CSAAPT Fall 2022
Semi-Virtual Meeting

Chesapeake Section of the
American Association of Physics Teachers
Fall 2022 Semi-Virtual Meeting
October 22, 2022 in Falls Church, VA

Report of Contributions

https://indico.phys.vt.edu/e/CSAAPT2022F

Contribution ID: **1** Type: **talk (15-minute)**

Physics in the Atomic Age: Nuclear Physics for General Education and High School Courses

Saturday, October 22, 2022 2:00 PM (15 minutes)

The story of the development of atomic physics is interdisciplinary, compelling, and deeply human. Therefore, this content is fitting for liberal arts undergraduate courses or for high school courses, providing not only a rich scientific experience, but also an engaging framework for investigating the nature of science and its role in society. I will describe an introductory undergraduate course called "Physics of the Atomic Age"taught at Randolph-Macon College for general education credit. I will discuss content, multi-media resources, and laboratories used in the course.

Presenter: DOMINGUEZ, Rachele (Randolph-Macon College)

Session Classification: Afternoon Session 1B (Chair: Tatsu Takeuchi, Zoom Monitor: Elena Kuchina)

Contribution ID: **2** Type: **talk (15-minute)**

Is Relativity in HS Crazy?

Saturday, October 22, 2022 2:30 PM (15 minutes)

Due to the advent of Quantum Computing Technologies, there has been a rush to reinvent the teaching of quantum mechanics in order to better train the future work force for that field. At the past few CSAAPT Meetings, we heard many talks on newly developed methods to teach the essence of quantum mechanics to high school students. But what about the other pillar of modern physics, namely relativity? Is it crazy to try to teach relativity to high school students? In this talk, I will argue that it is not, and that the best way to do it is to avoid the use of equations altogether and explain everything using pictures called "spacetime diagrams."

Presenter: TAKEUCHI, Tatsu (Virginia Tech)

Session Classification: Afternoon Session 1B (Chair: Tatsu Takeuchi, Zoom Monitor: Elena Kuchina)

Contribution ID: **3** Type: **talk (15-minute)**

Free Physics Demonstration Videos From Blue Ridge PBS

Saturday, October 22, 2022 9:00 AM (15 minutes)

Blue Ridge PBS, in partnership with Virtual Virginia and the Demonstration Lab at Virginia Tech, has produced a series of high school Physics demonstrations recorded on campus, hosted by Ph.D.candidate Alison Gaylord. These short, SOL correlated episodes are available at no cost and are also embedded in the Virtual Virginia Physics courses. The focus of the discussion will be how to use these in face to face, online, and blended courses.

Topics include:
Acceleration Due to Gravity
Principles of Projectile Motion
Conservation of Energy
Newtons Second Law - Balanced Forces
Sound Waves/Rubens Tube
Newton's Second Law: Elevator Demonstration
Circular Motion
Projectile Motion
Harmonic Sound Waves
Modeling Motion with Force Vectors
Electrostatic Forces and Fields
Circular Motion and Inertia
Impulse Momentum
Conservation of Momentum
Conservation of Energy

Primary authors: Mrs WARNICK, Sarah (Virtual Virginia); LANDON, Thomas (Blue Ridge PBS)

Presenters: Mrs WARNICK, Sarah (Virtual Virginia); LANDON, Thomas (Blue Ridge PBS)

Session Classification: Morning Session (Chair: Jason Sterlace, Zoom Monitor: Juliana Butler)

Contribution ID: **5** Type: **talk (15-minute)**

Directly measuring the harmonic oscillator wavefunction.

Saturday, October 22, 2022 2:30 PM (15 minutes)

It is important to bring 21st century physics into the classroom. A recent experiment by the Regal lab prepared the first three energy eigenstates of a harmonic oscillator and then used time-of-flight spectroscopy to measure the momentum distribution (which can be easily converted into the momentum-space wavefunction). In this talk, I will explain how this experiment works and how you can bring it into your undergraduate classroom. It is suitable for Modern Physics courses or for junior-senior level Quantum classes. It also can be shown to high school classes as a "really cool" result from the second quantum revolution. The measurement is interesting because we measure position to infer momentum using a cycling atomic transition measurement, which does not really fit the von Neuman measurement paradigm. Discussing this material in your class helps with explaining the uncertainty principle, how measurement of single quanta takes place, and dispels the myth that a wavefunction cannot be measured.

