



# Learning Math in the context of European Space for Higher Education

*Salvador Merino Córdoba*  
*Department of Applied Mathematics*  
*University of Málaga (Spain)*

**TIME 2010**

Learning Math in the context of ESHE. Page 2 / 20



## Bologna Process

Nowadays, European Universities are immersed in the implementation of a common area of knowledge development through making their teachings equal.

In this work we will try to focus and specify those more relevant aspects of the implementation of the European Higher Education Area (EHEA) in the teaching of mathematics

# Tools for distributed learning

In a new technological and scientific framework, the growing interest among teachers for knowledge and application of new teaching tools, prompts us to establish criteria for the successful implementation of new educational paradigms, from:

- ❑ Distributed learning
- ❑ The strategic plans in teaching mathematics



## Current Situation

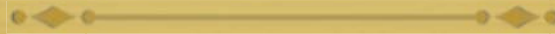
The creation of Masters and Degrees in each of academic disciplines brings on one hand, a task to standardize the teaching and, secondly, a specialization in the different races.

Therefore Mathematics as cross-training, provide to others in a rigorous scientific method and, at the same time, receives the richness of new teaching methods in the environment for Information and Communication Technologies.



## Previous teacher training

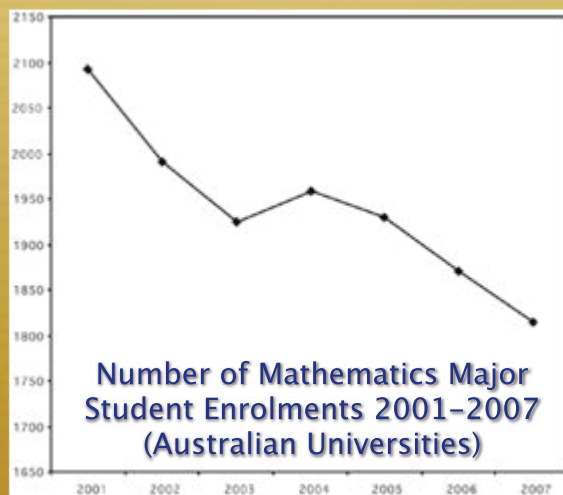
The procedure and mathematical knowledge are still present in their own teacher training and are part of its scientific basis.



Therefore it is important to deepen in its foundations through the culture and history of mathematics, continuous training in the geometrical and algebraical principles, the establishment in a way and order of proceeding through analysis and logic, and its applicability in both numerical and statistical results.

## Transmission of Mathematics

From Socrates or Pythagoras to present days, every mathematic tutor has felt the will of having a real treasure full of knowledge along with the responsibility of transmitting it to future generations. The difficulty of abstractions that mathematics have can not be compared to any other discipline.

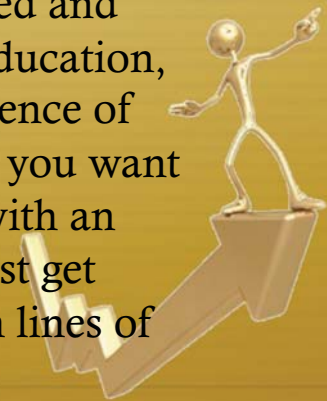




# Mathematics Teaching Strategic Plan I

It may seem pretentious the elaboration of a Strategic Plan for the development of teaching within the Mathematics departments. We could even have doubts about the inherent independence in academic freedom.

Most universities have come a way long enough within the educational innovation to recognize its need and make a start. The experiences of ICT use in education, both individual and team, suggest the convenience of developing a cooperative effort in this field. If you want to get some quality training materials, along with an adequate technological infrastructure, one must get together the whole efforts and define common lines of implementation.



# Mathematics Teaching Strategic Plan II

Following the traditional pattern of all the Strategic Plan, we have to detect weaknesses, threats, strengths and opportunities in teaching Departments. It is therefore usual the SWOT diagram.

Hence we set objectives and develop courses of action which allow both to correct the errors detected and reap the benefits that arise today.

Once this preliminary analysis is made, an overview of the mathematics teaching, and how we want this to be in the future, must arise. It should indicate how professor teachings and support services needed for this should be, adapting the technology to this new paradigm for teaching and learning.



