Transition into statistical thinking! Using Quiz Software to teach and assess introductory courses in Statistics.
Matina J. Rassias*, John H. McColl, Ewan W. Crawford & Karina Paterson
*E-mail: s.rassias@stats.gla.ac.uk

ABSTRACT. One of the main issues that statistical education has to face is that the early stages is introducing students to statistical thinking. It has often been observed that, in some service courses in Statistics, students have negative feelings, such as discouragement and even frustration towards the subject area. Therefore, the challenge for educators is to address the above issues. One approach is to provide a teaching environment which, through the use of computer technology, will enrich the students’ learning processes in Statistics. These quizzes have been carefully developed to incorporate immediate, tailored feedback to address each student’s particular errors and hence foster their statistical thinking. The use of quiz software can provide a highly stimulating and challenging e-learning environment in Statistics education that enables students to engage with the subject and make a smooth transition towards statistical literacy, which is a greatly-prized graduate attribute.

Web-based multiple-choice statistics quizzes

Tailored Feedback
Assessment

Intended Learning Outcomes for “Intelligent citizens”

Model Choice

An exam question in Probability often requires students to reference, from a brief description, the family of probability distributions they should work with, in order to solve a problem.

Model Choice offers a graded series of scenarios, at a level appropriate to students’ current learning, that tests their ability to do this.

This idea started 20 years ago as a tutorial example on paper. In the early 1990’s, it was implemented on computer as part of the STEPS project.

Example of Model Choice Question (2 attempts) - Feedback

The number of questions a student gets correct in a multiple choice examination, given that the student guesses all the answers. The number of times the same student has attempted the examination in order to pass it for the first time.

Which of the probability distributions listed below would you use to model these two random variables? (You might need to select more than one option.)

- Hypergeometric
- Binomial
- Negative Binomial
- Poisson
- Exponential

Correct for the 3rd time

Example of Testing Statistics Questions - Feedback

The idea of this project was that the use of real stories and data sets (see Gal and Garfield, 1997) with novel material is recommended when teaching Statistics.

Sometimes questions should contain more information than is necessary, in order to teach students how to be selective. Questions refer to specific principles of the course and the questions are constructed based on both the context of the lab in which the quiz is used and the relevant lectures.

There is a mixture of types of questions in order to assess both problem solving and knowledge. In creating the different possible answers, it is useful to take into account frequent mistakes that students make.

Testing Statistics

An exam question in Testing Statistics is a greatly-prized graduate attribute.

Example: Model Choice Question (2 attempts) - Feedback

The number of questions a student gets correct in a multiple choice examination, given that the student guesses all the answers. The number of times the same student has attempted the examination in order to pass it for the first time.

Which of the probability distributions listed below would you use to model these two random variables? (You might need to select more than one option.)

- Hypergeometric
- Binomial
- Poisson
- Exponential
- Geometric

Correct for the 3rd time

Example of Testing Statistics Questions - Feedback

The system of Testing Statistics was first piloted as a means of formative assessment in 2008-2009 for a one-year long, Level 1 Statistics course for students who wish to enter Honours Psychology. In 2009-2010 it was further used for summative assessment after being thoroughly reviewed and updated.

- Students generally enjoy the quizzes.
- They use the feedback effectively (e.g. 1 correct answer first time, but 7 correct altogether).
- Students vary enormously in terms of the length of time it takes them to complete a quiz when they use it for formative assessment (e.g. Multiple Regression, 1.36 to 17.26, with 27:13 as an outlier).
- It is possible to create questions of varied levels of difficulty (e.g. Multiple Regression, 23% correct up to 88% correct).
- Students like their individualised summary page.

Students’ Experience

The lab quiz is very useful as it tells you what you got right and what you got wrong so you know which areas to improve upon.

- The feedback is good and also to be given a chance to answer the question for a second time.
- These tests are very good as they give feedback if an answer is wrong and another opportunity to get the correct answer. They also cover quite a broad area of the lab material and so it is good revision for exams and future reports/projects.

- This test was useful as it gave you the correct answers at the end so you could look over what you had got wrong and what you need to work on.
- I like the test format. Receiving feedback on incorrect answers helps you gain the correct answer and understand where you went wrong. The explanation at the end is also useful. A worthwhile test method.
- Helpful to review topics we have gone over, and the feedback system for incorrect answers is helpful.
- Good method at the multiple choice makes you think twice about your answer and the wording.
- Awesome

Students’ Comments

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An Open Invitation

Please, visit the sites www.mathstore.ac.uk/modelchoice
www.mathstore.ac.uk/teststat
and provide us with your feedback!