





National Workshop 7









From Learning Outcomes to Classroom Activities: example: LO 1.9 3.8 3.9 3.10



Learning Outcome 3.8 -> 1.9, 1.10

- "Develop a model that will allow different scenarios to be tested"

- Choose a problem / scenario which doesn't lend itself to a straight-forward mathematical solution

George Box: "All models are wrong, but some are useful"



CompinSor - ALT3

Today

Develop appreciation of models / different types of models

Modelling / Simulation in our context

Analysing models (Problem – *Everything is a model* !!!!!)

(...leading to Investigating / Planning - after lunch - Sinéad)

Types of Models



Model – Representation of a person / thing / structure. (Min. / Abstract) Simulation – Using the model...

3 types:

Physical Models: prototypes / engineering / constructions / human models

Schematic Models: diagram or graph / network / GPS / maps

Mathematical Models: represent situations in Mathematical language / algebra / leads to algorithms, coding.

Physical Models















Schematic Models











Mathematical Models



Mathematical language / algebra / leads to formulae, algorithms, coding...

Example: Trigonometry – 2nd year class – get height of spire in Killiney Church



١.

Model / Simulation Video



https://www.youtube.com/watch?v=M0iZ52kUOiQ



Assessing Models

Specification:

3.8. develop a model that will allow different scenarios to be tested

...difficult to solve analytically

...analyse relationships, patterns

George Box – "All Models are **wrong** but some are **useful**"

Assessing Models - Mentimeter



Rough plan and analysis of models for 2 tax situations for Penny and Freda:

- 1. <u>Penny</u>: *PAYE* develop an outline model for tax due for a PAYE employee for example a full-time teacher.
- 2. <u>Freda</u>: Develop a model for a *free-lance* musician, who teaches some classes, private tuition, does some gigs, especially in the summer. (She doesn't have up-to-date accounts)

Give a very brief plan of the two models. Analyse the 2 models and give an opinion as to which is the most useful for our purposes.

Mentimeter 85012

Assessing Models – General (chat)



George Box – "All Models are wrong but some are useful"

Features / Characteristics:

Generalise on features / characteristics which are evident in models useful for ALT3 in chat....

Assessing Models



George Box – "All Models are wrong but some are useful"

Features / Characteristics:

Future

Forecasting / Predicting

Messy

Real-life

Not easily solved by other means



https://www.ted.com/talks/michael_bierut_the_genius_of_the_london_tube_map/trans cript?language=en



The Tube









Tube

Use the London Underground map. Find shortest route between 2 stations in one of the following ways:

- a) Using a visual / graphical solution only.
- b) Using a numerical / analytical solution only.
- c) Using a mixed graphical / analytical only.
- d) Extending the problem to allow multiple starting stations ('London Bridge' Shard)

Activities ?

Success Criteria ?



Shard – London Bridge









Classroom Visits – in one period? How to approach this problem?





Other Models

Teachers / Students to consider other models...

Brainstorming...

Are they useful?

Do they solve problems, that can't otherwise be solved.

Which scenario? Tax , Lotto numbers, Football crowds / stewards (all-ticket), Stock prices, Predator prey, Social class mobility.





4 buildings in a factory plant – with a problem with mice.

Various different features of the model: Some rooms allow extra mice in. Cat is more efficient at catching mice in some of the rooms rather than others. Cat is randomly placed in one of the rooms for 2 hours at a time. Some of the numbers change by %, by addition, or through a random function.

The code is here – it runs 3 simulations: https://docs.google.com/document/d/1SdcQMoVCu7dL2FQrLC7iisKn-





Carrick Population

Prepare a model for the increase and decrease in population of Carrick year-by-year (Births / Deaths / People leaving)

Given the following details: Births: 3% of the population per year Deaths 2% of the population per year

https://docs.google.com/document/d/1mQRQYjq_BVPQ36y2A88O8MHMi YLJPk8dV9GidUCU6JA/edit?usp=sharing

((And you may extend the problem:

People leaving: 3 equally likely scenarios depending on Economic factors:

- 1. 100 net people coming in.
- 2. 50 net people coming in.
- 3. 200 net people leaving.))



Discussion







Exploring Group Work Research

Groupwork – Implementations in Classroom



Implementing Group Work in the Classroom:

<u>https://uwaterloo.ca/centre-for-teaching-excellence/teaching-resources/teaching-tips/alternatives-lecturing/group-work/implementing-group-work-classroom</u>

Group Work articles:

https://drive.google.com/file/d/11kLjGUqF6pQDQoodGairerd1bJHzGqQE/view?usp=sharing







Discussion

