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

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

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

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

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

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

The challenge

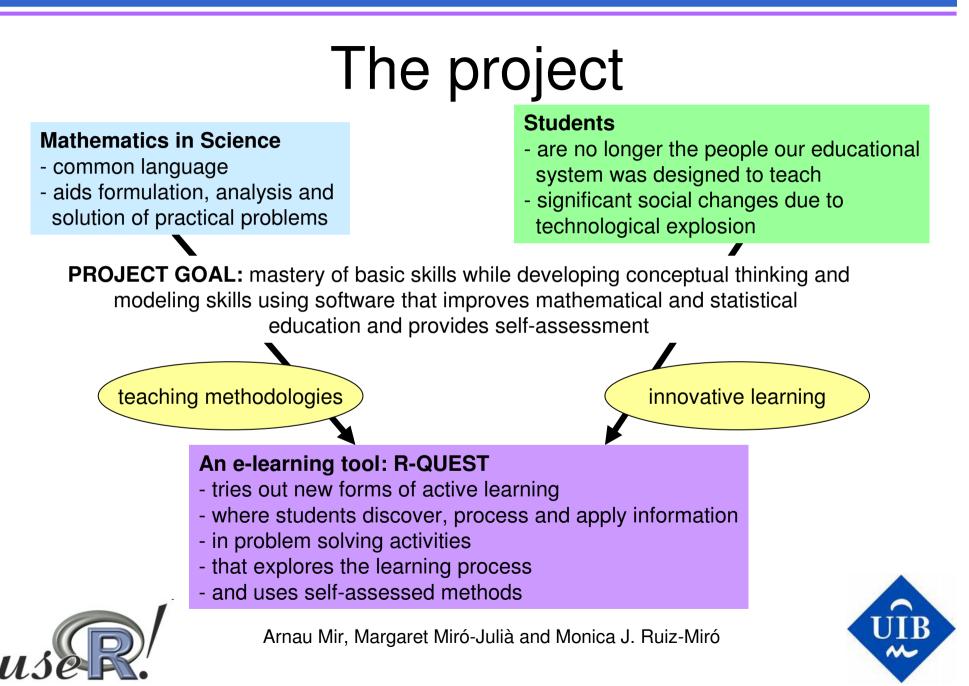- Teach Math to Biology and Biochemistry majors

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

teaching methodologies

innovative learning

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

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

R-QUEST

- We want students take a more active role in their leaning 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

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

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

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

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

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

Technical aspects of R-QUEST

- Questions are written in LaTeX

- LaTeX questions are transformed into a Moodle quiz format using GIFT

- A program in phython has been designed

- python was chosen due to its quality and productivity

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

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

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

THANK YOU
for your attention!

Any questions?

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