Using R for Active Learning and Self-assessment in an e-Learning Environment

Arnau Mir, Margaret Miró-Julià and Monica J. Ruiz-Miró
University of the Balearic Islands
Palma de Mallorca, SPAIN
The Bologna Process

The Bologna Process is a series of changes being implemented in Europe to restructure tertiary education by 2010

- European agreement initiated in 1999 (29 countries)
- So far 47 countries have signed
- Created a European Higher Education Area (EHEA)
- Purpose of fostering increased mobility of students and graduates throughout Europe
- Making academic degree standards and quality assurance standards more comparable and compatible throughout Europe
European Higher Education Area

• Main points
  – Increase attractiveness and transparency of HE;
  – Increase mobility of students and professors throughout Europe;
  – Facilitate recognition, comparable and compatible degree structures;
  – Reform degree system, standardized European credit transfer system (ECTS);
  – Quality assurance, common guidelines and standards in quality assurance HE;
  – Adapt HE to labor market
European Higher Education Area

• Redefinition of the teacher’s role:
  – Use of new teaching methodologies: basic skills are mastered while developing conceptual thinking and modeling skills
  – Use of innovative learning strategies: IT technologies

• Redefinition of the student’s role:
  – From mere recipients of knowledge to active learners
  – Improving student’s learning process: lifelong learning
The challenge

• Teach Math to Biology and Biochemistry majors

Math 20100
6 ECTS
Algebra, calculus
(including diff eq)

Math 20104
6 ECTS
Statistics
(CI, HT, MLR)

• Provide 150 h of student work without increasing professor’s workload

Arnau Mir, Margaret Miró-Julià and Monica J. Ruiz-Miró
The project

**Mathematics in Science**
- common language
- aids formulation, analysis and solution of practical problems

**Students**
- are no longer the people our educational system was designed to teach
- significant social changes due to technological explosion

**PROJECT GOAL:** mastery of basic skills while developing conceptual thinking and modeling skills using software that improves mathematical and statistical education and provides self-assessment

**An e-learning tool: R-QUEST**
- tries out new forms of active learning
- where students discover, process and apply information
- in problem solving activities
- that explores the learning process
- and uses self-assessed methods

Arnaud Mir, Margaret Miró-Julià and Monica J. Ruiz-Miró
Using R for Active Learning and Self-assessment in an e-Learning Environment

R-QUEST

- We want students to take a more active role in their learning process
- Student’s performance is driven by assessment, introduce new assessment methods
- By using IT technologies: virtual learning environments (Moodle)
- R-QUEST is an autonomous system based on self-assessment methods that guide the student throughout the learning process of the R statistical package
How does R-QUEST works?

• Weekly lessons are devoted to a single topic that is related to a regular classroom topic
• These lessons consider one or two problems that must be solved using R
• To help students learn R, handouts of required commands are available on-line together with quizzes to allow students to practice
• The “standard” student has to devote 1.5 hours each week to learn R
How does R-QUEST works?

• The number of questions for each quiz varies from 2 to 9, a typical quiz has 5 questions
• Each question has between 10 and 15 variants that are randomly assigned each time the quiz is open by the student
• The quizzes are adaptive in the sense that questions can be answered until the correct answer is found
• To motivate the students, they count as a small percentage in their final grade
Technical aspects of R-QUEST

• Questions are written in LaTeX
• LaTeX questions are transformed into a Moodle quiz format using GIFT
• A program in python has been designed
• python was chosen due to its quality and productivity
Conclusions

• The R-QUEST methodology makes learning R an easy chore
• R-QUEST can be used by the students in an autonomous manner, student’s are aware of their progress
• R-QUEST helps the students to better understand topics related to Math and Statistics
• The academic results support the usefulness of the method
• The results encourage us to continue working in improving the method
THANK YOU
for your attention!

Any questions?