Chapter 12
Designing and Evaluating Technology-Based Formative Assessments

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ABSTRACT

Formative assessments aligned with learning goals can improve student learning. Integrating technology into formative assessments can further enhance and transform the learning experience. This chapter focuses on how instructors can design and evaluate formative assessment activities that incorporate technology. It provides a practical guide for understanding how to apply the revised Bloom’s taxonomy framework and the substitution, augmentation, modification, redefinition (SAMR) model to create meaningful technology-based formative assessments. This chapter includes evaluations of example technology-based formative assessments that align with learning goals based on Bloom’s taxonomy. It determines if the technology used to either substitute or improve the functionality of the activity, enables the redesign of an entire activity, or yields a new activity that is impossible without the technology. This information can be applied to ensure the integrity of technology-based formative assessments and to determine if using a technology tool in a formative assessment is worthwhile.

INTRODUCTION

The body of research demonstrating the effectiveness of formative assessments in improving student learning is well-established. Formative assessments are considered a key component in evaluating and developing student performance, and they have been found to contribute to several factors related to high achievement. Studies have suggested that their benefits range from improving student performance...
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(Black & Wiliam, 2009), enhancing science skills (Keller, 2017), assisting low achievers (Baleni, 2015), to reducing anxiety and improving listening efficacy (Bayat, Jamshidipour, & Hashemi, 2017). The Bloom’s Taxonomy framework (revised by Krathwohl, 2002) has also been instrumental in helping instructors align formative assessments with learning objectives to ensure that the assessments’ activities help students develop the knowledge and skills required to achieve course goals. With education technology tools becoming more prevalent in face-to-face, blended, and online courses, research is focusing on ways to integrate technology effectively into formative assessment activities. The Substitution, Augmentation, Modification, Redefinition (SAMR) model (Puente, 2006) presents a guide to help instructors evaluate the extent to which the use of technology could enhance or transform a traditional formative assessment that does not use any technology. It allows an instructor to determine how specific technology tools can provide opportunities for activities that would otherwise be difficult or impossible to conduct. However, it can be overwhelming for an instructor not only to choose an appropriate technology tool to use out of the hundreds available, but also to align a technology-based formative assessment with course goals effectively.

This chapter provides guidance to instructors for how to design effective and worthwhile technology-based formative assessments. First, the purposes and benefits of using formative assessments will be discussed, followed by how the Bloom’s Taxonomy framework can be applied to ensure that the activity helps students reach specific learning goals. Next, the chapter will explore the potential benefits of integrating technology into formative assessments. The SAMR model will be presented as a way to determine how a technology tool changes the learning experience, thus allowing instructors to evaluate the appropriateness and value of using a technology tool for a formative assessment activity. Finally, multiple examples of technology-based formative assessments will be presented, demonstrating how a traditional activity can be enhanced or transformed through the addition of technology.

Little has been written about using both Bloom’s Taxonomy and the SAMR model together in order to inform the development of technology-based formative assessments. Instructors can use this information to evaluate their current use of technology in formative assessments, design new assessments, explore the potential of new technologies, and determine if the cost and time of using specific technology tools is worth spending. Instructors could then potentially compile a “technology tool library,” helping them keep track of the kind of experiences that each tool would bring to an activity. An instructor is then more likely to use technology appropriately and effectively.

BACKGROUND

The Purposes and Benefits of Formative Assessments

Research providing evidence of successful uses of formative assessments in higher education has been ongoing for several decades. Black and Wiliam (as cited in Sadler, 1998) conducted a review of two decades’ worth of studies regarding formative assessments and concluded that using formative assessments “is effective in virtually all educational settings: content areas, knowledge and skill types, and levels of education” (Sadler, 1998, p. 77). This wealth of research supporting the use of formative assessments continues to encourage their integration into the classroom as a way to monitor and improve student learning.
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