# Mathematics Teaching Strategic Plan III

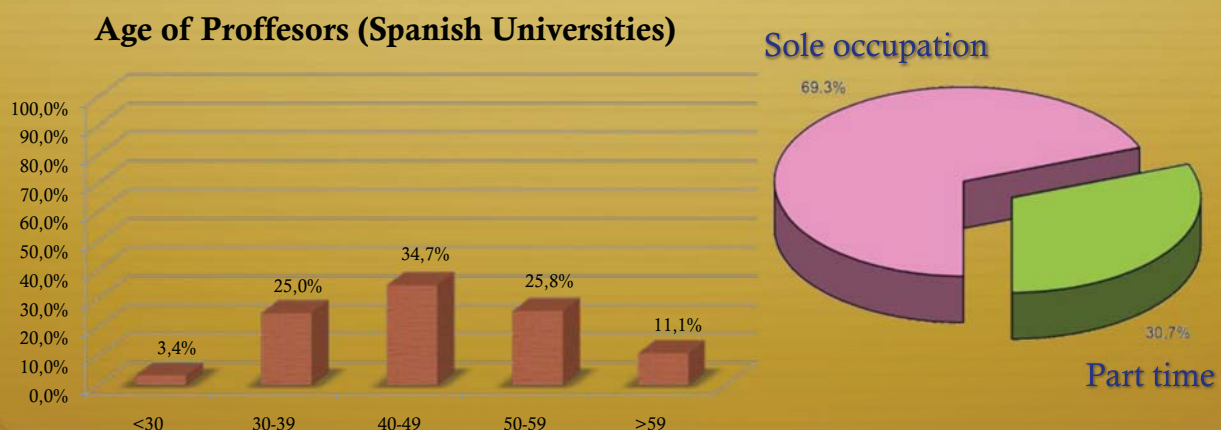
To carry out this plan some characteristics are required:

- the innovating culture of the members of the Department
- their commitment to teaching
- their previous experience in projects of educational innovation
- the ability to adapt themselves to new models of education that EHEA contains

From this vision, the development of the objectives and the plan lines will be a natural process that will require follow-up measures and indicators of success or failure in its implementation. The managements of the departments should encompass the phases of the type of students, their specialities, physical and budgetary resources and the staff assigned for it. All this happens within the current educational trends, which affect the class attendance and a virtual online learning as well as the training along a lifetime and distance education.

## Technological change

The invention and subsequent diffusion of computers has meant a radical change in our society. Today, some generations live completely involved in the daily use of computers and their applications, while others ignore most of their possibilities. This has produced not only a change in scientific methodology, but also a depth social misadjust and educational imbalance.





# Teacher Assessment

Most maths teachers have managed to integrate the importance of the use of Information and Communication Technologies in their research tasks. Today, most of the discoveries in this field would not be possible without a computer checking and, afterwards, its immediate international diffusion.

Number of students (Spanish Universities)



New students (Spanish Universities)



## Mathematics in the new degrees I

We can see how today we are back to giving main importance to the knowledge of mathematics. Particularly, in scientific and technical careers, nearly half of the credits that we find in the first basic training course belongs to this field.

Hence the effort needed for its knowledge leads to a greater ease for the deepening of other disciplines.

Basic course in Industrial Engineering (Malaga, Spain)	
6 ECTS in each subject	
First Semester	Second Semester
Algebra	Advanced Calculus
Calculus	Statistics
Physics I	Graphic Expression
Computer	Physics II
Chemistry	Business Organisation

## Mathematics in the new degrees II

Within the planning of the mathematic teaching in Spain, as part of the EHEA, its knowledge has been focused on:

- ❑ linear algebra
- ❑ classical and differential geometry
- ❑ differential and integral calculus
- ❑ differential equations and partial differential
- ❑ numerical methods and algorithms
- ❑ statistics
- ❑ optimization

