Escape rooms as a way to teach magnitudes and measure in degrees in Education

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Introduction

We present answers to the necessity of enhancing students' motivation towards mathematics in the degrees in Early Childhood Education and Primary Education.

Professors carried out an escape room experience based on contents about magnitudes and measure.

Objectives

01
To offer an experience to the students in which they had to work in a collaborative way.

02
To use of mathematical manipulatives.

03
To encourage students to get out of their comfort zone in their future teaching.

Theoretical Framework

Nicholson (2016) defines escape rooms as “live-action team-based games where players discover clues, solve puzzles, and accomplish tasks in one or more rooms in order to accomplish a specific goal in a limited amount of time”.

Theoretical Framework

Sánchez (2018) defines educational escape room as a creative learning environment that can be designed for any level and makes use of characteristics of escape rooms in addition to the elements and objectives of education.

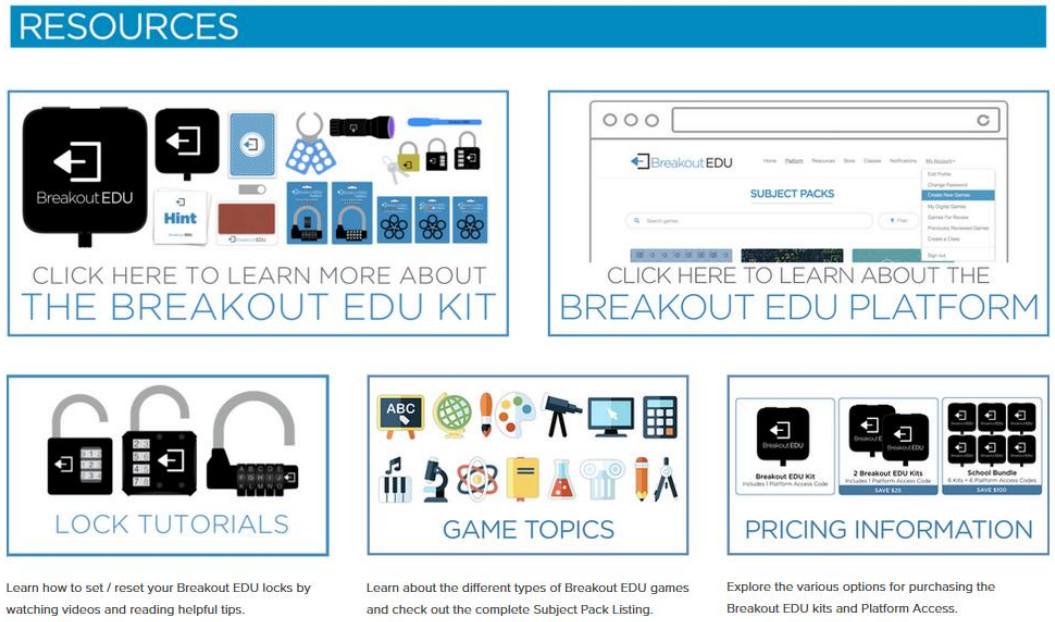
Theoretical Framework

Wiemker, Elumir and Clare (2016) establish four questions:

- Is the puzzle integrated into the storyline?
- Are the clues to the puzzle logical?
- Can the puzzle be solved using only the information within the room?
- Does the puzzle add to the atmosphere to the room?

Theoretical Framework

Some platforms have appeared to make things easier for educators. One of these platforms is BreakoutEDU to create escape rooms.



Theoretical Framework

There are also drawbacks to this approach of classwork. Often, if incorrectly designed, tasks can be focused only in opening boxes, which doesn't differ much to traditional classroom exercises. And a clear disadvantage is the additional work that this requires to the teacher.

Teaching measure and magnitudes through escape rooms

This experience was carried out in three different classes of the graduate degrees:

- Early Childhood Education
- Primary Education

In this part of the subjects, topics such as length, area, volume, time and mass were addressed.

Teaching measure and magnitudes through escape rooms

Having a considerable number of students in each class, the classical approach of escape rooms – this is, confining them in a closed room – was not possible, so other alternatives had to be considered in order to offer a similar experience. Having a single group with the whole class was immediately discarded, due to the possibility of only a few students working through the solutions and the rest doing nothing.

Teaching measure and magnitudes through escape rooms

So smaller groups were required. Due to the lack of physical space, two approaches were contemplated:

- The first one involved giving the students a compressed folder with password-protected pdf files.
- The other approach used the learning management system of the university, in this case, Moodle.

These two methods facilitated the labor of the professors.

