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A case of technology-enhanced formative assessment and achievement in primary grammar: How is quality assurance of formative assessment assured?

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ABSTRACT

This article investigates how using an online resource with learner response devices in primary school classrooms meets quality assurance criteria for formative assessment. It reports a randomised evaluation of the effects of technology-enhanced formative assessment on the grammar learning of pupils in primary schools in England. Instantaneous feedback is provided to teachers and pupils about each pupil's understanding of grammatical concepts just taught.

Quality assurance in formative assessment is multi-faceted; it includes promoting attainment and progression, enabling and motivating pupils to show what they can do, and combining information of different kinds to inform decisions about pupils' learning and achievements.

Introduction

This article investigates how using hand-held learner response devices (LRD) in primary school classrooms meets quality assurance criteria for formative assessment. The article starts by drawing on current literature in the field to highlight the complexities and features of formative assessment necessary to ensure the best achievement outcomes. It reviews the concept of technology-enhanced formative assessment, and presents criteria for quality assurance in formative assessment that promise to lead to better learning and achievement outcomes.

The article then applies this conceptual synthesis in reporting the process and findings from a randomised evaluation of the effects of technology-enhanced formative assessment on the grammar learning of pupils in primary schools in England. The evaluation builds on a recent study that demonstrated improvement in mathematics with a similar approach (Sheard & Chambers, 2011). The article then considers how quality assurance of formative assessment is achieved through teachers implementing Questions for Learning (QfL), a form of classroom response system (CRS) that provides instantaneous feedback to teachers and pupils about each pupil's understanding of the concepts just taught.

The complexity of formative assessment

On developing the theory of formative assessment, Black and Wiliam (2009) offer the following guiding principle: "Practice in a classroom is formative to the extent that evidence about pupil 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". It is important to emphasise the links Black and Wiliam make between interactive feedback and decision-making by teachers and learners about the next steps to promote learning: 'The quality of interactive feedback is a critical feature in determining the quality of learning activity, and is therefore a central feature of pedagogy' (Black & Wiliam, 2006). Similarly, feedback information presents a challenge to decide on the next step or line of action; on receipt of a learner's response, the teacher must decide why and how the learner made that response.

Black and Wiliam (2009) point out that while the self-regulated learning literature pays scant attention to learning in the context of discourse, it is helpful to focus on the creation of moments of "contingency". These are defined as real-time teaching adjustments in teaching, involving professional decisions informed by empirical classroom evidence, about when and how to intervene and engage pupils in discussions about the learning taking place.

Black and Wiliam (2009) suggest that teachers might frame and steer their feedback at a strategic level, guided by their pedagogical

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beliefs and practices, and at a tactical level, considering fine-grained responses to learner's responses. At the same time, activating learners as owners of their learning through feedback loops and learner-decision-making is additionally empowering; metacognition (Hacker et al., 1998), motivation (Ryan and Deci, 2000), interest (Harackiewicz et al., 2000) and attribution (Dweck, 2000) may be activated as well as self-assessment (cited in Black & Wiliam, 2009, p. 9).

Extensive research has established that frequent feedback, to give both the teacher and pupils immediate indicators of pupils' current levels of understanding and that of the class as a whole, can have a substantial impact on pupil learning (Black & Wiliam, 1998, 2009; McMillan, 2004; Sheard & Chambers, 2011; Slavin & Stevens, 1995). Research findings on the timing of feedback to inform formative assessment have shown that immediate error correction during task acquisition can result in faster rates of acquisition (Clariana, Wagner, & Roher Murphy, 2000).

In earlier research, Kluger and De Nisi (1996) concluded that feedback works by enhancing self-efficacy and self-regulation, such that attention is directed back to the task and causes pupils to invest more effort or commitment to the task itself. Importantly, the research evidence suggests that pupils' self-regulation of learning is best achieved through the opportunity to have more than one attempt at an answer. Feedback appears to have the most impact when goals are specific and challenging but task complexity is low. Pupils' cognitive effort is therefore directed at the question rather than the mode of response. Later research on pupils' self-regulation by Greene and Azevedo's (2007) demonstrated that the learner's overall control and monitoring function steers progress in learning.

