS/HS**	**A-3** The Box Problem - An introduction **Dover 8-HS**	**A-4** It's A Wrap **Hernandez/ Herlehy MS**	**C-1** Ecosystem disruption: Using lab and real-world examples to bring changes in Earth's ecosystems to life. **Randall/O'leary/ Anjur/Dosch MS/HS**	**C-2** "It IS as Easy as pi" **Moskalik/ Jones Elem**	**C-3** Engineering with Reinforced Concrete **Young MS**	**C-4** Design Your School's New Innovation Space **McKenna/ Bergie All**	**C-5** *Biotech Basics* **Martinez/ Ferrin**
10:15-10:30	***Break – Move between sessions***								
10:30-11:30 AM	**B-1** Model building in Planetary Science and the NGSS **Hawker MS/HS**	**B-2** IS STEM Truly for All: Motivating Black and Latino Students to Engage in STEM **Coleman All**	**B-3** Analysis of Pollutants in the Environment **Thurmond** HS	**B-4** STEM Integration: Statistics is the Connection **Togliatti/ Herlehy MS**					
11:30-12:30	***Lunch Break (1 Hour) Campus Cafeteria***								
12:30-1:30 PM	**D-1** Science and Spaghetti Monsters: **O'leary-Driscoll HS**	**D-2** Science and the Feminine: A Cultural Examination **Keiley HS**	**D-3** The Mathematical Wonders of Pascal's triangle **Porzio MS/HS**	**F-1** Exploration Geometry: Hands-On Transformations **Herlehy/ Herandez/ Togliatti MS**	**F-2** Simple Chemistry Labs and Activities to Teach Difficult and Important Concepts **DeVol/Scarano/ White HS**	**F-3** "It IS Rocket Science" **Jones/ Moskalik Elem**	**F-4** Developing Parametric Equations Using Mathematical Modeling **Kammrath HS**	**F-5** The new STEM education: Students as creators? **Heine/Gerry MS/HS**	**F-6** "To Infinity and Beyond"… Exploring ways to teach an abstract concept **Ross** MS/HS
1:30-1:45	***Break – Move between sessions***								
1:45-2:45 PM	**E-1** Labs for Waves, Sound, and Optics **Schmidt** MS/HS	**E-2** Function FUNdamentals, More Than x and y **Oronez/ Condie MS/HS**	**E-3** Addressing NGSS Engineering Standards with an Alternative Energy Module **Clancy/Carlson** HS						

A-1: Teaching Fields in Introductory Physics

Subject: Science
Grade Level: MS/HS
Location:
Abstract:
The concept of a field is integral to all areas of contemporary physics - perhaps as fundamental a concept as energy. Fields are mentioned in several NGSS standards and essential to understand physics at an advanced level. However, fields are not difficult and can be taught in an introductory course with minimal math. Students who understand the basic concept early should have less difficulty understanding electric and magnetic fields in later classes. I will discuss our implementation of a fields unit in our introductory physics course and give examples of simple labs and exercises to help students understand this basic concept.

A-2: Using Stories to Enhance Learning and Student Engagement in the Biology Classroom

Subject: Science
Grade Level: MS/HS
Location:
Abstract:
Storytelling can have a powerful impact on learning, and it can be used as an effective strategy to enhance student interest and engagement. In this session, participants will be introduced to some of the benefits of storytelling. They will also learn a few simple strategies for using stories to 1) enrich the learning experiences in biology classes, 2) improve the classroom environment, and 3) motivate and encourage students. The strategies that will be discussed are easy to implement and do not require large amounts of class time.

A-3: The Box Problem – An Introduction

Subject: Mathematics
Grade Level: MS/HS
Location:
Abstract:
Create some simple boxes with paper and scissors. Then we'll measure the height, area of the base, and the volume. Find formulas, find regressions, and graph the functions. It's a simple activity to engage students and combine many different aspects of mathematics.

A-4: It's a Wrap

Subject: Mathematics
Grade Level: MS
Location:
Abstract:
Investigate the concepts of surface area, measurement, ratio and proportion through a visual and kinesthetic mathematical investigation. Participants will be presented with the challenge of calculating how many sheets of toilet paper it would take to wrap one of their group members using a limited selection of tools. This session will provide teachers with a wonderful hands-on, minds-on activity that could easily be implemented into any classroom!

B-1: Model building in Planetary Science and the NGSS

Subject: Science
Grade Level: MS/HS
Location:
Abstract:
In this session I will guide teachers through the steps my students take in Planetary Science to develop a conceptual model of how planetary interiors work. Teachers will then create concept maps from their conceptual models, and then use their models and maps to understand planetary systems other than Earth.

