Barbie Bungee Jumping, Technology and the Contextualised Learning of Mathematics

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Ice-breaker

Count to 10
Outline of Presentation

1. Ice Breaker
2. Context
   1. Curriculum Change
   2. Bridge21
3. Warm-up!
4. A “How-to” guide
5. A Sample Activity
CONTEXT
Curriculum Change

• 21st Century Learning:
  
• Project Maths:
  
  – Increase *understanding*, *problem-solving* ability and *engagement*
  
  – Emphasis on problems set in *context*
  
  – Focus on *constructivist* learning
  
  – Encourage the meaningful use of *technology*
Promising, but not easy...

“Students need to be regularly given high quality tasks that require them to engage with the processes promoted by the revised syllabuses”

the Bridge21 Approach
Bridge21 Activity Model

- **Set-Up**: Ice breaker and teams
- **Warm Up**: Divergent thinking activity
- **Investigate**: Explanation of the problem context.
- **Plan**: Group planning.
- **Create**: Exploration with resources.
  - In the field.
  - In the classroom.
- **Create**: Modelling and Calculation:
  - Analysis and Synthesis.
- **Present**: Competition and/or Presentations.
- **Reflect**: Reflection and Discussion.
WARM UP

• Form groups of 3 – 4

• Work together to try to solve following problem

• You have 5 minutes!
Warm Up!

Someone has written a sentence containing only five words, the mean number of letters in each word is 4, but none of the words has four letters. What might the sentence have been?
Countdown!
Solutions?

• The cow is above gravity!
• I do not get mathematics!
• An ode to mathematical $\pi$. 
A “HOW TO” GUIDE
Activity Attributes

– Collaborative and team-based
– Problem-solving
– Meaningful context: interesting, immersive, real
– Various technologies
  • Transformative
  • Computational
– Assessment potential
– Open-ended
– Low-floor, high-ceiling
– Bridge 21 Activity Model
The Beginning...

- Begin with an **interesting problem** (I can’t do that bit for you)!

- Situate the problem in a **realistic/meaningful context**.

- If possible, provide a related question in the divergent thinking session.
Activity Development Process

The Middle...

- Have a **roadmap** for guiding the students - a set of steps that the students must be guided through. However, this should not be too prescriptive. It is an **open-ended** approach.

- Provide all the resources that the students will require, with **extras**, but let them try to figure out what they will need.

- Let them think! Use **Socratic questioning** for guidance when possible.

- Use team-lead meetings for guidance and **peer-learning**.
Activity Development Process

The End...

- Allow for different trajectories and answers. However, all approaches and results must be justified.

- Finally, present and compare results, and discuss approaches.
SAMPLE ACTIVITIES
Some activities

The Human Catapult

Scale Activity

Barbie Bungee

Photo
The Barbie Bungee

**Challenge:**
Using a doll, rubber bands, and some free software, calculate how many bands it would take to give Barbie an exhilarating, but safe jump from a height?

**Mathematics:** Collecting, representing and analysis of data, correlation, line of best fit, extrapolation.

http://illuminations.nctm.org/Lesson.aspx?id=2157
Barbie Bungee Video

• Removed due to size.
Challenge:

Using a cork board, thumb tacks, a template and marbles, can you build an accurate Galton Board? Use your board to design a game (rules and scoring system) for a casino.

Mathematics: Patterns, Pascal’s Triangle, probability, Bias.
The Steps

1. Build a board
2. Excel & Tracker
3. Simulation
4. Design a Game

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The Human Catapult

Challenge:
Using a catapult, a video camera and some free software, how accurately can you model the motion of a projectile?

Mathematics: linear and quadratic functions, angles, rates of change and initial velocity
Catapult - Modelling

Tracker

GeoGebra

WolframAlpha

PhET Simulation
Catapult Video

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Brainstorm!!

• Interesting problems?
That’s all folks!

Thank you!
Free Software

- GeoGebra (www.geogebra.org)
- Tracker (www.cabrillo.edu/~dbrown/tracker)
- Kinovea (www.kinovea.org)
- WolframAlpha (www.wolframalpha.com)
- Simulations (phet.colorado.edu)
- Spreadsheets etc. (www.openoffice.org)
- …
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