Studies in Educational Evaluation 59 (2018) 1–9

Contents lists available at ScienceDirect

Studies in Educational Evaluation

journal homepage: www.elsevier.com/locate/stueduc

Teacher AfL perceptions and feedback practices in mathematics education among secondary schools in Tanzania

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ARTICLE INFO

Keywords:
Formative assessment
Perceptions of FA and AfL
Teacher feedback practices
Mathematics education
Mixed methods

ABSTRACT

Feedback that monitors and scaffolds student learning has been shown to support learning. This study investigates the effect of mathematics teachers' perceptions of Formative Assessment (FA) and Assessment for Learning (AfL) and their conceptions of assessment on the quality of their feedback practices. The study was conducted in 48 secondary schools in Tanzania with 54 experienced mathematics teachers teaching Grade 11 (Form three in the Tanzanian system). Validated questionnaires were combined with interviews to investigate mathematics teachers' perceptions, conceptions, and feedback practices. Data were analysed by structural equation modeling and content analysis techniques. Results from the structural equation model indicated that mathematics teachers' perceptions of FA and AfL and their conceptions of assessment purposes positively predicted the quality of their feedback practices. Interview results illustrated that mathematics teachers used their students' assessment information for both formative and summative purposes. Future interventions for improving the quality of mathematics teacher's feedback practices are proposed.

1. Introduction

Formative assessment (FA) and Assessment for Learning (AfL) are widely acknowledged as powerful tools for effective instruction (Black & Wiliam, 1998; Ecclestone, 2012). Assessment as a formal or purposeful attempt to determine students' performance during and/or after a learning phase can be used formatively for improving the teaching and learning process, certifying students, placement of students in tracks, or for curriculum improvement (Brown, 2008; Pellegrino, 2014). Based on the ten principles of AfL first drafted by the Assessment Reform Group (ARG, 2002), the most important practices that guide teachers' implementation of AfL are: rich (classroom) questioning, feedback, peer assessment, self-assessment, and sharing learning goals and criteria of quality (Black & Wiliam, 1998, 2009; James & Pedder, 2006).

FA and AfL practices are assumed to serve two core functions: monitoring to track student progress and scaffolding to help students improve their learning (Pat-El, Tillema, Segers, & Vedder, 2013; Stiggins, 2005). Monitoring allows teachers to know the direction, speed, and quality of students' learning progress so that supportive interventions can be put in place. Scaffolding is feedback that explicitly provides task, process, or self-regulatory information (Hattie & Timperley, 2007) so that students know how to proceed. However, recent research has shown that the implementation of FA and AfL is far from straightforward. For example, peer and self-assessment can be biased due to students' intra- and interpersonal factors (Panadero, 2016), feedback is often ineffective (Lipnevich, Berg, & Smith, 2016), teachers do not always ask good questions (Airasian, 1997; Barnette, Orletsky, & Sattes, 1994), or actively promote feedback seeking (Winstone, Nash, Parker, & Rowntree, 2017). As a result, the nature of FA and AfL and how it leads to improved outcomes has been debated in FA and AfL literature (Bennett, 2011; Black & Wiliam, 2003).

1.1. What makes assessment formative?

The term 'formative evaluation' originates from Scriven's (1967) distinction of formative evaluation to summative evaluation (Bennett, 2011; Black & Wiliam, 2003). According to Scriven (1967), summative evaluation provides information to judge the overall value of an educational program and formative evaluation refers to information provided early enough in the process so as to inform improvements. Bloom

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https://doi.org/10.1016/j.stueduc.2018.01.004
Received 24 October 2017; Received in revised form 22 January 2018; Accepted 24 January 2018

(1969) shifted the initial focus of formative evaluation from 'program evaluation' to 'student evaluation'. The purpose of formative evaluation was to provide feedback and corrections at each stage in the teaching and learning process (Bloom, 1969; Bloom, Hastings, & Madaus, 1971). Later on, 'formative evaluation' which was about testing and assessment, evolved into what is now referred to as 'formative assessment' (FA).

In our view, formative assessment is the thoughtful application of a purposefully selected methodology or instrument that fosters the interpretation of student performance to inform teachers and students about the learning progress (Bennett, 2011; Popham, 2014). Tests can be used to collect information that helps teachers or students to adjust their actions accordingly; however, tests themselves are neither formative nor summative (Popham, 2014). Nonetheless, rather than focusing on the evaluative or grading function of assessment, the present study focuses on the pedagogical use of FA and AfL as an instructional strategy to regulate both the teacher's teaching processes and the students' learning tactics and active use of feedback to improve outcomes. In this framework, the decisions made by the teacher and their students' regarding assessment-elicited evidence make assessment formative. Decision-making depends in part upon beliefs that frame and guide thinking about a phenomenon (Fives & Buehl, 2012). Beliefs about assessment, which are rooted in their experience of assessment, influence the degree to which teacher assessment practices act formatively (Barnes, Fives, & Dacey, 2016; Fulmer, Lee, & Tan, 2015).