## Tools for teaching

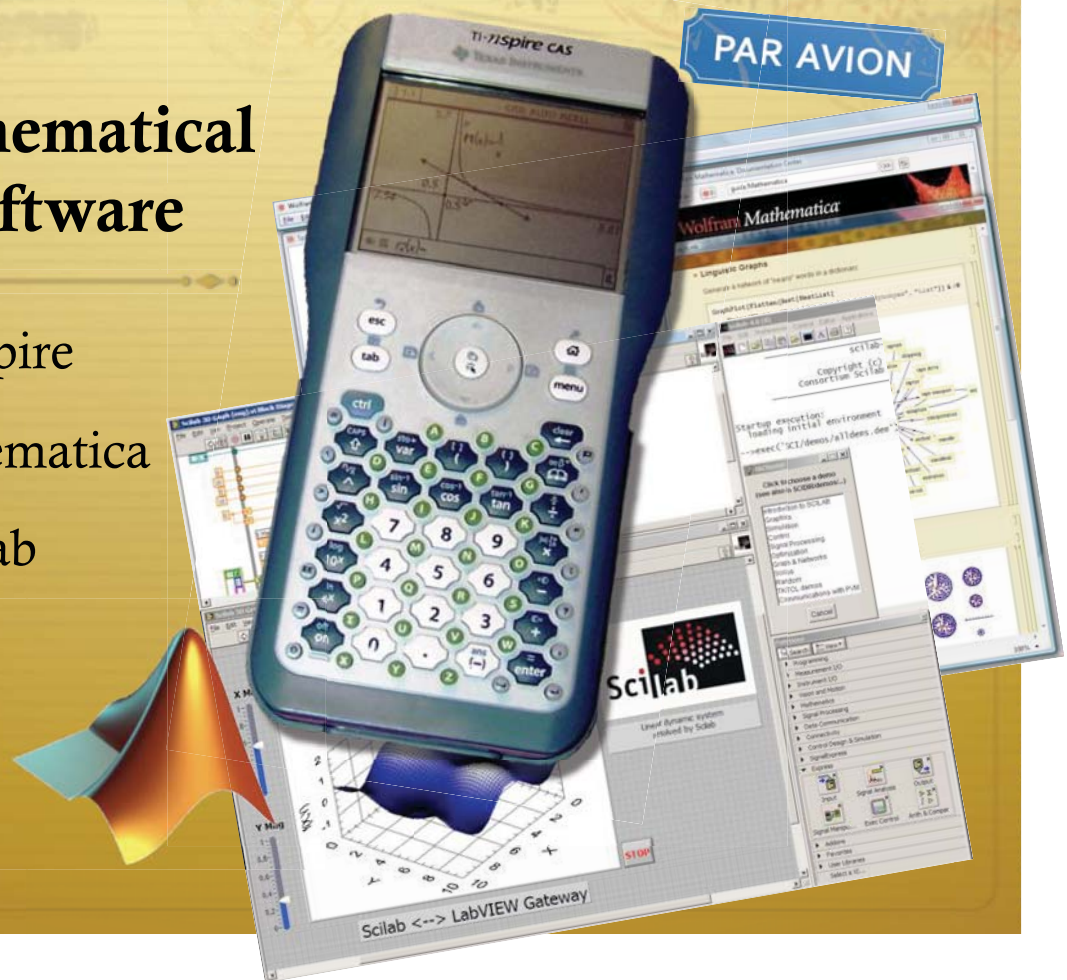
The tools used for the improvement of scientific knowledge have a great student participation, some of which are:

- ❑ Mathematical Software: **TI-Nspire, Mathematica, MatLab, Scilab**
- ❑ Creating Webs: **HECACEJ**
- ❑ Data representation: **SPSS and Excel**
- ❑ Virtual Campus and Tutorials: **MOODLE**
- ❑ Self-assessed Practical Classes: **ADOBE**
- ❑ Online Exams: **SIETTE**



## Mathematical Software

- ❑ TI-Nspire
- ❑ Mathematica
- ❑ MatLab
- ❑ Scilab



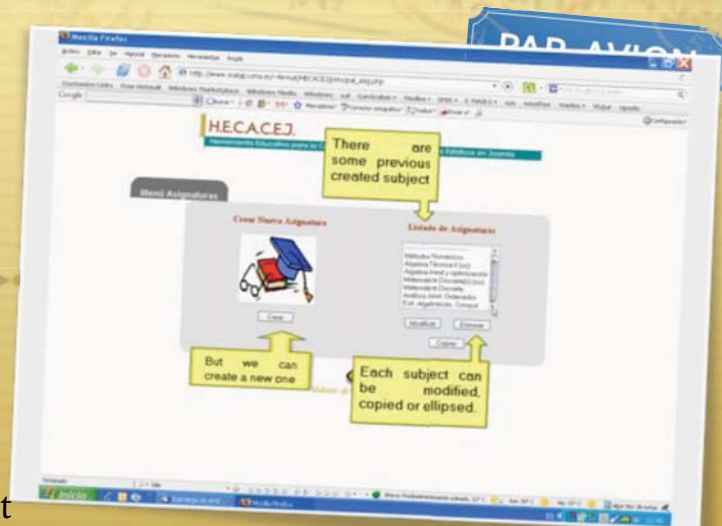
## Creating Webs

### HECACEJ

HECACEJ is a Meta-Content Management System for Joomla! in order to organize tasks more easily. Following patterns of menus one can access directly to the database generated by Joomla!. Some examples of such are:

- Create subjects.
- Assign professors to subject.
- Include further material (news, question sets, notes, forums, bibliography, ...) and links.

