INQUIZITIVE

Norton InQuizitive Efficacy Study for Introductory Sociology Courses

Dustin Tingley, *Harvard University*

This report describes an efficacy study designed to test the effects of InQuizitive on student performance. The results show substantial gains for students.

Introduction

InQuizitive is a formative, adaptive learning tool that supports select Norton textbooks. The primary purpose of InQuizitive is to facilitate student learning and provide feedback to instructors on student performance to improve future teaching. Instructors most often assign InQuizitive as pre-lecture assignments to ensure that students come prepared to lectures, quizzes, and exams.

InQuizitive provides a personalized learning experience in three ways:

- Students who need the most help get the most help. Students who don't quite grasp the material will have to answer more questions than their classmates who begin the activity with a good understanding of the topic.

- Students receive more questions on the learning objectives they're struggling with most.

- Students receive easier questions if they're struggling or harder questions if they've shown they're ready for them.

InQuizitive uses gamelike elements to engage students and motivate them as they work:

- The confidence slider, which allows students to wager points on each question.

- The visual design (e.g., rounded corners, blinking alien logo, bright colors).

- Levels: Students progress through Level 1, then through Level 2, then through Level 3, completing the activity. They get a short "reward screen" after completing each level.

- The sound effects, which provide immediate auditory feedback on students' actions, and background music.

- Bonus points for answering five questions correctly in a row and bonus questions for "leveling up" when students are struggling.

- Students can click to "Take a Break" at any time and solve a puzzle game while they clear their heads.

Motivation for Efficacy Study

Anecdotal evidence suggests that InQuizitive is having a profound impact on student performance. However, rigorous efficacy studies are required to completely understand and show these positive impacts. Efficacy studies are a common part of the education technology landscape, and there are increasing calls to make them more prominent, including their being a formal part of institutional purchasing decisions (Blumenstyk, 2016).

Efficacy Study Design

To test the effect of InQuizitive on student assessment performance, we adopted a within-subjects design with the following structure.

Students engaged in a three-step process. First, each student was assigned to take three test questions prior to beginning the InQuizitive activity. During this time, none of the learning features in InQuizitive were turned on. Students did not get feedback or have access to additional tutorial content, for example. Second, students engaged with a standard InQuizitive activity. Last, students were assigned another set of three test questions.
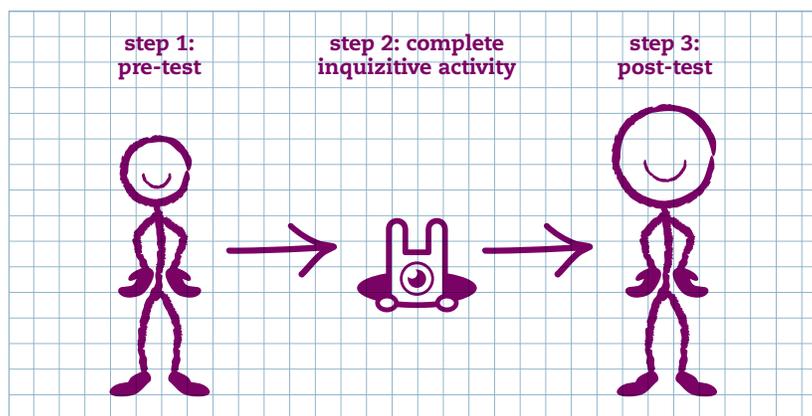
The Norton editorial team carefully selected the set of test questions from chapters on social stratification, race, and ethnicity. These questions were curated to represent typical questions found on quizzes or exams. From this bank of test questions each student was randomly assigned three for the pre-test and three for the post-test. As not all questions were guaranteed to be of equal difficulty, this ensures on average that students did not get easier questions in the pre-test which would bias our results.

Using the pre and posttest scores, we obtain an InQuizitive Effect:
InQuizitive Effect = % of correct answers on the posttest minus % correct on the pretest.

For example, if a student got two out of the three pretest questions correct, and all three in the posttest, their InQuizitive Effect would be 33%.

In addition to the InQuizitive Effect, we also collected data on the student's average reported confidence levels (ranging from 0 to 100) in the pretest and posttest questions. We can then calculate the change in average confidence.

The advantages of this within-subject design include that it is equitable (all students had access to InQuizitive), simple to implement (allowing for large sample sizes discussed below), and the ability to calculate an effect for each individual.

Sample

For this study, Norton worked with 10 instructors who had adopted one of Norton's introductory Sociology textbooks (*The Real World* or *You May Ask Yourself*). The study was implemented in the spring of 2017. In total 1,263 students completed the study. We calculated the InQuizitive Effect for all students who did not have a perfect pretest score (62% of students), leaving a final sample of 786 students.

Results

Average scores on the pre and post-tests are displayed below. The average InQuizitive Effect was **18%** (95% confidence intervals: 16%, 21%, *p*-value <.001). Of the students who got a perfect pretest score, no one got more than one question wrong in the post-test. Additionally, the average change in confidence was **six points** (95% confidence intervals 4.5%, 8.5%, *p*-value <.005), indicating an increase in confidence in addition to an increase in test performance.