



# The power of a simple verbal explanation: Evaluating the efficacy of narrated feedback



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## ABSTRACT

The explosion of online resources has changed the way assessments are designed and implemented. Students learn more when they have an opportunity to review their mistakes, an objective to which online homework systems contribute substantially. But the effectiveness of online assessments depends on the ability to obtain feedback, which often comes in the form of automated written explanations. This paper tests the efficacy of an alternative form of feedback: narrated feedback, consisting of short narrated videos providing verbal and visual explanations of a specific concept. We conduct a field experiment in a large enrollment microeconomic principles course in which students are randomly assigned to either a control group that received no feedback or a treatment group receiving either written or narrated feedback. We provide evidence that students with access to narrated feedback scored on average up to 10.1% higher on assessment questions relative to those with access to written or no feedback.

## 1. Introduction

Online assessments have become a standard feature in learning management systems as a way to complement textbooks in a media-enhanced learning environment. Assessment questions come in many forms, from multiple-choice questions and short-answer questions to interactive graphing and numerical exercises, and are designed for both pre-class (e.g., formative assessment) and after-class (e.g., summative assessment) implementation.

Moreover, online assessments are generally accompanied by feedback, consisting of short automated responses that are provided to students upon completion of a problem or assessment. Feedback is more critical when students select an incorrect answer, as feedback is designed to direct students to the cause of the mistake and to provide guidance for similar questions that may arise later. Although the quality of the information provided in the feedback is of utmost importance, the delivery mechanism is arguably as important. In other words, feedback that is not utilized by students becomes worthless, regardless of its quality.

Nearly all learning management systems in economics provide feedback in the form of a short written explanation, which relays information through the visual channel of one's brain as one reads the text. However, vast cognitive and neuroscience research have showed that comprehension and retention is more effective when information is explained through both the visual and verbal channels in what is known as dual coding theory (Paivio, 1986). Therefore, the link between the delivery mechanism of automated feedback common in learning management systems and the ability of students to effectively benefit from such resources deserve greater attention.

The purpose of this paper is to evaluate the effectiveness of various delivery mechanisms by which automated feedback is

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provided. We created two forms of automated feedback on a common set of assessment questions, one based on traditional text feedback and the other using a narrated format with audio and visuals, using the same content. We then conduct a field experiment in a large microeconomic principles course in which students are randomly placed into one of three groups and are asked to complete online assessments on a topic seen for the first time. Each group received one of the following feedback mechanisms: 1) no feedback (just the correct answer), 2) text feedback, or 3) narrated feedback, and is then evaluated on the performance in subsequent questions on the same concept to measure learning outcomes.

We present both summary and regression results showing that the use of narrated feedback mechanisms provides a marginally significant improvement in learning outcomes over the use of text feedback or no feedback. This effect is enhanced when feedback is provided on graphing or analytical questions that depend more on visual representations of concepts. These findings provide evidence that the delivery mechanism of automated feedback is as important as the quality of the information itself, and may encourage instructors to develop and/or adopt more narrated feedback resources to provide feedback to students in a more effective manner.

## 2. Literature review

Much has been written with regards to the effectiveness of feedback on student assessments. [Walstad's \(2001\)](#) seminal paper on improving assessment practices discussed the use of self-assessment and feedback mechanisms long before online homework systems became standard in economics courses. However, the process by which feedback is disseminated to students has changed with online homework systems, which provide automated feedback as opposed to the traditional approach of providing handwritten comments on a student's work, or assigning printed study guides that provide answers and explanations to questions.

Although the importance of feedback has never been questioned, there has been much debate about how to best provide it. [Nicoll and Macfarlane-Dick \(2006\)](#) argued that assessment with feedback is an effective tool when students are proactive in generating and utilizing feedback. They provide seven key principles in providing feedback, which include clarifying goals, facilitating reflection, providing quality information, encouraging dialogue, encouraging self-esteem, providing opportunities to close the gap between current and desired performance, and providing information to teachers to help shape learning. These principles are well accepted; but whether they can be incorporated in an online setting with automated feedback requires additional attention.

Automated feedback has taken on an increasingly important role as online assessment mechanisms become more common. Feedback must be designed to address deficiencies that prevent students from achieving a higher order understanding of the material. When feedback can be tailored to meet student's needs without having to rely on individually-provided feedback that is manually written or verbally conveyed to the student, economies of scale can be achieved through the use of automated feedback. But its effectiveness is still subject to debate.

[Wieling and Hofman \(2010\)](#) studied the effect of questions with automated feedback in a large European law class with 474 students randomly placed into two groups. Both groups had access to online lectures, but only the treatment group received questions with feedback. Their results showed that the main determinants of class performance were GPA, academic major, and the number of online classes viewed. The authors found a positive but insignificant effect with the feedback mechanism.

[Kennelly et al. \(2011\)](#) and [Emerson and Mencken \(2011\)](#) provide similar studies on the effectiveness of using online homework systems that provide automated feedback as opposed to assigning questions from the book or assigning no homework at all, respectively. Kennelly et al. found no effect with how homework is assigned, while Emerson and Mencken found a positive effect of online assessments with feedback over no homework.

The above studies suggest a general conclusion that automated feedback may provide a marginal benefit to students, but the evidence is not overwhelming. One explanation for these lackluster results may be that the medium by which feedback is provided, short written explanations, is not effective in improving the understanding of a concept; or worse, the feedback is not being read by students at all. In other words, it is the delivery mechanism and not the content that inhibits feedback from being utilized effectively.

This is not much different than the debate whether the medium of delivering a class—face-to-face, lecture capture, distance learning, or a hybrid combination, affects student learning outcomes. Several studies have argued that face-to-face lectures are more effective than online lectures because there is a live instructor providing (with varying degrees) interaction with students (see [Bosshardt and Chiang, 2016](#); [Goffe and Kauper, 2014](#); [Gratton-Lavoie and Stanley, 2009](#)). In a similar vein, [Vazquez and Chiang \(2016\)](#) showed that multimedia pre-lectures are more effective than assigned textbook readings prior to class. Their empirical results follow those found in previous studies conducted by physics education researchers (e.g., [Stelzer et al., 2009](#)). In both contexts, the theoretical support came from years of research by cognitive scientists in the area of multimedia learning and design (see [Mayer, 2001](#); [Vazquez and Chiang, 2014](#)).

Mayer points out two different, yet related, reasons why the transfer of information to students should be more effective using multimedia than simply text. First, content itself is *coded* by the learner, and assume a complementary relationship between content coded in words and content coded in pictures. For example, a textbook may combine a diagram (pictures) with text (words) to explain the way quantity demanded responds to a change in price. This is also referred to as dual-coding theory ([Paivio, 1986](#)). Although one can easily see how dual-coding is achieved using audio and text at the same time, on its own dual-coding theory does not explain the superiority of narrated feedback to text. Therefore, we must study Mayer's second reason. Multimedia is defined in terms of the number of sensory modalities used when receiving information. Consider a video in which a student *sees* a diagram of a steep demand curve reflecting inelastic demand, but the explanation is delivered through narration instead of text. This sensory-modality view of the benefits of multimedia provides a theoretical explanation of why students can retain information more effectively when delivered through narration than text.

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