

# **Criticism as a tool for active learning.**

## **An example of application in Statistics**

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### **Abstract**

We are introducing an active learning method. We developed this methodology using virtual Moodle forums. The group of students advances in the knowledge of the statistic with this tool. The technique ensures that students learn the subject by developing problems by working collaboratively and critically.

Part of learning Statistics in EUETIB relies on the critical method: each student solves problems. The solution is published. Other students review the publicly resolution. Criticism of the resolution helps students better understand the problem.

### **Keywords**

Active learning methods; critics; forums; teaching methodologies

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## 1. Introduction

The practice of teaching today requires new role models. We live in a globalized world marked by information and communications technology. We have to set aside some traditional teaching practices and we must implement new strategies to teach students to learn. The student should aim to be a proactive critical subject in society. Reflection is the basis for the construction of knowledge. From the knowledge and reflection the student analyzes and criticism. In this way, the student understands better what he is learning.

The incorporation of digital platforms in education promotes new ways of learning. The university promotes synchronous and asynchronous participation between subjects.

One of the technological tools that encourage interaction and asynchronous remote Virtual Forum is to be found on platforms such as Moodle. The virtual forum is a tool commonly used in educational platforms. The forum is a means of communication between everyone (teachers and students). The virtual forum to share ideas and help search.

The purpose of this communication is to present an efficient way for a student to learn in collaboration with the group by problem solving method, analysis and interactive review using the forum.

Criticism requires that the student be transformed into their training course in a subject committed to their learning through the implementation of techniques, strategies and methods of collaborative study which the teacher provides. The teacher guides the students. Communication in the forum should be clear and precise. It is vital to know how to communicate effectively in engineering.



The core of the method focuses on individual responsibility for solving a problem that will be published on a wall, on which two companions made their criticism, also publicly. After criticism, the student published the final version of the exercise.

## **2. Subject**

The framework of this communication was conducted in Statistics 6 ECTS (150 hours of learning). The student load is distributed over 15 weeks.

## **3. Methodology**

The method focuses on problem solving based on the following guidelines:

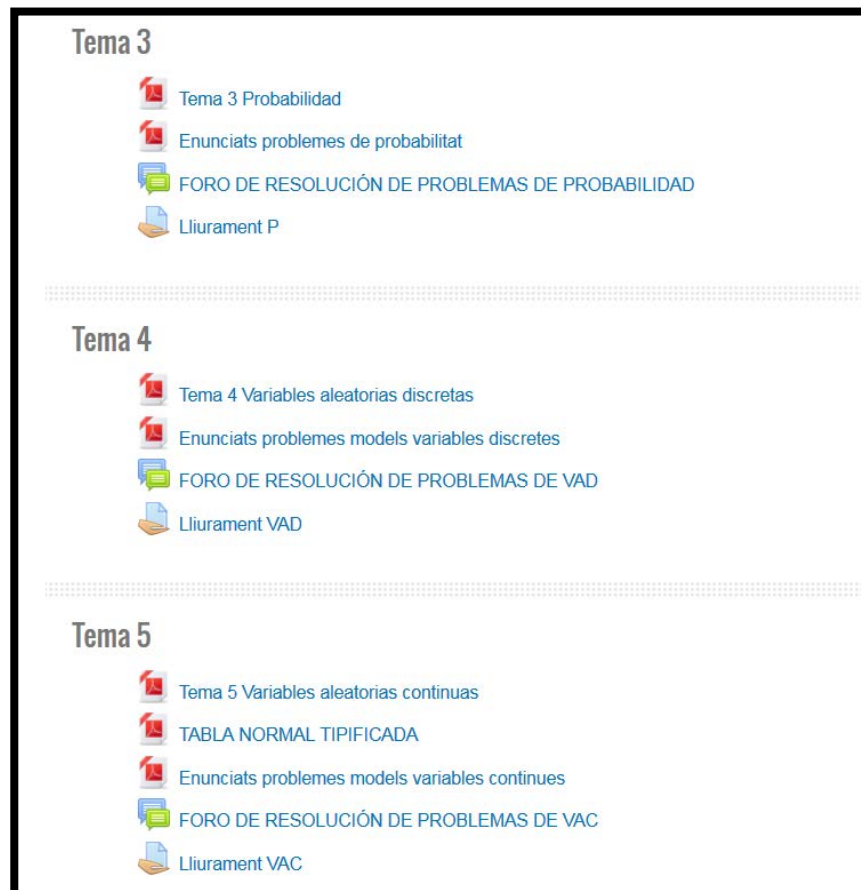
- Within each theme, we present an extensive list of problem statements. We randomly assigned an exercise to each student. In two days, the student must publish the resolution of the problem in his wall.
- Then, each student analyzes of critical and constructive way two of the problems. Generally criticism has 2 days to review the problems of colleagues. Consequently, every problem has 3 "workers", the student responsible and the two reviewers. The critical review is also public. It hangs on the wall of the problem.
- Finally, collected all interventions, responsible for every problem, after a period of reflection and analysis of the proposals, he publishes the refined and final version of the resolution on the wall. This phase lasts two days.

This methodology has a wide range of variants depending on group size and number of problems. The timing of the activity is important. With well-defined guidelines moderator participation in our case the teacher must act very promptly.

In the evaluation, the teacher should consider a broad assessment of value judgments on quantitative and qualitative criteria.













The critical approach requires great teaching effort to break the dependency relationship with the student. This strengthens the autonomy and integration of the group as a starting point for the construction of knowledge. The student must engage deeply with their own process of knowledge construction for the approach to be successful results.



