CSAAPT Spring 2021 Virtual Meeting

Chesapeake Section of the
American Association of Physics Teachers
Spring 2021 Virtual Meeting

Report of Contributions

https://indico.phys.vt.edu/e/CSAAPT2021S

Contribution ID: **3** Type: **Pedagogy**

Watching Online Videos Collaboratively

Saturday, April 17, 2021 1:00 PM (20 minutes)

There is a large collection of online educational videos for the learners at all levels. The use of online videos for instruction has skyrocketed in the era of COVID-19. While we depend on instructional videos for teaching and learning, there is evidence that students often do not watch them, or consume them passively, limiting the impact of these videos. It may be possible to improve this situation by encouraging students to watch videos in small groups, and by creating the right collaboration environment.

I have developed an ed-tech tool that allows small groups of students to meet in virtual rooms, where they can watch videos in-sync with shared controls (currently, only from Youtube). The users can also chat via text/video, as well as take notes, all from their web browsers.

While this demo is not specific to physics, the physics instructor community has been a pioneer in education research, and may have valuable feedback for the future development of this tool.

Primary author: Dr ROY, Anindya (Massachusetts Institute of Technology)

Presenter: Dr ROY, Anindya (Massachusetts Institute of Technology)

Session Classification: Presentation Session 4

Track Classification: Pedagogy

Contribution ID: **5** Type: **Program**

REYES: making STEM accessible

Saturday, April 17, 2021 10:30 AM (20 minutes)

The Remote Experience for Young Engineers and Scientists [REYES - https://odu.edu/reyes] is a free global program aimed to increase science literacy, inspire and train the next generation of scientists. This inclusive program, which has close to 8 thousand registrants from over 100 countries, is making science accessible to help diversify the future STEM pipeline. In this talk, I will review the purpose and structure of REYES and explain how you and your students may be able to participate.

Primary author: Prof. BRICENO, Raul (Old Dominion University)

Presenter: Prof. BRICENO, Raul (Old Dominion University)

Session Classification: Presentation Session 2

Track Classification: Program

Contribution ID: **7** Type: **Pedagogy**

Physics Phun with Kahoot

Saturday, April 17, 2021 11:30 AM (30 minutes)

Even after the pandemic ends, some of the technology that we have been exploring for remote instruction will also prove useful in the classroom. I am going to highlight the use of Kahoot, which is like an interactive, graded PowerPoint. I'll go over how and why to use Kahoot, and hopefully include ideas that will also benefit current Kahoot users. In this session, we will use Kahoot to explore 3 physics demonstrations, where you will have to predict or explain what is happening. (I'll also provide information on how to do them yourself later.) This Kahoot will also test your knowledge of practical applications of physics. I encourage you to either download the Kahoot app for your cell phone in advance, or you can take our Kahoot quiz on a different tab on your computer set to "Kahoot.it". We'll keep score, but we'll be using Random names, so you can vote without fear of embarrassment. The 20 question Kahoot quiz will be also available for you to challenge your colleagues or students.

Primary author: Prof. WRIGHT, David (Tidewater Community College)

Presenter: Prof. WRIGHT, David (Tidewater Community College)

Session Classification: Presentation Session 3

Track Classification: Pedagogy

Contribution ID: **8** Type: **Pedagogy**

Water Oscillations in a U-Tube

Saturday, April 17, 2021 11:00 AM (30 minutes)

A U-tube or manometer consists of two vertical pipes connected at their bottom ends by another pipe. Fluid (say water) partly fills the manometer, sufficiently below the tops of the pipes that it does not spill out when it is set into oscillations. Assume the flow is laminar; in reality that requires the connection not be a single horizontal pipe because that would generate eddy swirls at the corners as the flow suddenly shifts from vertical to horizontal motion. Either one can ignore those swirls (by assuming the flow speed is small enough to minimize turbulence) or, better, one can make the connection via a smoothly varying arc-shaped pipe. Make all the other usual simplifying assumptions that the fluid is incompressible, irrotational, and inviscid. Further neglect air drag, so there is no mechanism to damp the oscillations of the fluid.

