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Development of an active learning methodology for a course of Radioactive Contamination in an Engineering Higher School

José Ródenas, Sergio Gallardo, Josefina Ortiz

**Departamento de Ingeniería Química y Nuclear
Universidad Politécnica de Valencia (Spain)**



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INTRODUCTION

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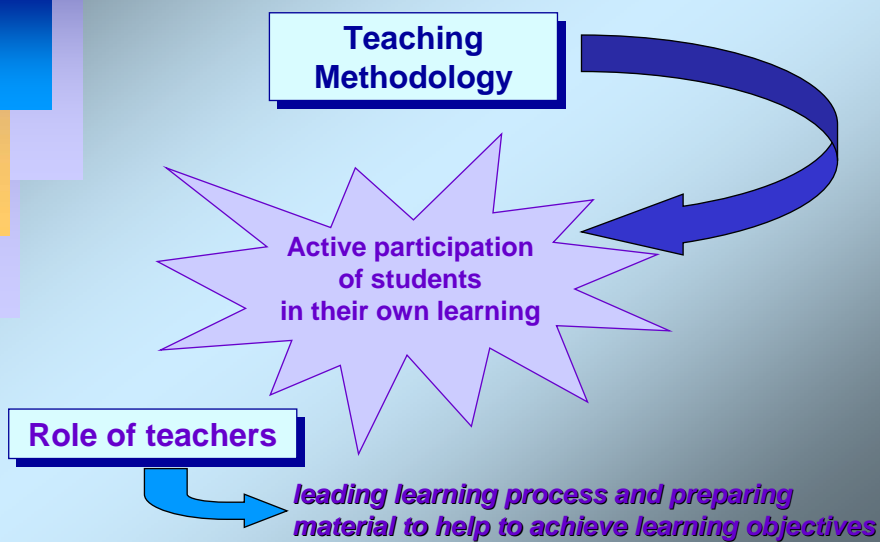
- One of the main objectives of European High Education Institutions is to promote the use of **active learning methodologies**.
- Experience developed at UPV in a course on **Radioactive Contamination** (5th year of IE-Environment)
- Students arrive to this course with scarce or no background in this field.
- Students must be previously provided with the **information necessary** to prepare the discussion.
- A **textbook** has been finally published .



INTRODUCTION

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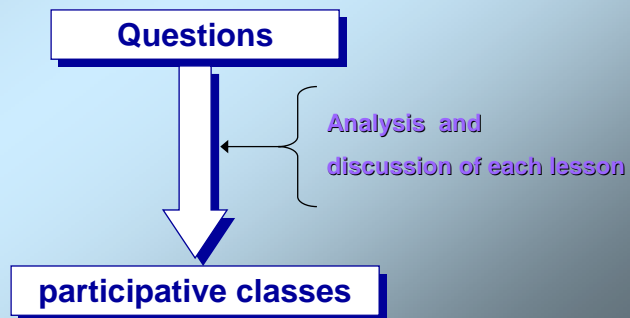
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METHODOLOGY

- *Student active subject of his own learning.*
- *Teachers supervise and direct learning process in order to optimise teaching results.*
- *Involving students in the development of lessons*
- *Personal motivation.*

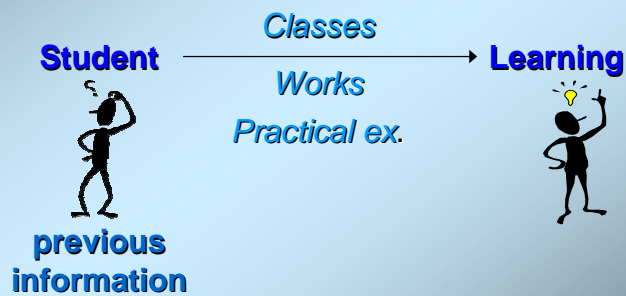


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METHODOLOGY

- **Development of classes**



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METHODOLOGY

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Professor tasks

- ◆ previous recapitulation
 - Establish connection to other lessons
- ◆ to raise questions → Discussion & analysis
 - Motivation {
 - Test on 1st day
 - Exercise surprise
 -
- ◆ Recapitulation at the end of each class



Consolidation of concepts

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METHODOLOGY

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Student Work

- ◆ Previous work
 - Compilation of information {
 - Textbook
 - Bibliography
 - Micro Web
 - ↓
 - Study
- ◆ Active participation in the development of classes
- ◆ Subsequent work...