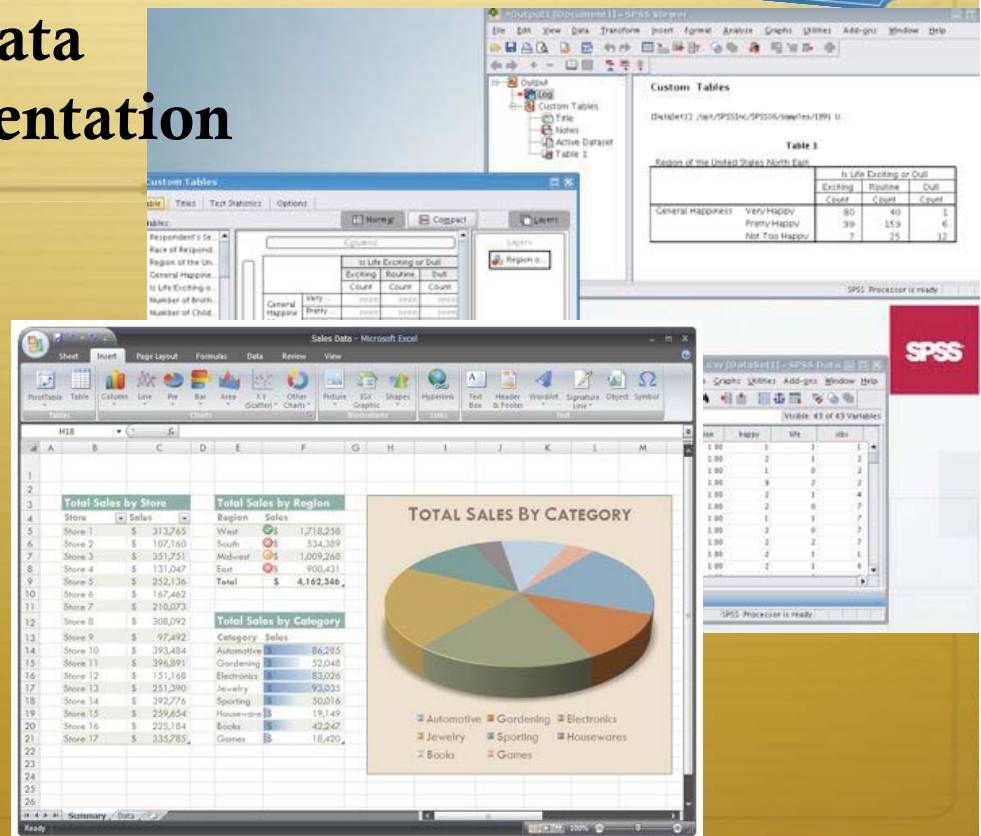
It allows all subjects and material have the same format.