To set the fluid into oscillation, one can insert a piston into one vertical pipe, push the water down some distance, and then rapidly yank the piston out of that pipe. The problem is then: Under what circumstances are the fluid oscillations described by simple harmonic motion? For example, must the initial displacement by the piston (which equals the amplitude of the motion) be small? Clearly we need to model the physics to explore that question. What would be the best approach? For example, can one apply the standard Bernoulli equation?

So far you have probably assumed the cross-sectional area of the pipes (both the vertical ones and the one making the bottom connection, be it horizontal or arc-shaped) is constant, since I didn't say anything otherwise. But what happens if that is not the case? For example, the U-tube might be tapered from one top end around to the other top end.

Surprisingly (to me at least) even simple non-uniform cross-sectional variations do not appear to be amenable to analytic solution. I will first discuss the case of constant cross-section, which is analytically soluble; however I will show a serious error in previous treatments of this case in journals such as The Physics Teacher. I will then present an example of numerical calculations using Mathematica for a tapered tube. I will then end by briefly describing some interesting applications of such non-uniform cross-sections.

Primary author: Prof. MUNGAN, Carl (U.S. Naval Academy)

Presenter: Prof. MUNGAN, Carl (U.S. Naval Academy)

Session Classification: Presentation Session 3

Track Classification: Pedagogy

Contribution ID: **9** Type: **Pedagogy**

Being an Experimentalist During COVID-19

Saturday, April 17, 2021 8:40 AM (20 minutes)

Social distancing has created significant challenges for teachers offering lab courses and students taking lab courses. This talk will highlight obstacles, attempted solutions, and unforeseen opportunities brought on by the COVID-19 pandemic at Randolph-Macon College.

Primary author: Prof. WOOLARD, Deonna (Randolph-Macon College)

Presenter: Prof. WOOLARD, Deonna (Randolph-Macon College)

Session Classification: Presentation Session 1

Track Classification: Pedagogy

Contribution ID: **10** Type: **Demo**

Kitchen Cabinet Demonstrations

Are you looking for engaging physics demonstrations that you can do with household items that you probably already have in your kitchen cabinets? Would you like to make your demos more interactive? Participants in this workshop will be introduced to interactive demonstrations that will fit well into both in-person and remote instruction. Best of all, your students will be able to reproduce these demos at home!

Primary author: ROBINSON, Alma (Virginia Tech)

Presenter: ROBINSON, Alma (Virginia Tech)

Session Classification: Presentation Session 5

Track Classification: Demo

Contribution ID: **11** Type: **Program**

The Radford University Society of Physics Students (SPS) Physics Outreach Program

Saturday, April 17, 2021 2:50 PM (20 minutes)

In late 2019, the Radford University Society of Physics club received a Marsh White Award from the National Society of Physics Students to fund a physics outreach effort for local middle and high schools. While the outreach program was proposed pre-covid to be in person, it was delayed a semester and then shifted towards remote sessions with the club members interacting and guiding participants via Zoom. The goal of this outreach is to promote and increase attention towards STEM related fields such as physics. The outreach events revolved around teaching high school students basic circuitry by building a simple unpowered radio. The parts were given to the high schoolers so that they could keep their radios after the events. The SPS hosted two (so far) outreach opportunities with high schools in the area near Radford University. The two outreach events will be discussed, and we will share the lessons learned from these events as our group continues our outreach work.

