Determining the Efficacy of Immediate Feedback Delivered to Students Enrolled in an Online Educational Research Course

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Abstract

This paper will present and discuss the analysis of research findings to determine the efficacy of immediate feedback delivered in an online educational research course. Feedback delivered via two instructional strategies (problem-based instruction and multiple-choice content assessment) are compared for their impact on student learning outcomes.

Introduction

In learning environments, *feedback* is generally described as evaluative and/or corrective information provided to students during assessment events (e.g., content-mastery checks, quizzes, tests, Q&A, etc.) or upon completion/submission of a longer-term project, problem-solving exercise, and so on. In online, asynchronous learning environments – where teachers are frequently unavailable for live consultation – students rely heavily on regular feedback to guide their learning as well as focus their attention on needed areas of improvement.

Immediate feedback is described as the feedback given directly after each question versus delayed feedback which is presented after a delay of several days. Students valued immediate feedback during a problem-based learning setting (Parikh, Amish, Kylen, & Brian, 2001). A later study by (Webb & Moallem, 2016) looking at formative feedback found their students appreciated found that the frequent and immediate feedback allowed them to make changes in the assignments helping their success in the course. Formative feedback also aided the faculty in understanding and evaluating their class presentations.

In an investigation of studies on the effects of instructional feedback, researchers found that *effective* feedback should guide the students to the correct answer (Bangert-Drowns et al., 1991). Students should have the ability to

correct errors and improve future submissions after receiving informative feedback (Shute, 2008). A later study by Hattie & Timperley (2007) addressed the positive effect of instructional feedback on increased student effort, motivation, and engagement.

Issues regarding the timing of feedback have been debated for years, whether it is better to present *immediate* or *delayed* feedback in an instructional environment. A review of fifty-three studies of both immediate and delayed feedback (Kulik & Kulik, 1988) determined the results for neither method were superior. Each was effective in specific situations. Later, Epstein et al. (2002) evaluated a feedback technique where students knew the correctness of their responses immediately and were allowed to re-submit their responses before moving to the next question. This method demonstrated students' ability to retain previously tested information.

The "answer until correct" feedback method has an even longer history, evidenced by Pressey's research and development work (1926). He developed a teaching machine to deliver multiple-choice questions, including immediate feedback regarding the correctness of students' submissions. A later study (Gilmam & Ferr, 1972) used this process to gather knowledge of the psychometric properties of a test benefiting both students and faculty. An experiment conducted by Attali et al. (2016) suggested a negative effect. The researchers posited that a multiple-try test might create less student effort, thus reducing the feedback's effectiveness. It is important to note that this finding was the opposite of the studies by others (Epstein, Epstein, & Brosvic, 2001; Epstein et al., 2002; Maurer & Kropp, 2015; Attali et al., 2016). When considering immediate feedback, it was suggested by Lefevre & Cox (2017) that delaying feedback requires students to re-study the question to determine their thinking about their response.

Finally, Nicol & MacFarlane-Dick (2006) suggest multiple suggestions in creating proper feedback. Their suggestions include clarification of the expected product, encouragement, opportunities to correct submission, and providing information to the teachers to improve their delivery. Others also presented the influence feedback has during the learning experience for both students and faculty (Goldsmith, 2014, Pashler et al., 2005, Hattie & Timperley, 2007).

Methodology/Results

Method A: Problem-Based Scenario/Immediate-Feedback

Students read a chapter about sampling and educational research. Students were then asked to respond to a problem-based series of two scenarios. The questions consisted of choosing the proper research methodology, the type of sampling needed for each scenario, and then choosing from a list of 10 choices the two that fit the rationale for their sampling decision. During this scenario, there were multiple stages where they were asked to make a decision and then respond how comfortable they were with that decision. If they were comfortable with the decision, they were given a choice to change their minds or move on to the next question. Students were asked to complete a survey at the end of their responses in the two scenarios.

Results A:

The results were to look at sampling choices and their feelings of confidence in the choices. Initial results allowed faculty to make slight adjustments recommended by students

These types of problems and how they were presented would help in the future. It gives one a deeper understanding of the different sampling methods and how to choose the right ones for a study. It gives one perspective on the ways of conducting research

It would be nice if it were more apparent that you could review the "check box" section for more information. Also, I think it would be good if we were told that we were correct on the sampling method or not before that screen.

It would have been helpful if the scenario was viewable the whole time to refer back to it while answering.

Note: The above changes and others altered this second delivery to these students

These scenarios were easier to understand than the first time.

I love that the terms were explained before finalizing an answer choice. The scenarios were listed above the simulation to reference throughout the simulation, the multiple opportunities were given to arrive at the correct answer, and the pictures for motivation.

Method B: Multiple-Choice Quiz/Immediate-Feedback

Quizzes were created for each chapter in the textbook of educational research. Ten questions were created for each chapter with multiple choice answers. The multiple-choice quiz was the typical one correct answer and three distractors. When the students chose one of the four multiple possible answers, they were given instant feedback to that response whether it was correct or the student was guided to why it was incorrect. The activity throughout the student's attempt to answer the quiz was captured. Each click was recorded to add the student's results to be captured. This allows the faculty to determine the student's knowledge and effect of the questions. An early student response concerning the new format:

Results B:

This course has taught me so much, and I love it. How you have it set up is much more of a learning experience. I love to get feedback and dig deeper. Thank you for that!

Conclusion/Discussion

This paper describes two approaches to learning assessment techniques used in teaching research methodology (statistics) concepts in an online, asynchronous learning environment. The work completed thus far was formative, which led to substantive changes in each delivery mechanism – 1) problem scenario and 2) multiple-choice questions.

Informal (email correspondence) and structured mechanisms (online Google forms) were used to gather learner reactions to both designs. As denoted in the results section, students reacted positively to the assessment tools and offered positive suggestions for improvement(s) in their design and implementation.

For example, the multiple-choice question trial added a "behind the scenes" tracking mechanism. This feature was designed to provide additional feedback to the learner (e.g., summary performance reports per concept area and recommendations for further reading/study) as well as the instructor (e.g., student time on task, selection patterns, specific subject content challenges per student (and/or aggregate) and so on.

The instructor for the course used in both trials has also reported significant benefits from his active participation therein. For example, the instructor can now better track multiple indicators (per student or in aggregate) that address the effectiveness of instructional strategies used in the course. Additionally, data collected and analyzed "behind the scenes" offers an enormous opportunity to make instructional adjustments and tailor them to meet individualized student learning needs.

A follow-up paper is being written to report findings of a more comprehensive and rigorous analysis of the data collected.

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