Innovative ICT-based teaching materials in mathematics and science

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Introduction

FaSMed

Raising Achievement through Formative Assessment in Science and Mathematics Education

Examining use of technology in formative assessment (FA) practices in mathematics and science teaching.
Research question

We pose the following question:

Which factors promote or impede the implementation of innovative materials in practice?
Innovativity

(1) Facilitates student centered learning

(2) There is a variety in the selection of ICT tools being used

Drent & Meelissen (2008, p.191)
Theoretical background

‘those activities undertaken by teachers – and by their students in assessing themselves – that provide information to be used as feedback to modify teaching and learning activities.’

Black and William (1998)
Technology «can help teachers plan, implement, and refine classroom formative assessment strategies.»

Quellmalz (2013)
Drent & Meelissen (2008)
Conceptual framework based on Ten Brummelhuis (1995)
Manipulative factors at teacher level

- ICT ATTITUDE
- PERSONAL ENTREPRENEURSHIP
- PERCEIVED CHANGE
- ICT COMPETENCE
- INNOVATIVE USE OF ICT
- PEDAGOGICAL APPROACH
Materials and method

Teaching practice

Lesson studies
Case study 1
Travel of microorganisms when sneezing
SRS – Socrative & Kahoot
Case study 2
Echo loggers and graphing

«Walk a graph»

- https://www.youtube.com/watch?v=MkXEJkOktQo
Case study 2
Echo loggers and graphing

Task 1: Walk a graph and try to make the letter W.
Try several times until you succeed

Task 2: How did you walk to get a W?
Answer: «We had to start further back and then walk to and from». 
Some examples from teachers

**ICT ATTITUDE**
- Positive to new technology

**PERSONAL ENTREPRENEURSHIP**
- Interested in new approaches to teaching
- Participation in Fasmed

**PERCEIVED CHANGE**
- "do a quick thing"
- Instant feedback (with SRS)

**ICT COMPETENCE**
- Using previously unknown ICT

**INNOVATIVE USE OF ICT**
- "Motivating"
- Echo sound data logger used to walk a graph

**PEDAGOGICAL APPROACH**
## Conclusions (observations and interviews)

<table>
<thead>
<tr>
<th>Teacher level</th>
<th>Non-manipulative factors</th>
<th>Manipulative factors</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>-Young age</td>
<td>-Positive attitude</td>
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<tr>
<td></td>
<td>-Male</td>
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<td></td>
<td>-Educational experience with ict</td>
<td>-Teachers becoming more conscious about own use of ICT</td>
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<tr>
<td></td>
<td>-Economy</td>
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<td></td>
<td>-Interests in new approaches to teaching</td>
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<tr>
<td>School level</td>
<td>-Internet stability</td>
<td>-Economy</td>
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<td>-Installation procedures</td>
<td>-Participation in professional development</td>
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Other findings

• Engaging
  – Both low and high achievers highly engaged

• ICT Pedagogy
  – Changed – using new type of digital tools
  – SRS used frequently after the Fasmed introduction

• Competance
  – Improved teacher competance through new digital tools

• Technical aspects of SW and HW
  – Bugs
  – Version
  – User interface
Finally

• There are thus different approaches and impacts - in some schools ICT was identified as responsible for a significant shift in teaching and learning practices while in others it is seen as reinforcing traditional methods.

• BUT ANYWAY - Change in ICT ought to be followed by changed pedagogy (using an interactive whiteboard as a blackboard – useless - except you miss the dust of the chalk)

(OECD report: ICT and Innovative Schools. Report by the CERI/OECD Secretariat.)
Literature