Primary authors: WILLIAMS, Samuel (Radford University Student); REITZ, Sami (Radford University Student); BRANDON, Hunter (Radford University Student); BROWN, Megan (Radford University Student); CHATTING, Mckenzie (Radford University Student); FISCHER, Caitlynn (Radford University Student); HALFERTY, Jonathan (Radford University Student); MARTIN, Kaleb (Radford University Student); MUTHALALY, Anith (Radford University Student); NELSON, Andy (Radford University Student); SOURIVONG, Krislyn (Radford University Student)

Presenters: WILLIAMS, Samuel (Radford University Student); REITZ, Sami (Radford University Student); BRANDON, Hunter (Radford University Student); BROWN, Megan (Radford University Student); CHATTING, Mckenzie (Radford University Student); FISCHER, Caitlynn (Radford University Student); HALFERTY, Jonathan (Radford University Student); MARTIN, Kaleb (Radford University Student); MUTHALALY, Anith (Radford University Student); NELSON, Andy (Radford University Student); SOURIVONG, Krislyn (Radford University Student)

Session Classification: Presentation Session 5

Track Classification: Program

Contribution ID: **12** Type: **Pedagogy**

Bringing the physics back into the junior-senior undergraduate quantum mechanics course

Saturday, April 17, 2021 9:50 AM (20 minutes)

Quantum mechanics instruction has remained relatively unchanged for at least 75 years, following a coordinate-space-based formalism that requires significant class time for instruction on the mathematical background for the Frobenius method, delta functions, Fourier transforms, and the like. This mathematics instruction greatly limits the amount of physics that can be included. In this talk, I will tell you how to reverse this trend. In Fall 2020, I taught a one-semester junior-level quantum mechanics course at Georgetown University that worked within a representation independent formalism (emphasizing operators, not wavefunctions). It is mathematically much simpler and frees up significant time for discussing conceptual ideas and physical ideas. I was able to discuss important experiments in detail such as Stern-Gerlach, delayed choice, EPR, Bell inequality tests, Hong-Ou-Mandel, Pickering-Fowler lines, discovery of deuterium, proton radius, electron momentum spectroscopy, time of flight, hyperfine interactions and radio astronomy, cyclotron resonance and MRI, single-photon detection, homodyne detection, and how squeezing is employed to improve LIGO. Come to the presentation and see how you can adopt such a framework for your class as well.
Funding: National Science Foundation Grant Number PHY-1915130 and McDevitt Bequest at Georgetown

Primary author: Prof. FREERICKS, James (Georgetown University)

Presenter: Prof. FREERICKS, James (Georgetown University)

Session Classification: Presentation Session 2

Track Classification: Pedagogy

Contribution ID: **13** Type: **Pedagogy**

Sky and Telescope for Introductory Astronomy

Saturday, April 17, 2021 2:10 PM (20 minutes)

I will present strategies and tools for implementing two types of observing activities in an introductory level astronomy course that meets during the day:
(1) a structured naked eye sunset and Moon phases observing project
(2) lab activities centered on data collection using remotely accessed telescopes
The activity described in (1) is commonly assigned in introductory astronomy, with the goal of students developing an understanding of the connections between motions of celestial objects and patterns observed in the sky from Earth. A critical component of the structure presented here is an associated scoring script. The algorithm uses Sun and Moon position data and Moon phase data downloaded by the user from the United States Naval Observatory to score student input and provide feedback in an efficient manner. This scalable method allows instructors to assign and grade student observations in a large university class. Lab activities described in part (2) make use of the Skynet robotic telescope network, which allows students to obtain and analyze real telescope data to investigate concepts such as Standard Candles, Rotation Curves, and Hubble's Law.

Primary author: Dr SCOTT, Jennifer (Towson University)

Co-author: Mr AUBURGER, Robert (Towson University)

Presenter: Dr SCOTT, Jennifer (Towson University)

Session Classification: Presentation Session 5

Track Classification: Pedagogy

Contribution ID: **14** Type: **Pedagogy**

Entropy - What's in a Meaning

Saturday, April 17, 2021 1:20 PM (20 minutes)

The term "entropy"has created much controversy over the past hundred years on it's interpretation, or miss-interpretation. In a book by Dr. Ariah Ben-Naim (Hebrew University, entitled "Entropy and the Second Law", the author attempts to explain the meaning of entropy, to guide readers in its understanding, and to show how it relates to Shannon's Measure of Information, of Uncertainty, and to the Second Law of Thermodynamics. In this talk I want to share some of the ideas presented in this book in order to remove any speculative interpretations of the term "entropy".