Primary author: FREERICKS, James (Georgetown University)

Presenter: FREERICKS, James (Georgetown University)

Session Classification: Afternoon Session 1A (Chair: Juliana Butler, Zoom Monitor: Kent Yagi)

Contribution ID: **6** Type: **talk (15-minute)**

Mentoring for Careers in Physics: a new pilot program at William & Mary

Saturday, October 22, 2022 2:15 PM (15 minutes)

Last year, the Department of Physics at William & Mary launched a new professional mentoring program for female undergraduates in physics, Mentoring for Careers in Physics (MCP). Initiated by Ran Yang, the co-founder and co-director of MCP, our program pairs undergraduate physicists (or anyone considering a physics major) with female professionals working in STEM fields beyond academia. MCP aims to: help students build career skills and identify career goals; provide networking, internship and job opportunities; and strengthen students' sense of STEM identity and belonging. I discuss the process of starting our mentoring program and reflect on our experience of delivering a pilot program in its first year.

Primary author: MONAHAN, Christopher (William & Mary)

Presenter: MONAHAN, Christopher (William & Mary)

Session Classification: Afternoon Session 1A (Chair: Juliana Butler, Zoom Monitor: Kent Yagi)

Contribution ID: **7** Type: **talk (15-minute)**

Announcing the Organization for Physics at Two-Year Colleges (OPTYCs)

Saturday, October 22, 2022 2:00 PM (15 minutes)

The newly-created Organization for Physics at Two-Year Colleges (OPTYCs), under the auspices of AAPT, will resurrect previous workshop series and programs for professional development, reduce isolation for TYC faculty through networking and mentoring opportunities, and create a culture of PER for TYCs nationally. In this talk, I will describe the vision for OPTYCs and outline the various programs that are planned in the coming years. OPTYCs is a one-stop shop for physics at TYCs, and welcomes participation from all physics teachers. (Supported by NSF-IUSE-2212807.)

Primary author: LUI, Kris (AAPT - OPTYCs)

Presenter: LUI, Kris (AAPT - OPTYCs)

Session Classification: Afternoon Session 1A (Chair: Juliana Butler, Zoom Monitor: Kent Yagi)

Contribution ID: **8** Type: **talk (15-minute)**

Optimal launch angles: Novel perspectives of an ancient problem

Saturday, October 22, 2022 10:00 AM (15 minutes)

We revisit the ancient problem of finding the optimal angle for launching a projectile so as to maximize the range. In the last meeting, we showed a solution to this problem using only geometry. Here, we present some novel perspectives. One is the notion of "duality" (between the launch and target sites). Another is the envelope of all trajectories (for launching at different angles, but with the same speed). Consequences associated with these ideas are explored. If time permits, we will show a simple, unified approach that includes launches on a spherical earth. Relying only on energy conservation and properties of ellipses/parabolas, this approach should lie within the grasp of high school students.

Primary authors: Prof. RUIZ, Michael J. (University of North Carolina at Asheville); Prof. ZIA, R. K. P. (Virginia Tech)

Presenter: Prof. ZIA, R. K. P. (Virginia Tech)

Session Classification: Morning Session (Chair: Jason Sterlace, Zoom Monitor: Juliana Butler)

Contribution ID: **9** Type: **talk (15-minute)**

Effectiveness of simulation-based lesson in introductory physics classes

Saturday, October 22, 2022 2:15 PM (15 minutes)

Physics is a science that can be difficult for students to understand. It involves a lot of abstract thinking. It can be difficult for students to conceptualize the concepts learned. Our studies show that simulations-based lessons have the potential to engage students in deep learning that empowers their understanding as opposed to traditional learning which requires mostly memorization. In this talk, we show some examples of the simulation-based lesson and how effective they are.

