Enhancing formative assessment using digital technology

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Introduction

Focus
The research focuses on the use of iPads in mathematics lessons and how they can be used to facilitate or enhance formative assessment. The lessons designed and observed in this phase all involved some use iPads (or laptops) but with different software and mathematical topics.

Research questions
• How do teachers obtain, process and present formative assessment data from students using digital technology?
• How do teachers inform and adapt their future teaching using such data?

<table>
<thead>
<tr>
<th>Where the Learner is Going</th>
<th>Where the Learner is Right Now</th>
<th>How to Get There</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>Clarifying learning intentions and sharing criteria for success</td>
<td>Engineering effective classroom discussions and tasks that elicit evidence of learning</td>
</tr>
<tr>
<td>Peer</td>
<td>Understanding and sharing learning intentions and criteria for success</td>
<td>Activating students as instructional resources for one another</td>
</tr>
<tr>
<td>Learner</td>
<td>Activating students as the owners of their own learning</td>
<td></td>
</tr>
</tbody>
</table>

![Formative Assessment Framework (William & Thompson, 2007).](image)

**KEY FINDINGS**
1. The speed and accessibility of information can be beneficial.
2. The effective use of information provided by digital technology in formative assessment is dependent on appropriate teacher action.
3. Pedagogy is important. Teachers need to understand how to interpret and use information.
4. Detailed analysis of the process can help highlight key decision points for teachers.
5. Using formative assessment processes as a means of examining the impact on learning of digital technology focuses the study of digital technology on areas where positive effects can be expected.

![In the use of digital technology in education there are three interlinked strands but these are unequally developed:](image)

- Technology
- Pedagogy
- System change (Fullan and Donnelly, 2013)

Practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited.” (Black & William, 2009)

The project involved working with three schools and nine teachers to design and trial a total of eight lessons.

![The design research approach involved collaborative work with teachers in a cycle of lesson planning, observation, reflection and feedback into the next lesson.](image)

**Framework for analysis**

<table>
<thead>
<tr>
<th>Key area</th>
<th>Examples using digital technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building on students’ prior knowledge</td>
<td>Pre-lesson diagnostic assessment and class overviews are used in lesson planning.</td>
</tr>
<tr>
<td>Identifying and responding to students’ conceptual difficulties</td>
<td>Sample student work is selected and displayed to expose misconceptions.</td>
</tr>
<tr>
<td>Using questioning</td>
<td>Student work is displayed and students are questioned about their methods.</td>
</tr>
<tr>
<td>Increasing student collaboration</td>
<td>Students compare and discuss their work even when working on individual iPads.</td>
</tr>
<tr>
<td>Enabling students to become assessors</td>
<td>Peer assessment takes place during class discussion and collaborative work.</td>
</tr>
</tbody>
</table>

![EFFECTS OF DIGITAL TECHNOLOGY ON FORMATIVE ASSESSMENT PROCESSES](image)

**Digital technology in formative assessment**

Example: Pre-lesson assessment

<table>
<thead>
<tr>
<th>Summary of use</th>
<th>Examples of apps, systems, Process</th>
<th>Assessment and response</th>
<th>Comparison to paper-based process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed response questions are sent to students to complete and return to the teacher. These may or may not be processed into summaries by the system.</td>
<td>For communication: Teacher gains an overview of students’ facility with the content prior to lesson. Teacher may group students according to results, for example, so that one can help another.</td>
<td>Replacement of paper-based methods with benefit of easy access for the teacher. Summary information has benefit of the speed at which this is available to the teacher and time saved.</td>
<td></td>
</tr>
</tbody>
</table>

Advantages:
- Replacement of paper-based methods with benefit of easy access for the teacher.
- Summary information has benefit of the speed at which this is available to the teacher.

Drawbacks:
- Limited number of question formats available on some software.

References:
William, D., & Thompson, M. (2007). Integrating assessment with learning: What will it take to make it work?