Primary author: Dr OCHAB, JR., John S. (Reynolds Community College)

Presenter: Dr OCHAB, JR., John S. (Reynolds Community College)

Session Classification: Presentation Session 4

Track Classification: Pedagogy

Contribution ID: **15** Type: **Pedagogy**

Examples of Collaborative Tools Used During Remote-Learning

Saturday, April 17, 2021 10:10 AM (20 minutes)

In this presentation, I will first give a brief introduction to my research stream which concentrates on particle physics within UMD's First-Year Innovation & Research Experience (FIRE) program. I will, then, highlight two of the collaborative online tools I have used during the pandemic virtual-learning as part of my synchronous meetings. I have used these tools both for community building as well as research activites. I will give a couple of examples from Google's Jamboard interactive whiteboard, as well as one example from Mentimeter online collaboration tool, and share my experiences using such tools.

Primary author: Prof. KARAGOZ, Muge (University of Maryland College Park)

Presenter: Prof. KARAGOZ, Muge (University of Maryland College Park)

Session Classification: Presentation Session 2

Track Classification: Pedagogy

Contribution ID: **16** Type: **Demo**

Physics.land pedagogy and demo

Saturday, April 17, 2021 9:20 AM (20 minutes)

Have you heard students say they understand the physics concepts, but they cannot do the math? Is the TI-calculator still your sidekick in the classrooms?

Imagine an alternative where students breeze through the math and spend more time focusing on the concepts. With the new generations of learners in mind, Physics.land provides a modern tool to perform physics computations, tailored to their learning styles. Once students learn how to dissect a problem, they simply pick the associating module(s) in the tool to instantly obtain accurate numerical results. Students will also see detailed steps and explanations; visual representations of the solutions; sig. figs. and unit conversions done automatically. The main concepts and the big pictures are laid bare in front of them.

In this session, the creator of Physics.land will walk you through the tool. You will understand how users contribute to the training of artificial neural networks (ANN) behind-the-scene to ultimately learn to solve physics problems with AI. You will uncover why and how Physics.land might just be the right model for your generations of STEM learners!

Try out: https://physics.land
More info: https://physicsland.github.io/

Primary author: Dr LO, Edwin (Loyola University Maryland)

Presenter: Dr LO, Edwin (Loyola University Maryland)

Session Classification: Presentation Session 1

Track Classification: Pedagogy

Contribution ID: **17** Type: **Demo**

Wave-Particle Duality and Interference

Saturday, April 17, 2021 1:40 PM (20 minutes)

We can see how interferometers can be used to see both waves and particle behavior in the same experiment and learn connections to quantum computing.

Primary author: Ms MURDOCK, Maajida (Morgan State University)

Presenter: Ms MURDOCK, Maajida (Morgan State University)

Session Classification: Presentation Session 4

Track Classification: Pedagogy

Contribution ID: **18** Type: **Demo**

Using iOLab for physics lab

Saturday, April 17, 2021 9:00 AM (20 minutes)

During the last summer, as it became apparent that DCC would be going virtual for all science classes due to the pandemic, I looked for solutions where students can get some hands-on experience in performing physics lab experiments and data analysis which are meaningful, easy to perform and does not require students to look for many different items. Having attended a talk on iOLab during one of the AAPT Summer meetings a few years ago, I ordered the iOLab device during the summer from Macmillan. After playing with it for 2-3 weeks, I felt it could be a good device for students since it can perform a number of experiments in mechanics, electricity and magnetism. I have used the device for both algebra-based and calculus-based physics classes. In this talk I will demonstrate the basic features of iOLab and share student experiences with the device.