Primary author: PAL, Bilas (Marywood University)

Presenter: PAL, Bilas (Marywood University)

Session Classification: Afternoon Session 1B (Chair: Tatsu Takeuchi, Zoom Monitor: Elena Kuchina)

Contribution ID: **10** Type: **talk (15-minute)**

Fostering Critical Thinking Through Cartoon Clicker Questions

Saturday, October 22, 2022 9:45 AM (15 minutes)

The speaker is passionate about undergraduate teaching and research and he believes in the holistic development of students by integrating teaching and research at the undergraduate level. He has developed hundreds of cartoon clicker questions to provoke vigorous group discussions on critical thinking questions in classrooms, created corresponding hands-on active learning labs to further investigate their understanding and created modular research projects so that students can gain authentic research experiences.
In this talk he will focus on the use of concept cartoon clicker questions in classrooms to engage students, incite discussions and promote critical thinking.
Some sample questions can be found here.

Primary author: DAS, Kausik (University of Maryland Eastern Shore)

Presenter: DAS, Kausik (University of Maryland Eastern Shore)

Session Classification: Morning Session (Chair: Jason Sterlace, Zoom Monitor: Juliana Butler)

Contribution ID: **11** Type: **not specified**

Energy Conversion and Electrostatic Activities using Simple Toy-Like Devices Available Free to Attending Teachers

Saturday, October 22, 2022 4:15 PM (45 minutes)

Summer workshops spearheaded by the Department of Physics in collaboration with the Curry School of Education at the University of Virginia and with Jefferson Laboratory in Newport News developed activities for secondary physics and physical science teachers to use in their classrooms. Specifically, energy, electricity, magnetism, light and optics were the subject areas. In this presentation we will discuss the physics/pedagogy for several energy and electrostatics activities and make available(free) materials needed to conduct these activities including a lesson plan on the specific activity. These are very rudimentary instructions and you are obviously free to develop any set of instructions as you see fit. For the taking, there will be approximately 10 super-cooled gel heating pads; 16 dippy ducks; 14 piezo poppers; 12 build your own solar race cars; 12 electric charging kits with Teflon rods, acrylic rods, almost frictionless rotating holder, and silk cloth; 12 electroscope kits with an almost unbreakable, rugged, portable electroscope holder, 2 charging rods, and silk cloth; and 26 Van de Graaf Wanderama sticks. Selected examples of such activities will be presented and demonstrated focusing mostly on the home-made electrostatic activities. After discussion teachers will be allowed to peruse the activities and take at least 1 item home. You may be permitted to select as many as 2 items if all items are not first exhausted by the attending teachers.

Primary author: LINDGREN, Richard (University of Virginia)

Presenter: LINDGREN, Richard (University of Virginia)

Session Classification: Featured Talk 3 (Chair: Kent Yagi, Zoom Monitor: Brett Taylor)

Contribution ID: **12** Type: **talk (15-minute)**

Building Things in Physics Classes

Saturday, October 22, 2022 3:45 PM (15 minutes)

You might be surprised (and perhaps a little dismayed) to learn how few of your students have actually built things with their own hands. Physics teachers have a unique opportunity to allow students to build their own lab devices. In doing this, I have found that students usually take ownership of their learning and better understand how things work. In this workshop, I will describe several of the things I have students build (toy cars, mobiles, motors, microphones, speakers, musical instruments, pickups, etc.), discuss the physics being taught, and will provide time for teachers to construct their own versions of the devices.

Primary author: LALLY, Sean (Jemicy School)

Presenter: LALLY, Sean (Jemicy School)

Session Classification: Afternoon Session 2A (Chair: Simone Kulin, Zoom Monitor: James Freericks)

Contribution ID: **13** Type: **talk (15-minute)**

The Virginia Department of Aviation: An Educational Resource

Saturday, October 22, 2022 9:15 AM (15 minutes)

The Virginia Department of Aviation has three main functions: Support Virginia's public use airports, fly the Commonwealth's aircraft, and to inspire and educate our residents into the aviation industry.