Moreover, the research by Kluger and De Nisi (1996) suggested that feedback is more effective when there are perceived low rather than high levels of threat to self-esteem, presumably because low-threat conditions allow attention to be paid to the feedback itself.

Whitelock (2010) reminds us that often the missing characteristic in assessment tasks is 'advice for action', a form of feedback that will take learning forward. This reinforces the emphasis Crook (1994) placed on focusing on cognitive change and recognising the role of assessment in promoting and monitoring this type of change.

Whitelock (2010) also suggests that for assessment tasks to be more effective, their underpinning pedagogy needs to be supported and informed by tool development, staff training, rethinking assessment tasks, and transfer of learning from assessment tasks that include advice for learning.

From the review of the literature above, it would seem that the pressing challenge for research in this field is how to define and ensure quality assurance.

Quality assurance in formative assessment

We therefore now turn our attention to quality assurance in formative assessment, focussing on underlying guiding principles to inform our operational definition of this central concept.

Gardner (2012) proposes that quality formative assessment is that which promotes attainment and progression, and ensures public accountability for the progress and achievement of every child. Furthermore, Gardner's (2012) suggested principles underpinning the quality of assessment include the following:

- Improves learning;
- Enables progress in all important learning goals to be facilitated and reported;
- Includes explicit processes to ensure that information is valid and reliable;
- Be part of a process of teaching that enables pupils to understand the aims of their learning and how the quality of their achievement will be judged;
- Promotes the active engagement of pupils in their learning and assessment;
- Enables and motivates pupils to show what they can do;
- Combines information of different kinds to inform decisions about pupils' learning and achievements.

Uses assessment methods meeting standards that reflect a broad consensus on quality at all levels from classroom practice to policy.

Gardner (2012) summarises quality in assessment as a multi-faceted concept that will identify all relevant types and outputs of learning, not just knowledge recall, and show the way to improved learning and outcomes. Such outcomes could include enhanced self-efficacy, defined as the confidence and ability to complete a task and reach a goal (Hattie & Timperley, 2007).

Adopting Gardner's principles above, we conceptualise quality assurance in formative assessment as situated in teachers' professional decision-making, integrated and embedded in their teaching, to support individual pupils at the point of learning and through modifying future teaching/learning goals.

We now turn our attention to research findings on technology-enhanced formative assessment, and how quality assurance might be promoted and assured in this domain.

Technology-enhanced formative assessment and quality assurance.

Hattie and Timperley (2007) found that the most effective forms of feedback in classrooms are video-, audio-, or computer-assisted instructional feedback, related specifically to learning goals. They concluded that technology-assisted feedback supporting self-regulation, is powerful in leading to further engagement with the task. Pupils can identify their mistake and have the opportunity for additional attempts in order to independently arrive at the correct answer. In quality assurance terms, this permits pupils to be motivated, enabled and actively engaged in a successful learning process.

However, more recently, Hansen-Nygård, Nielsen, and Stav (2012) suggest that, considering that the majority of research shows several positive effects from use of learner response systems in classrooms, greater consideration should be given to factors leading to their sustained success in enhancing learning. For example, research by Charlesworth (2012) found benefits of increased pupil engagement and the provision of a simple and quick means of pupil feedback which improves a teacher's awareness of their learners understanding and progress. However, these findings do not go far in addressing the principles underpinning quality of formative assessment outlined above. This is supported by the finding that teachers often lacked awareness of the pedagogical benefits of using LRDs and understanding how to set up and use the formative assessment system (Charlesworth, 2012).

Socio-cultural theories of learning teach us that even when learners are engaged in individual tasks, learning is a cultural phenomenon and that learning tools mediate learning actions and outcomes (Whitelock, 2010). For example, Laurillard (2002) highlights the importance of dialogue where the learner and teacher interact with each other, mediated through educational technology, to further understanding in a particular domain or subject area.

Fies and Marshall (2006) argue that research in this area relies heavily on surveys and test results, some based on one single instrument, others using combinations of instrumentation, but few

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