Primary author: Prof. CHHAJER, Mukesh (Danville Community College)

Presenter: Prof. CHHAJER, Mukesh (Danville Community College)

Session Classification: Presentation Session 1

Track Classification: Demo

Contribution ID: **19** Type: **not specified**

Share-a-thon

Saturday, April 17, 2021 3:20 PM (40 minutes)

Please join one of the following Zoom break-out rooms to share your ideas and opinions on the respective topic:

1. Ideas for Cool Classroom Demonstrations
2. Ideas for improving the quality of student research/science fair projects
3. Ideas for improving Introductory Physics Labs
4. Ideas for introducing various "flavors" into the physics curriculum : Computational Physics/Programming in Physics/Engineering Physics, etc.
5. Anything else that you would like to discuss

Session Classification: Discussion Session

Contribution ID: **20** Type: **not specified**

"What can the CSAAPT do for you?" Meeting

Saturday, April 17, 2021 4:00 PM (30 minutes)

Please tell us what the CSAAPT can provide to assist in your teaching, e.g.

1. Talks by Physics Education research experts at the CSAAPT meetings
2. Talks by various experts working on the frontiers of physics and astronomy (e.g. LIGO, space telescope, LHC, etc.) with emphasis on how to explain the research to high school students
3. More talks about physics courses/programs that were successful at various institutions
4. Can I get help in meeting the NGSS (Next Generation Science Standard) and other standards?
5. Tutorials/workshops for various software and tools (e.g LaTeX, Overleaf, Mathematica, Glowscript, etc.) that would be useful for teaching
6. Tell me more about the availability of physics outreach programs, astronomical observatories with open houses, planetariums, etc. in my area where I can take my students to
7. etc.

Session Classification: Discussion Session

Contribution ID: **21** Type: **not specified**

Lunch Break-out Session

Saturday, April 17, 2021 12:00 PM (1 hour)

You can step away from Zoom to go have your lunch in the privacy of your own kitchen, or stay online and socialize with your fellow attendees while having your lunch.

We will have five breakout rooms open where you can meet and chat with your peers :

1. for Middle and High School Teachers
2. for Instructors at 2-year colleges
3. for Instructors at 4-year colleges
4. for Undergraduate and Graduate Students
5. Free for all

Session Classification: Lunch Break-out Session

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

Post-Meeting Social in Zoom Break-out Rooms & CSAAPT Business Meeting

Saturday, April 17, 2021 4:40 PM (50 minutes)

We will have the following Zoom Break-out Rooms where you can socialize with other attendees:

1. for Middle and High School Teachers
2. for Instructors at 2-year colleges
3. for Instructors at 4-year colleges
4. for Undergraduate and Graduate Students
5. Free for all
6. CSAAPT Business Meeting

Room #6 is for the CSAAPT business meeting. CSAAPT members, please gather here.

Session Classification: Post-Meeting Social & CSAAPT Business Meeting

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

Welcome from the CSAAPT President

Saturday, April 17, 2021 8:30 AM (10 minutes)

Presenter: STERLACE, Jason (James Madison University)

Session Classification: Welcome

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

Closing statements form the CSAAPT President

Saturday, April 17, 2021 4:30 PM (10 minutes)

Presenter: STERLACE, Jason (James Madison University)

Session Classification: Closing Statements

Contribution ID: **25** Type: **Pedagogy**

How can we prevent students from searching for homework solutions on the web?

Saturday, April 17, 2021 2:30 PM (20 minutes)

Many students waste their time and energy searching for solutions to homework problems on the web, or they resort to paying Chegg and other tutoring services to solve the homework problems for them.

How can we prevent this? In this talk, I will discuss the strategies I have been implementing at Virginia Tech.

Primary author: Prof. TAKEUCHI, Tatsu (Virginia Tech Department of Physics)

Presenter: Prof. TAKEUCHI, Tatsu (Virginia Tech Department of Physics)

Session Classification: Presentation Session 5

Track Classification: Pedagogy