Vicphysics Webinar: Resources that were mentioned during the discussion

Many of these resources can be found on the webpages of the Vicphysics website. There are also similar resources also on these pages that are worth checking out.

The **Apps and Applets webpage**, https://www.vicphysics.org/appsandapplets/ has many of the resources mentioned at the webinar including:

Applets

- **Walter Fendt applets.** A link to his full collection of waves (9), optics (6), electrodynamics (13), thermodynamics (1), mechanics (18), relativity (1), atomic physics (3) and nuclear physics (2) Applets on specific topics such as wave interference can be found on the webpage for the relevant Area of Study. Walter Fendt's applets are very well designed and useful for senior physics.
- **PhET - Physics Education Technology** These applets are based on research on how students learn. They are highly recommended. Support materials are also available.
- **Wolfram Demonstrations:** Wolfram Demonstrations Project brings computational exploration to a wide range of subjects and audiences. It is an open-code resource that uses dynamic computation to explore and demonstrate aspects of science, technology, mathematics, art, finance, etc. The physics section covers all the main areas and the demonstrations range from secondary up to high level tertiary, with hundreds on offer. Ones that are specifically useful to various VCE topics can be more easily accessed by going to the webpage for that Area of Study, e.g. Waves and Light for ones on interference, etc.
- The Applets section of this webpage also has links to 12 collections of applets including oPhysics, **The Physics Classroom**, NTNU and several US university sites.

Apps

- **PhyPhox - The Physics lab on a Phone** . and is listed under 'Phone Apps' PhyPhox is a website dedicated to experiments that can be done with a mobile phone, with many being free. PhyPhox is an initiative of Aachen University in Germany, the website has an English version. There are monthly newsletters going back to 2016 as well as a Forum that has many contributions on experiments, etc.
- **The Physics Toolbox** is also under 'Phone Apps' The Physics Toolbox website provides free and low cost data analysis tools to 'harness the power of mobile sensors and enhance science education'. Their website is well designed with tutorials, apps for Android and iOS, as well as Lessons. Their apps use 16 different sensors.
- **Winscope** is an old oscilloscope app that is still available and is listed under 'Oscilloscope Apps' along with eight others.
- There is also a table of other apps with costs and descriptions.

Conceptual Understanding Procedures (CUPs)

CUPs is a set of teaching procedures for physics developed by Monash University. They are designed to aid the development of understanding of concepts that students find difficult. There are 12 activities: 10 on Forces, Energy and Motion, and 2 on Electricity.

There is an article on our 'Misconceptions' webpage, https://www.vicphysics.org/misconceptions.html , by Dr Pam Mulhall from Monash University about using CUPs in the teaching of Motion. The links to CUPs material is also on this webpage or you can go direct to the Monash link at http://monash.edu/science-education/2015/resources/conceptual-understanding-procedure/ The 'Misconceptions' webpage has an extensive range of resources covering most physics topics.

Bouncing basketball analysis

- Measuring heights. The drop and rebound heights are easier to measure from the bottom of the ball against a vertical ruler or tape measure. So the dimensions of the ball don't need to be used. Also, for the drop height, as a static measurement, the bottom of the ball can be lined up with mm markings on the ruler.
- Measuring impact time. An IEC electronic timer is accurate to a millisecond or less. One terminal is connected to a length of very fine enamelled Cu wire, with the other end sanded. The sanded end is taped to a small square of alfoil which has been taped to the bottom of the ball. The other terminal is connected to a large square of alfoil on the floor by an alligator clip.
- The impact time is independent of drop height for most objects. A theoretical investigation of this result is included in a presentation at the 2020 Physics Teachers' Conference. Check Conference Proceedings for session A10 at https://www.vicphysics.org/conf2020.html

Video Analysis with Live Photo Physics - https://www.rit.edu/cos/livephoto/

Live Photo Physics is a collection of videos that are ideal for analysis. The collection covers most areas of physics, but mainly Mechanics. They can be used by Tracker, Vernier and Pasco.

Core questions for students when using their log book from Rachael Gore

- What did you do?
- Why did you do it?
- What did you find?
- Why did you find it?

Questions for students to consider each day as they record their work in the log book.

Practical Investigations: Tips

A useful Youtube video for students on error bars is https://www.youtube.com/watch?v=261yk7HsU-U It is now on the **Students** page for 'Practical Investigations' https://www.vicphysics.org/practical-investigations/ where are a few videos on data analysis along with other resources for students such as topic lists, poster templates and poster hints.