Chapter 60
The Relationship Between Online Formative Assessment and State Test Scores Using Multilevel Modeling

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ABSTRACT

The relationship between one online formative assessment program in reading and state test scores in reading was examined using existing data (N=208) in four cohorts across elementary, middle, and high school from 2004/2005 to 2009/2010. The following research question was addressed: What is the relationship between online formative assessment score growth and state test score growth? Two-level time-varying covariate growth models were used. The results indicated that gains in online formative assessment scores over time covaried significantly and positively with state test score gains. Although causal inference is limited, the demonstrated relationship can provide teachers/administrators with evidence of the benefits of technology-based formative assessment practices. This relationship is reassuring given the number of educators who are using technology-based and/or online teaching tools in the classroom, and the number of administrators who are seeking to increase the use of technology as a learning tool in their schools.

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INTRODUCTION

The main goal of the current study was to examine the relationship between online formative assessments (FAs) and summative, yearly state proficiency test scores. Specifically, the relationship between one online formative assessment (FA) program in reading, known as the Diagnostic Online Reading Assessment (DORA), and state test scores in reading (i.e., the Colorado Student Assessment Program [CSAP]) was examined in four cohorts across elementary, middle, and high school in beginning in the 2004/2005 academic year and ending in 2009/2010. This investigation used Hierarchical Linear Growth Modeling (HLGM; i.e., Multilevel Modeling) to address the following research question: (1) What is the relationship between online formative assessment score growth and state test score growth?

Formal and informal FAs are one of many teaching methods that have been used to increase student performance on end-of-course, academic year, and other high-stakes achievement tests for decades and has a large research base to support these practices (e.g., Black & Wiliam, 1998a). Additionally, summative assessment data (e.g., yearly state proficiency tests) are continually used as indicators of school and district performance for policymakers and the public. However, these summative data are of little use in the day-to-day activities of teachers in diagnosing student learning progress and modifying teaching strategies, as is done in the FA process (e.g., Black, 2015). Because this collection of abstract theories and research methods have transitioned into actual teaching practices, it is important to build the literature surrounding technology-based methods as teachers continue to use FA in the classroom.

The purposes in conducting this study include the following: (1) To support the burgeoning literature outlining the role of technology in general in teaching and learning, and (2) To bolster support for federal initiatives and administrative demands for more efficient ways to meet state standards. As technology-based assessment is gradually used to support and/or replace traditional forms of evaluation, the need to examine the extent to which these methods are educationally sound is in high demand. Overall, information presented in this study can provide practical implications to district-wide implementation of supplemental reading instruction in an online environment.

BACKGROUND

E-learning (i.e., learning that is facilitated by electronic technologies) is referred to as part of the equipment of 21st Century scholarship (Buzzetto-More & Guy, 2006). However, e-learning is only half of the equation as government mandates have required schools to use data to inform decision making. The use of data has necessitated the development of improved information technology and access to computers and high-speed Internet in schools (Petrides, 2006). Thus, the other half of the equation is the use of data rendered from e-learning, or e-assessment, which entails using electronic technologies to drive student learning and assessment as with FA (Ridgway, McCusker, & Pead, 2004).

FA can be briefly defined as the use of diagnostic formal and informal assessments to provide feedback to teachers and students over the course of instruction for the purpose of improving performance and achievement (e.g., Black, 2015; Boston, 2002). Previous research in this area has primarily focused on traditional FA practices (e.g., paper-and-pencil quizzes), with the current literature beginning to examine the effectiveness of Internet-based, automated FA programs (e.g., Chua & Don, 2013; Kingston & Nash, 2011). The overall consensus from the traditional body of literature is that FA is an essential