This presentation will discuss the educational programs of the DOAV including, grants, scholarships, and contests.

Question and answer session to follow.

Primary author: Mr SOTELO, Anthony (Virginia Department of Aviation)

Presenter: Mr SOTELO, Anthony (Virginia Department of Aviation)

Session Classification: Morning Session (Chair: Jason Sterlace, Zoom Monitor: Juliana Butler)

Contribution ID: **14** Type: **talk (15-minute)**

To Think Deeply of Simple Things: Reflections & Possible Results from an Ancient REU

Saturday, October 22, 2022 3:15 PM (15 minutes)

During summer of 2005 I worked with my dad who was a professor in mathematics at the University of Illinois (now emeritus) on a research project that was broadly in the area of inverse problems. An inverse problem in science is the process of calculating from a set of observations the causal factors that produced them. For example, calculating an image from MRI data or source reconstruction from a measured field. The project I proposed was what measurements of the electric field –where and how many –would be needed to uniquely determine the placement of the electric point charges that created it. This question is identical to the question: What is the zero set of an electric field from a finite set of point charges? This turns out to be a complex question. Some of the characteristics of the zero set are solved, for example that the zero set consists of a locally finite set of points and analytic curves (i.e. a two dimensional area cannot be all zero). However, other conjectures are still unproven. For example, if the charges are constrained to a plane, does this reduces the zero set to a finite set of points? Some high level results from this work will be presented and some personal reflections on the value of this experience for my understanding of theoretical research, and the research enterprise, that still shapes my thinking today.

Primary authors: Dr ROSENBLATT, Joseph (University of Illinois (emeritus)); ROSENBLATT, Rebecca

Presenter: ROSENBLATT, Rebecca

Session Classification: Afternoon Session 2B (Chair: Maria Gordon, Zoom Monitor: Elena Kuchina)

Contribution ID: **15** Type: **talk (15-minute)**

Collaborative Group Quizzes as a Novel Formative Assessment

Saturday, October 22, 2022 9:30 AM (15 minutes)

Collaborative learning has proven to be an effective pedagogical approach that is gaining broad acceptance across STEM disciplines. While classroom activities are often the focus for such collaborative work, assessments have primarily remained the province of individual effort. For summative assessment, this is entirely appropriate, but for formative assessment, it is reasonable to "bend the rules"a bit. Since the latter can be treated more like a training exercise than a formal evaluation, the notion of incorporating a collaborative element into such an assessment can offer advantages beyond the range of regular classroom activities.

We are leveraging low-stakes quizzes as opportunities for meaningful student learning by instituting a novel and dynamic method that combines individual student accountability with the benefits of collaborative group learning. Quizzes consist of two parts: (1) students work alone to answer 10 multiple-choice questions worth 50 points, then (2) students work together in groups on the same questions using IF-AT scratch-off cards worth another 50 points. These cards are similar to lottery tickets, with 5 covered answer boxes hiding the one correct answer. In their groups, students discuss the questions, converge to a collective answer, and then scratch off that box to get instant feedback. If correct, they get full credit. If incorrect, they continue to discuss and scratch off a second (or third) box for reduced credit. A student's total quiz score (out of 100 points) is based on the individual portion plus the group portion.

Students find the group interactions highly engaging and the suspense of revealing the hidden answer boxes quite stimulating. They take the answer selection very seriously (for fear of losing valuable points!), and this helps focus their attention on the relevant physics concepts that are being probed by the questions. Upon completion of the quiz, all correct answers are revealed, and each student knows his/her score. This feedback loop, coupled with the group discussion and the self-correction option, provides a powerful learning experience for the students.

Primary author: FELDMAN, Gerald (George Washington University)

Presenter: FELDMAN, Gerald (George Washington University)

Session Classification: Morning Session (Chair: Jason Sterlace, Zoom Monitor: Juliana Butler)

Contribution ID: **16** Type: **talk (15-minute)**

Testing of Learning or Learning Through Testing?