B-2: Is STEM Truly for All: Motivating Black and Latino Students to Engage in STEM

Subject: STEM
Grade Level: all grades
Location:
Abstract:
This presentation takes an intricate look at the factors that motivate gifted and talented Black and Latino students to engage in science, technology, engineering and mathematics (STEM). According to the literature, the U.S. workforce could employ as many as 140,000 additional Black and Latino college graduates in STEM fields annually if the gap in college completion by Blacks and Latinos closed to roughly match that of the White and Asian student graduation rates. Thus, the goal of this presentation is to inform administrators, educators, and programs of a 5-step motivation-based process that encourages Black and Latino students to engage in STEM.

B-3: Analysis of Pollutants in the Environment

Subject: Science
Grade Level: HS
Location:
Abstract:
Participants will perform a laboratory activity to measure pollutants in the environment. The laboratory activity may be amenable to chemistry or environmental science courses.

B-4: STEM Integration: Statistics is the Connection

Subject: STEM
Grade Level: MS
Location:
Abstract:
In this activity, participants will complete a STEM-integrated lesson incorporating problems in aerodynamics. Using the mathematical, science and engineering practice standards, they will design and model parachutes to determine a life-size chute to support their body weight. Participants will also consider design criteria for rate of descent, and graphically represent data and mathematical information as a scatter plot.

C-1: Ecosystem Disruption: Using lab and real-world examples to bring changes in Earth's ecosystems to life

Subject: Science
Grade Level: MS/HS
Location:
Abstract:
The magnitude of the changes occurring in Earth's ecosystems seems difficult to tackle in the classroom and lab. Here we explore ways to demonstrate the changes in the Earth's water and carbon cycles in the lab and bring them to life in real-world ecosystems in the classroom.

C-2: "It IS Easy as pi"

Subject: Mathematics
Grade Level: Elementary
Location:
Abstract:
Participants will work together using pi to try to open an ancient chest filled with treasure!! The chest is protected by a passcode that can only be determined through the activities within the lesson. Enjoy a progressive exposure to pi through this two-part lesson (total 110 minutes) offering a FUN storyline within the context of geometry and circles. With "pi-day" right around the corner, this hands-on, fun, inquiry-based lesson is sure to be a hit with your budding mathematicians.

C-3: Engineering with Reinforced Concrete

Subject: Engineering
Grade Level: MS
Location:
Abstract:
Does your school need a shelter? Whether your students are concerned about tornadoes, sharknadoes, or a zombie apocalypse, reinforced concrete is the answer! Learn about the history and chemistry of concrete. Make your own. Design a test to evaluate the strength of your concrete, based on anticipated threat (the natural or unnatural disaster of your choice). Conduct that test using small, preformed slabs. Making and breaking concrete is easy and fun, but wear your play-clothes. You will get dirty.

C-4: Design Your School's New Innovation Space

Subject: STEM
Grade Level: all grades
Location:
Abstract:
Schools are rethinking learning spaces, turning outdated computer labs and tired libraries into vibrant innovation spaces. Maker spaces, collaboration areas and technology hubs that connect applied learning to the real world are emerging. See plans for IMSA's new innovation hub, called IN2, (opening fall 2016) learn how it was designed, and tour IN1 (the prototype of IN2) in a former computer lab. Learners are guided through a design thinking process to reimagine a current space at your school. Participants should come with photos of their potential space/s and room dimensions ready to create a prototype of their new space.

C-5: Biotech Basics

Subject: Science
Grade Level: MS/HS
Location:
Abstract:
The field of biotechnology is rapidly expanding. What is biotech? What are the applications? How is biotech studied? These topics will be explored as participants engage in hands-on lessons developed at an appropriate level for middle school students. Activities may be used to introduce students to the world of biotech.

D-1: Science and Spaghetti Monsters: Addressing the ethical issues and controversy related to genomics and Evolution in the Biology classroom

Subject: Science
Grade Level: HS
Location:
Abstract:
As science teachers, we may shy away from addressing the controversy surrounding particular topics in our classrooms in order to maintain focus on content. However, the real world context of knowledge is essential, and the performance expectations in the life sciences as outlined in the NGSS state that students should be able to discuss the ethical issues related to genetic modifications and the nature of science. We will discuss ideas for how to address these topics effectively and help our students understand their importance beyond academics in our global community.