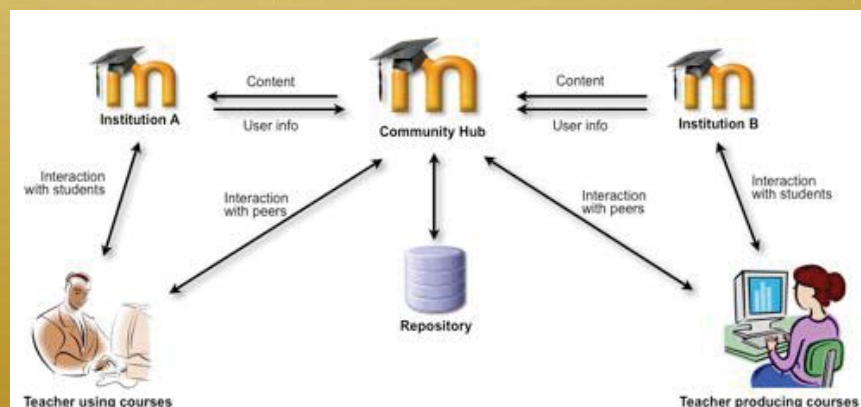
# Data Representation

- ❑ SPSS
- ❑ Excel



# Virtual Campus and Tutorials

Moodle



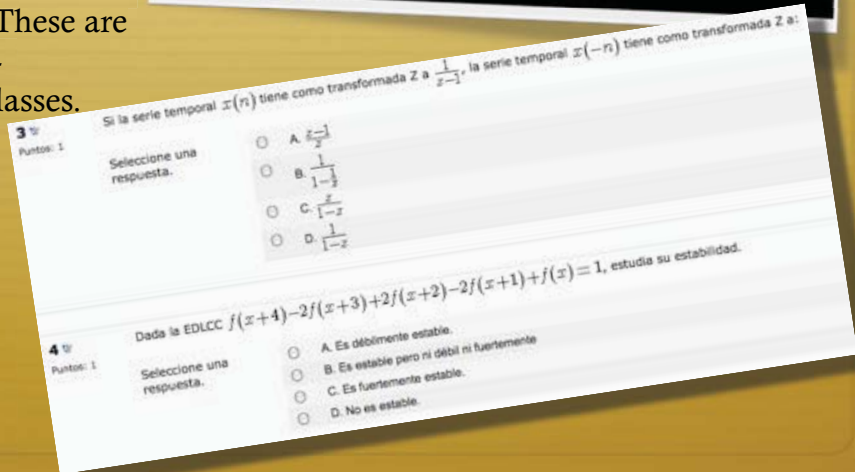
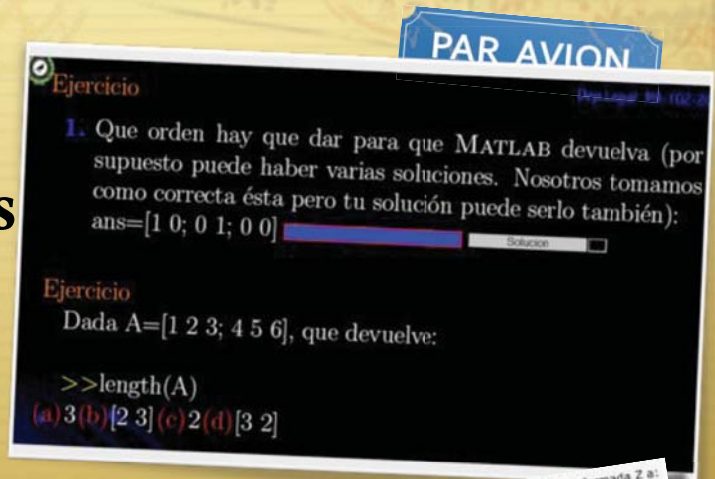
# Self-assessed Practical Classes

## Adobe

Professors can edit PDF files to create open documents. These are used to the student's self-assessment in practical classes.

Mainly test formats are:

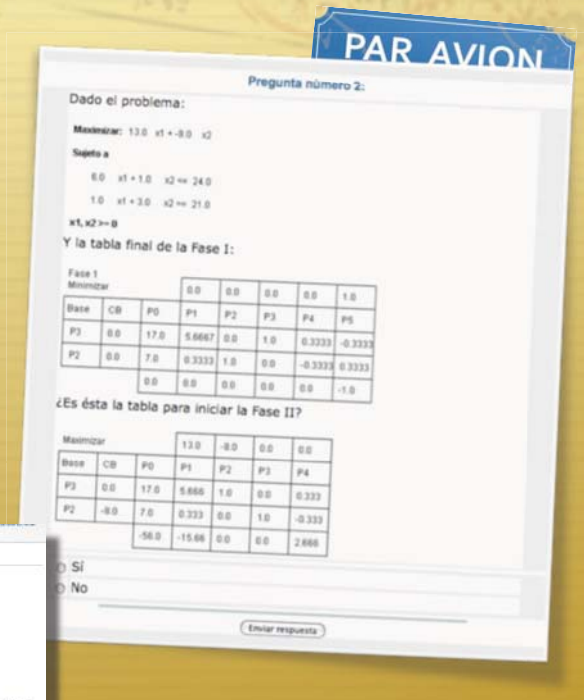
- ◆ True or False
- ◆ Matching exercises
- ◆ Multiple Choice
- ◆ Short Answer
- ◆ Fill in blanks



# Online Exams

## Siette

Software to create automatic and random exams





## References

- ❑ The Bologna Declaration
- ❑ European University Association
- ❑ National Institute of Statistic
- ❑ Strategic Plan of Malaga University
- ❑ Strategic Plan for Mathematical Science:
  - Zaragoza (Spain)
  - Florida, Grand Valley, Illinois, Texas State & Tech (USA)
  - Vancouver (Canada)
  - Valparaiso (Chile)
- ❑ Engineering Mathematics Education in Australia
- ❑ University Strategy 2015
- ❑ New learning models based on technologies
- ❑ Survey of Teaching and Research Staff in Universities



**Learning Math in the context of  
European Space for Higher Education**

**THANKS FOR YOUR ATTENTION**

*Salvador Merino Córdoba  
Department of Applied Mathematics  
University of Málaga (Spain)*

**TIME 2010**