Saturday, October 22, 2022 3:00 PM (15 minutes)

After two years of remote learning, labs, and testing, we are finally able to bring students back to campus, albeit for a limited time while I kept all the remote testing in place. In a sense, I decided to "parallel-test"students - keep the online, timed, brief, low-stake tests against the in-person, longer, higher-stake, traditional show-work tests of the pre-pandemic years. The preliminary results are in and they are exciting! In this talk, I will show you the comparison of in-person test results against students'current online performance.

Primary author: Dr STANTCHEVA, Tatiana (Northern Virginia Community College)

Presenter: Dr STANTCHEVA, Tatiana (Northern Virginia Community College)

Session Classification: Afternoon Session 2A (Chair: Simone Kulin, Zoom Monitor: James Freericks)

Contribution ID: **17** Type: **talk (15-minute)**

Herd Hours: What is it and how does it work?

Saturday, October 22, 2022 3:30 PM (15 minutes)

Office hours, a time and place where students receive professor guidance, is an asset available to nearly every college and university student; however, many students do not use office hours. Office hours can be extremely beneficial, so the question exists, how to get students who need help to come to office hours? Herd Hours, an alternative to office hours, successfully addresses this question. Herd Hours is designed with the professor's office hours moved to a large room, students can come individually, or especially in large groups, or herds as the name implies, to work on coursework without a hovering professor. Students are encouraged to use large chalkboards to explain their work and seek validation from peers. Individual work is first encouraged, followed by working with peers, before seeking help from the nearby professor. Overwhelmingly, the data from 248 students in introductory undergraduate physics courses shows that Herd Hours is effective in getting the students the help they need. Over six semesters, 47.6 % of students attended at least once and 31.9 % attended 4 or more sessions. Independent of the students prescore on the Force Concept Inventory, an assessment test on Newtonian mechanics, the individual normalized gains for Herd Hours students increased 2.0 −13.1 %. Data shows the peak in the individual normalized gain for Herd Hours students is more than double the control group. Results also show the average individual normalized gain for Herd Hours students is nearly double the expected value for traditional lecture-based introductory physics courses.

Primary author: MCBRIDE, Sean (Marshall University)

Co-author: Dr MCBRIDE, Sachiko (Marshall University)

Presenter: MCBRIDE, Sean (Marshall University)

Session Classification: Afternoon Session 2B (Chair: Maria Gordon, Zoom Monitor: Elena Kuchina)

Contribution ID: **18** Type: **talk (15-minute)**

In-class Active Learning Examples

Saturday, October 22, 2022 3:30 PM (15 minutes)

Between 2019-2022, I ran a particle physics research course within UMD's First-year Innovation and Research Experience (FIRE) general education undergraduate program. During this time, I designed and utilized many in-class activities that incorporated active and collaborative learning components. I will share my experiences of a couple of these activities, with the hope of brainstorming for further ideas in this forum.

Primary author: KARAGOZ, Muge

Presenter: KARAGOZ, Muge

Session Classification: Afternoon Session 2A (Chair: Simone Kulin, Zoom Monitor: James Freericks)

Contribution ID: **19** Type: **demo (15-minute)**

STEAM—Teaching Space Weather Studies

Saturday, October 22, 2022 3:00 PM (15 minutes)

1. Introduction

Direct learning approach commonly used by Physics teachers does not really improve student ability to develop self-understanding as well as environment awareness 1. In direct learning, especially used to teach Physics at senior High School, teachers give an explanation about the material, followed by examples of exercises, and end with students working on exercises. However, other learning strategies may hold an important role to improve conceptual understanding. Research-based active-learning instruction in physics involves students in their own learning more deeply and more intensely compared to that with traditional instruction [2]. The methods are very diverse sharing three common features: (1) they are explicitly based on research in the learning and teaching of physics; (2) they incorporate classroom and/or laboratory activities that require all students to express their thinking through speaking, writing, or other actions that go beyond listening and the copying of notes, or execution of prescribed procedures; and (3) they have been tested repeatedly in actual classroom settings and have yielded objective evidence of improved student learning. Simple observational experiments using no special educational technology includes the use only of paper and pencil, yet still engage students in learning activities that are demonstrably more effective than traditional lectures and homework.