D-2: Science and the Feminine: A Cultural Examination

Subject: Science and History
Grade Level: HS
Location:
Abstract:

This session will explore the treatment of the feminine in science and natural philosophy from Antiquity to the 20th century. We will examine different views of the female role in nature and generation, and trace the links between such views and the treatment of women in society. We will also study changing notions of the relationship between gender and mind, and we will consider how such views have affected the place of women in the scientific community.

D-3: The Mathematical Wonders of Pascal's triangle

Subject: Mathematics
Grade Level: MS/HS
Location:
Abstract:
Most mathematics teachers are aware of the some of the more straightforward connections Pascal's Triangle has to mathematics. Come explore some of the lesser known connections that can be used to peak your students' interest and entice them into exploring the mathematics behind these connections.

E-1: Labs for Waves, Sound, and Optics

Subject: Science
Grade Level: MS/HS
Location:
Abstract:
I've been reworking our labs for waves, sound, and light this semester and I would like to share my work with you. These are a mix of both derivation and application experiments. I will also give suggestions for modifications for the middle school level.

E-2: Function FUNdamentals, More Than x and y

Subject: Mathematics
Grade Level: MS/HS
Location:
Abstract:
How many of your students say that $\sqrt{9} = \pm 3$? This may have to do with a lack of understanding of functions.
This session will highlight some of the nuances of functions with less formal, non-formula driven examples with which students can expand their understanding.

E-3: Addressing NGSS Engineering Standards with an Alternative Energy Module

Subject: STEM
Grade Level: HS
Location:
Abstract:
In our Engineering class at IMSA, we have taught an Alternative Energy unit over the last four semesters. We will discuss how the 4 engineering NGSS standards are addressed through the various activities involved with this unit. We will also discuss how the unit has evolved over the last 2 years.

F-1: Exploration Geometry: Hands-On Transformations

Subject: Mathematics
Grade Level: MS
Location:
Abstract:
In this session, participants will engage in a series of hands-on, minds-on Geometry lessons designed to explore the four transformations. By completing several critical thinking challenges, teachers will use the Common Core Mathematical Practices and various manipulatives to investigate how figures rotate, dilate, translate, and reflect within a plane.

Appropriate for multiple grade levels, teachers will leave the session with all instructional plans and various ways to adapt the lesson based on the needs of their students.

F-2: Simple Chemistry Labs and Activities to Teach Difficult and Important Concepts

Subject: Science
Grade Level: HS
Location:
Abstract:
This will be a hands-on session where participants will perform four chemistry activities/experiments (two of the experiments will be a variation on one theme). The topics will include bonding, equilibrium, and stoichiometry. Teachers will be provided with copies of the activities to take back to their classes. In the spirit of learning together, we ask participants to bring their favorite activity/lab to share with the group (these labs will not be performed, just shared. Bringing an activity to share is optional, not required).

F-3: "It IS Rocket Science"

Subject: Engineering
Grade Level: Elementary
Location:
Abstract:
All current NASA rocket launchers are no longer useable because all of the available rocket-fuel sources on Earth have been depleted. Participants will serve as NASA engineers tasked with developing non-fuel-based rocket launcher prototypes in an effort to maintain current and future NASA space programs and missions. Model how you will get your students to take off with Rocket Science.

F-4: Developing Parametric Equations Using Mathematical Modeling

Subject: Mathematics
Grade Level: HS
Location:
Abstract:
Designing project to develop student understanding of parametric equations and two modeling situations in which they are applied. No previous knowledge of parametrics is required by the students. The project requires two days of class time, with the remaining work done outside of class. This project is intended to be given three days into a unit on vectors.

F-5: The new STEM education: Students as Creators?

Subject: STEM
Grade Level: MS/HS
Location:
Abstract:
Engage students in STEM learning and its applications through real-world entrepreneurship experiences. IMSA's entrepreneurship program, TALENT, combines face-to-face and remote opportunities enabling students to develop life-long entrepreneurial mindsets and skills. This workshop explores all facets of the TALENT extra-curricular program that fills the entrepreneurship gap at middle school and high school. Try out instructional resources that you may use to promote effective idea generation, market research, prototyping, business modeling, product testing and pitching to investors.

F-6: "To Infinity and Beyond" – Exploring ways to teach an abstract concept

Subject: STEM
Grade Level: MS/HS
Location:
Abstract:

Imagine a numberless world. I wonder if you can. No need for calculations, or counting tools of man. Imagine all the people living without 1, 2, 3's…Abstract concepts are often difficult to teach. Students frequently desire concrete examples of calculations or real-world connections to concepts. The concrete becomes increasingly difficult when numbers are extraordinarily large or small. Join us as we explore techniques designed to provide real-world connections and help make numbers, big, small, or infinite, easier to understand.