

MORE A BRICOLAGE THAN A WAR

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THEME:

Innovative STEM pedagogy and curriculum

BACKGROUND AND OBJECTIVES

In this practical workshop we will build key circuits for the measurement of data, develop calibrations for scratch-built sensors and realise an implementation that may be used to determine the sugar content of soft drinks.

Debates surrounding concerns for ideal pathways for the development of learning opportunities have placed explicit approaches in counterpoint to inquiry processes (Cobern et al., 2010). This workshop chooses an intentional approach that is sensitive to narrative trajectories of learning. We will look at the opportunities that modelling, simulation and computation offer intentional approaches to the design of learning opportunities to allow explicit approaches and inquiry processes to work together in education, in a context of discipline informed, practitioner-oriented engagement.

We will explore how the experience with the design, building and implementation of instrumentation may provoke learners to rethink and reimagine instrumentation, experimental protocols, data wrangling and conclusion crafting. We will explore apparent boundaries between explicit/ inquiry approaches, theoretical/ applied learning and between the disciplines themselves by playing with an assembly approach to learning opportunities as an attempt to replace the dichotomies with continuums of practice.

The workshop will utilise SystemModeler, Mathematica (Hastings et al., 2020) Raspberry Pi microcomputer, Arduino microcontroller and simple scratch-built sensors and actuators to build a polarimeter that may be used to investigate the sugar content of soft drinks. SystemModeler will be used as a conduit for processor inputs and outputs, such that the logic of the polarimeter system may be visualised. Mathematica will be used to determine a calibration for the polarimeter system.

STRUCTURE OF THE SESSION

This workshop will have broad application for teachers working with learners from years 5/ 6 through to year 12 [matriculation].

This is a practical workshop that assumes no prior engagement with the technologies and processes being investigated.

IMPLICATIONS

An exploration of how the experience with the design, building and implementation of instrumentation may provoke participants in a learning environment to rethink and reimagine instrumentation, experimental protocols, data wrangling and conclusion crafting.

An exploration of the apparent boundaries between explicit/ inquiry approaches, theoretical/ applied learning and the between the disciplines themselves by playing with an assembly approach to learning opportunities as an attempt to replace the dichotomies with continuums of practice.

REFERENCES

Coburn, W. W., et. al. (2010). Experimental comparison of inquiry and direct instruction in science. *Research in Science & Technological Education*, 28(1), 81-96.

Hastings, C., Mischo, K., & Morrison, M. (2020). *Hands-on start to Wolfram Mathematica: and programming with the Wolfram language*. Wolfram Media.