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Looking for the Antidote for Contaminated Water: Learning Through an Escape Game

María Jesús Santos¹(✉), Mario Miguel², Araceli Queiruga-Dios³,
and Ascensión Hernández Encinas¹

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Abstract. This article presents a Breakout played with students of the Master in Teaching of Compulsory Secondary Education and Higher Secondary School, at the University of Salamanca, as part of their training as future teachers. Both the difficulties and the advantages that this type of educational activities bring out are analyzed. Moreover, some possibilities of its possible utilization in the classroom, at different educational levels, are also discussed and presented.

Keywords: Escape Room · Breakout educative · Gamification · Competencies · Assessment

1 Looking for the Antidote for Contaminated Water

I am attending the master course with 14 fellows, in a “Physics and Chemistry Didactics” lesson. An unknown man arrives at the beginning of the class. He identifies himself as the person responsible for the Health Department of the Spanish Government. He asks for our help in solving a serious problem existing in the building of our Faculty: the water is absolutely contaminated. We have been selected to begin working as part of an interdisciplinary team of graduates in Chemistry, Chemical Engineering, Physics, and Energy Engineering.

On the classroom screen we see a video where the problem is set out: the polluted water of our building could be extended both to the University of Salamanca and to the rest of the city, endangering the life of the population. In addition it would tarnish the celebration of the VIIIth Centenary of our institution, it would project a negative image of our city. We have to find the chemical combination that could purify the water as soon as possible to avoid massive poisonings among the inhabitants of the city, students, and tourists who visit us.

The initial shock turned into an exciting experience. This was the introduction to a game. We have 60 min to solve some riddles and problems to find the antidote and to make the water drinkable.

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The evaluation of the activity, together with the group of players, future teachers of Secondary Education, allowed us to reflect on the difficulties and advantages of this type of activity.

The Breakout activity is conceived as a good practice of innovative teaching, which includes important elements for the teaching-learning process: motivation, work with multiple intelligences, evaluation by competencies, teamwork, promotion of creativity and the students-centered learning.

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Rules_Math: Establishing Assessment Standards

Araceli Queiruga-Dios¹(✉), Ascensión Hernández Encinas², Marie Demlova³,
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Abstract. In 2017, we proposed a European project: Rules_Math, in order to find new rules to assess mathematical competencies. This proposal was a consequence of what we were facing separately in our daily classes. We teach mathematics in several engineering schools, and we want to change the way of teaching and learning for engineering students. Some university teachers from different departments usually teach mathematics as we have learned mathematics. They only give master classes but students usually want to write numbers and formulas to learn and practice mathematical reasoning and to distinguish mathematical symbols. To communicate in, with, and about Mathematics, they need mathematical thinking, and to use aids and tools for mathematical activity. We have included in this papers our proposal to make this possible, and to assess mathematical competencies.

Keywords: Engineering · Mathematics · Competencies · Assessment

1 What Happens the First Day of a Math Course?

In some departments and some universities, lecturers do not choose their courses and they change subjects every year. This makes them to try to adapt to their students. To teach Mathematics to mathematicians, or physicists is (should be) different than to teach future engineers. When you get this, you have half of your work done.

When a trainer first looks at a new course, he usually has an academic guide at his disposal, where all the information about the course is included: credits, previous recommendations, objectives, contents, methodology, assessment criteria, bibliography, etc. So, what a beginning lecturer usually do is to take the contents and prepare some presentations on the course topics.

The thoughts about a new course should start with establishing the goals that the teacher wants students to acquire. Usually, the goals are listed as list

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