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METHODOLOGY

- **Works to perform after the class**
 - ◆ They are **voluntary**.
 - ◆ Objective: complementing comprehension of concepts.
 - ◆ Type of Works:
 - ❖ *Exercises of application (numeric)*
 - ❖ *Utilization of computer programmes*
 - ❖ *Practical Exercises in Laboratory*
 - ❖ *Analysis of objectives*
 - ❖ *Elaboration of questions*

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EVALUATION

- The learning process of all students is conditioned by the **evaluation method** applied.
- For an active learning methodology the best evaluation method is the **continuous evaluation** of the student participation in classes.
- **Each exercise** (numerical, computer, laboratory reports, other works,...) performed and presented during the course **receive a mark**.
- Complemented with **traditional methods** such as written or oral exams.

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EVALUATION

- Whenever it is possible the final evaluation is carried out by means of an **oral presentation of a work** developed by a group of 2-3 students.
- The mark obtained with this work will complement the continuous evaluation taking also into account all marks obtained from voluntary individual exercises and works.
- **Final written exam**
 - Basic concepts*
 - Problems with practical application*
 - Free questions*

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EVALUATION

EXAMPLE OF FREE QUESTION

Given the titles of lessons of the course...

- A. State the 10 most important objectives of the course covering the four parts, but necessarily parts I (Basic Concepts) and III (Radiological Protection and Contamination Sources). Comment briefly these objectives.
(Not more than 2 lines each one)
- B. Choose 3 of these objectives and develop them with a schema such as the following:
 - Motivation (why).
 - Finality.
 - Relation to other points.
 - Questions and answers on the chosen point (at least 1)

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RESULTS

Year	NS	Refused		Approved		Notable		Excellent		Honour	
96/97	21*	7	33.33	10	47.62	1	4.76	2	9.52	1	4.76
97/98	53*	6	11.32	23	43.40	18	33.96	4	7.55	2	3.77
98/99	30	8	26.67	11	36.67	10	33.33	0	0.00	1	3.33
99/00	24	4	16.67	8	33.33	7	29.17	2	8.33	3	12.5
00/01	23	0	0.00	12	52.17	8	34.78	2	8.70	1	4.35
01/02	28	3	10.71	7	25.00	14	50.00	3	10.71	1	3.57
02/03	18	2	11.11	4	22.22	7	38.89	3	16.67	2	11.11
03/04	14	0	0.00	3	21.43	6	42.86	3	21.43	2	14.29
04/05	17	0	0.00	5	29.41	6	35.29	4	23.53	2	11.76

NS = number of students evaluated

* Students from Chemical Engineering joined the group.

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CONCLUSIONS (1)

- **Active participation** of students → improve their learning.
- **Not a master class** → discussion with questions addressed to the comprehension of concepts as well as to fix objectives for each lesson, checking out that they have been completely achieved .
- It is indispensable to obtain the **adequate motivation** of students.
 - ◆ to adjust the development of the classes in terms of the feedback obtained from the attitude and work of students.
- To provide students with documents so that they can prepare lessons in advance (web page, **textbook**)
- Activities proposed to **stimulate the participation** of the students.
 - ◆ not compulsory but with positive repercussion in the final mark

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CONCLUSIONS (2)

- The **elaboration of lesson objectives** by students as an exercise is very useful to enhance their learning process.
- The **continuous evaluation** seems to be the best method when an active learning methodology is applied.
- An additional evaluation taking into account understanding of basic concepts, its application to practical cases and the free exposition of the objectives of the course by the student has been shown, in general, very **positive**.
- **Marks obtained by the students as well as their satisfaction** seem to confirm this point.

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