1.2. Teacher perceptions of FA and AfL practices and conceptions of assessment

While multiple terms are used to refer to the mental representations humans have for a phenomenon (e.g., perception, conception, belief, attitude, etc.), it seems likely these terms refer to the same thing (Brown, 2008). Hattie (2015) suggested that while Australian scholars use the term 'beliefs', those in the United States commonly use the term 'epistemology', while those in Europe prefer the term 'conception'. In the present study, we consider the terms perceptions and conceptions separately—in particular because of the terminology used in survey instruments to refer to different content. However, it is acknowledged that others may consider perceptions and conceptions as largely synonymous.

In this study, teacher perceptions of FA and AfL are concerned with the way teachers evaluate their own practices to perform the core functions of monitoring and scaffolding student learning (e.g., "I adjust my instruction whenever I notice that my students do not understand a topic"). Monitoring practices entail analysing student learning progress to foster students' self-monitoring by finding challenges and opportunities to optimise teaching and learning. Meanwhile, scaffolding involves teachers helping students to improve their learning by controlling elements of the task that are essentially beyond the student's capacity (Pat-El et al., 2013). According to Wood, Bruner and Ross (1976) scaffolding permits learners to concentrate upon and complete only those elements that are within their range of competence. Kyaruzi, Strijbos and Ufer (2016) showed that students' perceptions of their mathematics teacher's monitoring and scaffolding practices were significantly related to their mathematics achievement.

In contrast, conceptions of assessment refer to the more general representations teachers have concerning the purposes of assessment (e.g., "Assessment improves learning"). It has been shown that teachers' conceptions about the nature and purposes of assessment strongly influence how they teach and what students can actually learn or achieve (Dacey, 2015, 2017; ; Pajares, 1992). Three conceptions of assessment have been generally attested to, including (1) assessment improves teaching and learning, (2) assessment evaluates and holds accountable students, schools, and teachers, and (3) assessment is irrelevant (Bonner, 2016).

The conception that assessment improves teaching and learning is the central argument for FA and AfL (Black & Wiliam, 1998; Popham, 2014) and requires teachers to use evidence about student progress to support their learning (Brown, 2004). The conception that assessment makes schools and/or teachers accountable is the rationale behind accountability policies that use student assessment results to judge and reward or punish schools and teachers (Brookhart, 1994; Nichols & Harris, 2016). Student accountability is evidenced in the assignment of grades, checking off student performance against criteria, placing students into classes based on performance, as well as various qualification examinations for graduation or placement into further opportunities (Brown, 2008). The conception that assessment is irrelevant regards assessment as a negative practice, which, because it is unfair to students or inaccurate, can be ignored—even if it is imposed. If assessment cannot help teachers improve student learning, then teachers may choose to ignore it (Deneen & Brown, 2016).

Although studies into the role of teacher conceptions of assessment and assessment perceptions on teaching and learning processes have proliferated in the last two decades (e.g., Brown, 2004; Brown, Chaudhry, & Dhamija, 2015; Gibbs & Simpson, 2003; Maclellan, 2001; Pat-El et al., 2013), few studies have examined African educational systems (e.g., Gebril & Brown, 2014; Kitta, 2014; Ndalichako, 2015). Furthermore, comparatively few studies provide accounts of teachers' assessment perceptions and their determinants in mathematics education (e.g., Adams & Hsu, 1998; Al Duwairi, 2013; Ginsburg, 2009; Rach, Ufer, & Heinze, 2013).

1.3. Teacher feedback practices

FA and AfL literature provides extensive evidence that, if well implemented by teachers and well perceived by students, FA and AfL have the potential to improve student learning (Njabili, 1999; Wiliam, Lee, Harrison, & Black, 2004; Wiliam, 2011), and especially for struggling learners (Black & Wiliam, 1998). Specifically, the quality of how teachers deliver feedback and how it promotes students to seek feedback (i.e., 'feedback delivery' and 'promote feedback seeking') is essential in contributing to both student outcomes and increased student regulation of their own learning. In fact, the more considerate a feedback source is when providing feedback, the more likely an individual is to accept and respond to the feedback provided (Strijbos, Pat-El, & Narciss, 2010; Duijnhouwer, Prins, & Stokking, 2012; Gregory & Levy, 2015; King, Schrodt, & Weisel, 2009). Considerate feedback, among other things, maximises clarity of information (Winstone et al., 2017).

An important goal of FA and AfL is to have students become active participants in assessment and active seekers of feedback. Feedback seeking requires students to identify areas in which they need help and seek feedback that aligns with their learning needs (Carless, Salter, Yang, & Lam, 2010). However, students are likely to seek feedback only if the social dynamics of the classroom or the teacher promotes feedback-seeking behaviours (Neitzel & Davis, 2014). Unfortunately, there is limited information on how teachers can promote students' becoming active feedback seekers instead of being passive feedback receivers (Winstone et al., 2017). Thus, teacher feedback delivery and promoting students to seek feedback are important aspects of feedback practices that require further scrutiny.

It is also noteworthy that previous research has examined teacher perceptions of FA and AfL independent of their conceptions of assessment. While perceptions and conceptions may overlap considerably, there is a possibility that teacher perceptions of feedback practices may vary systematically with their conception of assessment. For example, Brown & Harris (2009) showed that when New Zealand primary teachers conceived of assessment as a measure of student accountability they perceived assessments as formal tests and measures of surface cognitive processes. Thus, it may be that teachers, who have a strong conception of assessment as an evaluation of students (perhaps consistent with systemic use of external examinations), would perceive feedback as accuracy on task-focused skills rather than supportive of