Engineering students’ problem solving using the digital tool Sim2Bil
Introduction

• Mathematics education for engineering students
• Technology brings in new ways of modelling and visualizing mathematics
• Technology-supported collaborative work
Explorative study

- Digital visualization tool Sim2Bil
- Mathematical tasks
- Investigate students’ problem solving
Theoretical framework

- The analysis will follow a socio-cultural perspective

Lev Vygotsky

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Sim2Bil

Determine other mathematical expressions for v1 and v2, so that the cars run with different velocities, and arrive at the finish line at the same time.
Research Questions

• How can Sim2Bil engage engineering student while working with mathematics?
  • How do engineering students use visualizations to communicate about representations and applications using Sim2Bil?
  • To what extent can Sim2Bil be used for group work in learning environments, in which students work remotely from each other (synchronously and asynchronously)
  • ........
Methods

• Small-scaled controlled environment (outside normal lectures)

• Participants:
  – Groups of engineering students (1st year)
  – Unfamiliar to Sim2Bil
Tasks

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c) What can you do to make the green car be only half way when the red car reaches the finish line?
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d) Find the velocities of the green and the red car (v1 and v2), so that v2 is half of v1 when they reach the finish line simultaneously at 4 sec. Can you prove that your answer is correct?
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Video analysis

...we can use t in third and t in first
A few Findings

• 1. Gestured to understand the task
  – Mediated how the cars would run

• 2. Visualized areas on paper
  – Mediated thoughts to peers
A few Findings

• Found 5 velocity functions:

- 1b) \[ v_1 = 6,25t^3 \]
  \[ v_2 = 18,75t^2 \]

- 1c) \[ v_1 = 3,125t^3 \]
  \[ v_2 = 18,75t^2 \]

- 1d) \[ v_1 = 100 \]
  \[ v_2 = -25t + 150 \]
Final remarks

• **Visualizations** are a great support to many learners
• **Visualizations** require certain media

• **Simulations** require “experimental space”

• **Modelling** may give more meaning to the learning and teaching
• How should we introduce modelling practices to students?

• **Technology** brings new ways of teaching and learning mathematics
Thank you!