E-mails between ASP 2022 Lecturers Responding to Request for Comments on Teacher and Learner Programs, December 2022

Dear Uli and Ken:

Thank you!

This is very interesting, I think through this activity, students will have an opportunity to learn how to build, program and operate the virtual world.

Happy Holidays and New Year 2023!

Mounia

(Mounia Lassiri, University of Helsinki)

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Hi Mounia,
This is just to tell you that I already have an ultrasonic distance meter working with the small IoT kit I used during the IoT workshop.
https://afnog.iotworkshop.africa/do/view/IoT_Course_English/VirtualWorld
In fact I have two devices:

- the ultrasonic distance sensor
- a color sensor

The final project consists of a "virtual world" program written in VPython and running on the PC. This shows a model of the real setup consisting of the micro-controller, the back-plane bus and the color sensor and distance sensor.
When you insert a colored paper sheet in front of the sensors, this sheet (the white plane in the virtual world screen dump) will pop up with the correct color in the virtual world. When you move the colored paper this will also be reflected in the virtual world. When you remove the paper this will also be seen in the virtual world.
The communication between the micro-controller program, responsible for determination of paper color and distance and the virtual world program, happens through WiFi.

I wish you a merry Christmas and all the best for the new year
Uli
(Ulrich Raich, CERN-retired)

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Dear Ken,
Dear all:

Thank you for giving me this opportunity to be part of the ASP High School Learners program.

I totally agree with Mary and Uli that an explanation of the data supplied on the particle cards would be helpful, you could introduce this activity by initiating a discussion of "fundamental" things, asking students to suggest how the term "fundamental" might apply to physics. This can lead into a discussion of

fundamental particles and forces and also add agree/disagree quiz in this activity to spark students' interest in learning more about this field, by revealing recently discovered facts that they may find surprising.

Rutherford's activity was very fun. I think it would be useful to describe and give examples of random and systematic errors, distinguish between precision and accuracy, explain how the effects of random errors may be reduced and determine the uncertainties in results.

Suggestions for the future of the ASP Learner Programs:

The physics education in High Schools in Morocco is focused only on theory (if you will address the public schools). It will be great to tell them about how physics works, starting from developing an idea, drawing first experimental sketches on the whiteboard and building a first setup based on simple components such as:

- Light diffraction kit, to visualize the diffraction phenomena and to calculate the wavelength of the monochromatic light.
- Kit for calculating the sound speed in air using an ultrasonic sensor (transmitter and receiver), an obstacle and an acquisition card such as ARDUINO.
- "Let's make fun with physics: Sun, light and colored shadows", this will aim at discovering the concepts of light and colors through different experiments.
- …

ASP2022 Learners in South Africa (Link to pictures).

Happy Holidays and New Year 2023!

Mounia

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Hi Ken,

I loved the learners program and particularly the learning with Rutherford activity. I think it all went really well! I have a few comments/suggestions:

1. It may be good before the playing card exercise to just explain what the numbers on the cards are and the units. Especially with younger learners who may or may not be familiar with scientific notation or concepts like lifetime. We had learners as young as 9th grade. Also a reminder to note to students that the positron is anti-electron before the start. I also found that it was useful to let them know they can have multiple groupings – that it doesn't have to be all one group.
2. The CERN video was a little bit too much for the younger learners… it didn't have a lot of pictures showing things to scale – like how big the detectors are for example compared to humans.
3. I don't know if it would be useful to come up with some analogy of how detectors work and how big they are using cell phones – for example the CMS tracker is the equivalent of xxx cell phones stacked several meters in diameter and several meters long..

4. We didn't have enough time, but the first day when the cosmic ray tracker was part of the activity it was very popular. Maybe not have it optional but a planned activity for all. If you could have several cosmic setups in future, then more learners could participate actively.

And thank you and Shane ever so much for all the hard work and amazing activities. It was truly a pleasure.

Cheers,

(Mary Bishai, Brookhaven National Laboratory)

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Hello Ken,

Thanks a lot for your email. It was a wonderful journey and a good experience. Overall, everything looks good to me.
If there is something we can improve, maybe it's when we make the students collide to mimic the collision at the LHC. For instance, instead of using one by one person, we can use three by three to emphasize the partons model of the protons. And then let them know that we can also have gluon gluon collisions (They already saw gluon from the cards). This is just to make sure that curious students won't be surprised if they want to know more about this on the internet.

Best,

Diallo
(Diallo Boye, Brookhaven National Laboratory)