**Figure 1.** Statistical activities.

#### 4. Results

Statistics is distributed in 6 subjects and each activity described in the section on methodology is developed. In all this activity problem it weighs 20% in the evaluation. This process we are building for 10 years.

Problema 8.22		Enrique Garcia Plazas	5	Garcia Plazas Enrique dv, 22 mai 2015, 22:48
Problema 8.27		Marti Garcia Martinez	4	Garcia Martinez Marti dv, 22 mai 2015, 22:27
Problema 8.5		Marcos Lopez Altes	4	Lopez Altes Marcos dv, 22 mai 2015, 16:39
Problema 8.31		Adrian Mora Pedregosa	4	Mora Pedregosa Adrian dv, 22 mai 2015, 15:40
Problema 8.6		Jesus Maria Merino	4	Maria Merino Jesus dv, 22 mai 2015, 15:11
Problema 8.36		Rafael Roldán Ubeda	4	Roldán Ubeda Rafael dv, 22 mai 2015, 15:08
Problema 8.4		Enrique Oliveros Muñoz	5	Oliveros Muñoz Enrique dv, 22 mai 2015, 14:32
Problema 8.44		Enric Casanova Batlle	4	Casanova Batlle Enric dv, 22 mai 2015, 13:16
problema 8.57		Arnau Parareda Pujolras	7	Parareda Pujolras Arnau dv, 22 mai 2015, 13:12
Problema 8.38		Neus Figuera Pérez	4	Figuera Pérez Neus dv, 22 mai 2015, 12:31

**Figure 2.** Discussions of problems.

In these 10 years, we have worked with groups of different sizes, from 30 to 60 people. In all cases the results have been classified as very satisfactory. Students and teachers see positive experience.

We analyze the activity comparing the initial and final papers. This analysis was carried out in 4 work of the Statistics course and found the results shown in Table 1.

**Table 1.** Results obtained in the tests already performed.

	Before	After
Work 1	5.3	7.5
Work 2	6.1	8.0
Work 3	5.8	7.7
Work 4	6.3	8.4

Data analysis shows that peer interaction helps the student growth.

## **5. Conclusions**

There has been a method of problem-based learning that is based on the critical peer reviews. The present method allows the student to be more critical and analytical. It allows peer feedback.

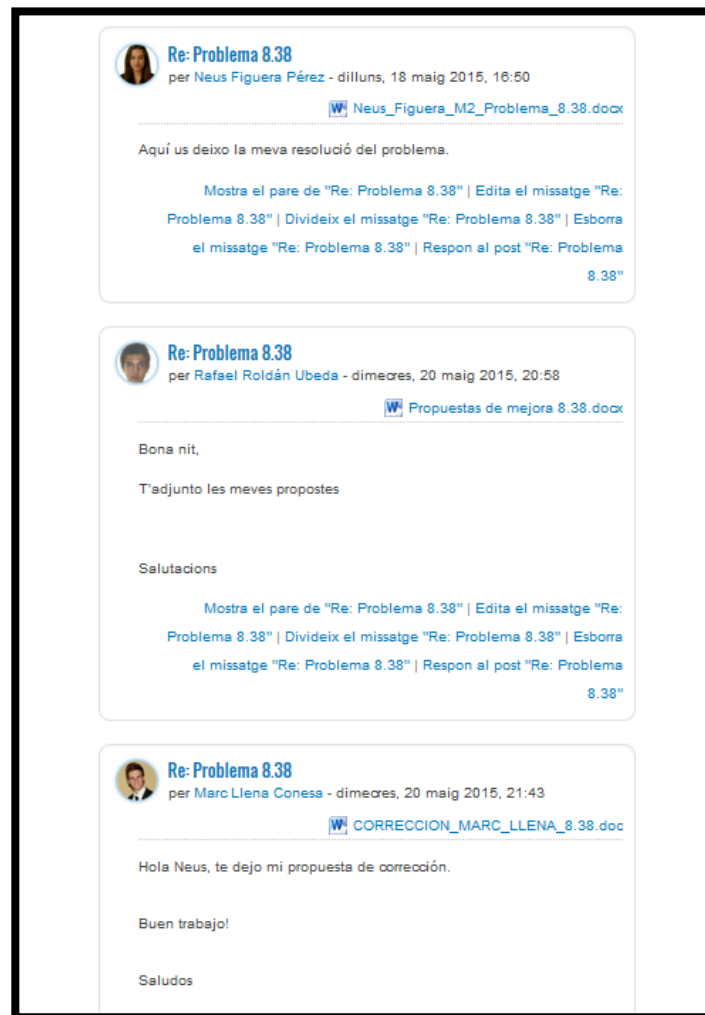
The approach helps to stimulate critical analysis and reflection. It also stimulates the proper formulation, it helps the student in the use of statistical vocabulary, concepts and structure.

This methodology improves student performance. This activity enhances the ability of critical analysis and improve the interaction between individuals in the collaborative learning. Consequently we consider appropriate to promote and advise the use of the forum for the resolution of problems as focused tool, in addition to communication, learning of any matter in collaboration with the group.

This learning tool's been developing for a decade in the EUETIB and consider it a good mechanism for student growth.

The student grows in the subject under study and grow in the communication of ideas with the critical activity. Without much effort, the student compares the way to their peers and this gives tools to himself. Consequently, these reviews represent a growth reflected a posteriori in their own work and, above all, in their learning.





**Figure 3.** Activity in a discussion.

We believe that this methodology can be extrapolated to any subject in the field of engineering and we recommend its use. The critical review is an excellent learning tool to train engineers.

## 6. References

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