A large body of peer-reviewed research indicates that typical learning gains for the majority of students on qualitative, conceptual physics questions, when engaged in "traditional"instructional activities, are around 10–15 percentage points on standard diagnostic exams [3]. This represents the pre-to-post-instruction gain, and corresponds to correcting 20% of incorrect pretest responses). By contrast, research-based active-learning materials and methods produce gains up to and often more than double that amount on similar questions. For example, in a recent study [4], a sample of more than 3000 students from ten universities showed gains from active-learning instructional materials to be more than four times those obtained through standard instruction. The active-learning methods also generally produce gains on traditional, quantitative physics problems that are equivalent or superior to gains observed with traditional instruction.

1. Purpose

The aim of this paper is to explore other teaching modalities that would be more effective for student understanding and match a more diversified learning style.

1. Case Demonstration

Learning style differences have been attributed to student modality strengths (i.e. sensory channels that receive and give messages)—the visual, auditory, and kinesthetic [5]. Last year's presentation "STEM —Teaching Space Weather Studies"matched to a student's auditory learning style is adapted for this year's presentation "STEAM—Teaching Space Weather Studies"which is matched to a visual learning style. Whereas STEM adjoins science, technology, engineering and mathematics and applies academic concepts to hands-on, real-world activities, STEAM uses the same integrated approach but with a nod to arts education that captures visual learning. Last year's auditory presentation was secondarily enhanced by visuals and charts; visuals (i.e. Powerpoint slides) were ordered correctly with respective narrations. In reverse, this case demonstration asks students to match visuals randomly ordered with their corresponding narrations. The primary modality is visual with figures and charts but secondarily enhanced with narrative per auditory modality. Student matching is facilitated with slides having relevant clues embedded that correspond to textual narrations. Reading textual narrations and critically evaluating the observed slides afford students

the opportunity to learn subject matter through concrete experience (i.e. matching slides selected to corresponding narrations) and abstraction. As noted in Guild and Garger (1985), "While every person is able to use both sequential and random ordering, we each have a tendency to prefer and to operate most frequently and most successfully with one kind of ordering"(p.38).

Successful completion of this study module introduces students to the next module that explores space weather beyond Earth's ionosphere and magnetosphere onward to the Moon's exosphere where the upcoming Artemis mission will find formidable with unfiltered risks.

References

1 Kade, A., Degeng, I., & Ali, M. (2019). Effect of jigsaw strategy and learning style to conceptual understanding
on senior high school students. International Journal of Emerging Technologies in Learning (iJET), 14(19).
[2] Meltzer, D. E., & Thornton, R. K. (2012). Resource letter ALIP–1: active-learning instruction in physics. American journal of
physics, 80(6), 478-496.
[3] Hake, R. (1998)..Interactive-engagement versus traditional methods: A six-thousand-student survey of
mechanics test data for introductory physics courses,"Am. J. Phys. 66, 64–74.
[4] Thornton, R., Kuhl, D. Cummings, K., & Marx, J. (2009). Comparing the force and motion conceptual
evaluation and the force concept inventory. Phys. Rev. ST Phys. Educ. Res. 5, 010105]
[5] Guild, P. & Garger, S. (1985). Marching to Different Drummers. Alexandria, VA. Association for Supervision
and Curriculum Development

Primary author: FREEMAN, Ronald (Space Operations and Support Technical Committee AIAA)

Presenter: FREEMAN, Ronald (Space Operations and Support Technical Committee AIAA)

Session Classification: Afternoon Session 2B (Chair: Maria Gordon, Zoom Monitor: Elena Kuchina)

Contribution ID: **20** Type: **talk (15-minute)**

Designing a First-Year Undergraduate Lab Course to Teach Authentic Experimentation Skills

Saturday, October 22, 2022 3:15 PM (15 minutes)

Traditional undergraduate laboratory courses are typically designed to reinforce and verify lecture content and use highly structured experiments to achieve this goal. In recent years, there have been numerous national calls to examine and enhance the student experience in these lab courses. AAPT and APS have recommended that undergraduate lab curricula should develop students'critical thinking and experimentation skills, such as uncertainty and data analysis, modeling, computational proficiencies, and experimental design. At Virginia Tech, we have re-designed the first-year physics lab course to align it with these recommendations by removing verification goals and incorporating more authentic scientific activities. These activities engage students in scientific decision-making and allow students to construct knowledge through empirical investigations. This talk will focus on the curricular design of this lab course –how the coursework, lessons, and assessments help achieve the course's learning goals. In particular, I will discuss how we leverage Mathematica to teach statistical concepts and methods and data analytics.