Suggested activities

Length: One of the challenges proposed was to obtain the length of a table when shown a series of Cuisenaire rods laid upon one of its sides. In addition to test the knowledge in this topic, this activity assessed whether the students knew how to use this mathematical manipulative.

Suggested activities

The other activity involved to obtain the cylindrical contour of the leg of an advertising pet.

Suggested activities

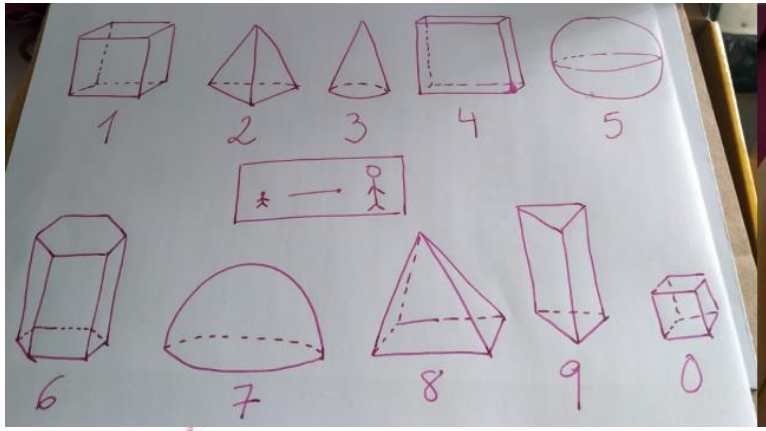
Area: In this task, students were asked to compute the area of a set of floor tiles located near the classroom. This evaluated if they could correctly measure these tiles with a measuring tape or ruler and the knowledge of the formulae of different polygons.

Suggested activities

Volume: In this category, we proposed two activities with different perspectives. The first implied the exact calculation of the volume of an object. In particular, the object was a cube hold by a statue.

Suggested activities

The other activity involved the use of direct comparison of volumes given four hollow geometric bodies, which had to be arranged from smallest to largest.



Suggested activities

Mass: In this case, there also were two different challenges posed. The first one, was a riddle in which the students had to obtain the mass of a number of objects given the weight of several sets of them.. The second activity tackled a similar problem, but in a manipulative way, using a kitchen scale and bags with pebbles in them.

Student opinions

Once the escape room was over we let the student express freely about this different experience. Immediately after finishing that class, they reflected their positive views regarding this kind of activities, as well as enhancing motivation towards mathematical problem solving. In order to obtain concrete evidence of these opinions, students filled an anonymous survey about the activity, its strengths and weaknesses and the changes they would make.

Student opinions

"It's a way to learn and assimilate concepts which are different to the usual ones so, in my opinion, it's more fun." (Student from Degree in Early Childhood Education)

"I liked it a lot. The best of the subject (the rest has been good too)". (Student from Degree in Primary Education)

"The playful environment that it creates and the stimulation to reasoning". (Student from Degree in Early Childhood Education)

Student opinions

In addition to the positive aspects of this activity, some of the students wanted to express in their feedbacks some of the weaknesses they had noticed:

- “It was sometimes a bit stressful because we saw other groups who were very fast and our group was slower, but at the end we finished and we had fun.” (Student from Degree in Early Childhood Education)
- “Some of the test were a bit annoying because they weren't exact amounts.” (Student from Degree in Early Childhood Education)

Student opinions

Some students would like to repeat this proposal in the rest of the subjects of the degree, while others consider that doing it more often would turn it from a success to a failure.

- “I would do more topics with this format.” (Student from Degree in Early Childhood Education)
- “As a complementary activity like a review I think it's a good idea. [...] If the idea is to build the whole subject around it, replacing the theoretical classes, I think it would become a failure.” (Student from Degree in Primary Education)

Conclusions

We can conclude that it has been possible to reach the main objective, which is being able to work on magnitudes and measurement in an innovative way, without reducing to the instrumental dimension of mathematical knowledge.

In addition, the development of the proposal has favored communication among students, favoring a cooperative learning and promoting confidence between peers. Students have been aware of the benefits of escape rooms as a new way to teach, which not only encourages a playful environment but also a good level of reasoning in each of the activities is estimated.

Conclusions

As for difficulties, most of them involved proper use of measuring instruments and precision in the different measurements.

In terms of proposals to improve this experience in the following years, as Nicholson (2016) proposes, instead of students being the subjects of the escape room, we are studying the option of having them create the escape room, so as to increase engagement in the activity and assimilate better the topics discussed.

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Thank you very much for your attention

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