Primary author: MERRITT, Travis (Virginia Tech)

Presenter: MERRITT, Travis (Virginia Tech)

Session Classification: Afternoon Session 2A (Chair: Simone Kulin, Zoom Monitor: James Freericks)

Contribution ID: **21** Type: **talk (15-minute)**

Imaginary Flights

Saturday, October 22, 2022 3:45 PM (15 minutes)

In this activity, students learn about addition of vectors and relative motion in two dimensions by simulating real flight conditions on an obsolete Flight Navigation Chart. These charts, called "Sectional Charts", are used by pilots to identify landmarks. Students act as "pilots"as they take their airplane from the origin airport to her destination airport, first passively (without correcting for wind), then actively (correcting for wind.) Details of the activity, learning objectives, teacher preparation, tips for a successful project, as well as student "pre-flight"preparation, final project results and learning outcomes will be shared. Extension activity suggestions will be presented as well.

Primary author: CLAIRMONT, Lilian (Appomattox Regional Governor's School)

Presenter: CLAIRMONT, Lilian (Appomattox Regional Governor's School)

Session Classification: Afternoon Session 2B (Chair: Maria Gordon, Zoom Monitor: Elena Kuchina)

Contribution ID: **22** Type: **not specified**

Using math in physics: What's the problem?

Saturday, October 22, 2022 11:00 AM (1 hour)

I often find the students in my intro physics classes have trouble with the math even though they've done well in all the pre-req math classes. It turns out using math in science isn't the same as in a math class. I analyze what's going on and make suggestions for helping them to deal with the differences.

This seminar will be interactive. If you have a smartphone, tablet, or laptop with the Chrome or Firefox browser (Safari doesn't work - sorry) you can log into https://app.tophat.com/e/132795 (choose to log in as guest) and you'll be able to contribute answers to my questions.

Presenter: Prof. REDISH, Edward F. "Joe" (University of Maryland College Park)

Session Classification: Featured Talk 2 (Chair: James Freericks, Zoom Monitor: Maria Gordon)

Contribution ID: **23** Type: **not specified**

The Physics of Star Wars

Saturday, October 22, 2022 10:30 AM (30 minutes)

Since he was young, Prof. Johnson has loved both science and Star Wars. As an adult, he wrote a book that tries to explain different theories as to how scenes and devices in the Star Wars universe work.

Have you ever wondered how the Death Star works? How shields can stop catapults, but droids can walk right through? This talk will offer possible explanations of these scenes and more.

This will be an enjoyable talk for anybody who is a fan of Star Wars, physics, or both. As educators, we always want to make our content in classes as engaging as possible. Star Wars, with its ubiquity in popular culture, offers a great topic to be engaging while also widely understandable by most students.

Presenter: Prof. JOHNSON, Patrick (Georgetown University)

Session Classification: Featured Talk 1 (Chair: James Freericks, Zoom Monitor: Maria Gordon)

Contribution ID: **24** Type: **not specified**

How to survive the first few years as a physics teacher

Saturday, October 22, 2022 1:00 PM (45 minutes)

Panel discussion by high school teachers and administrators.

Presenters: JACKSON, Andrew (Harrisonburg City Public Schools); STERLACE, Jason (James Madison University); DOSS, Kerlin (North Stafford High School); GORDON, Maria; THOMPSON, Michael (Montgomery County Public Schools)

Session Classification: Panel Discussion (Chair: Jason Sterlace, Zoom Monitor: Simone Kulin)