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Escape Room Game for Engineering Students: "Escape Department", a Case Study

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Abstract: The importance of ludic activities alongside educational activities for the involvement of students has nowadays been established. Among the most popular and loved games among today's youths, there is certainly the one known as the escape room. This article describes an escape room organized at the department level, thus involving students of the various engineering degree courses, with the aim of making them appropriate their own spaces in the university structures and stimulating organization skills and teamwork attitudes. The event was also an opportunity for students to explore some of the topics covered in their own course of study and, above all, to learn about topics studied in other degree courses of the department. In this paper it is described how the event was organized and what objectives were achieved. The results are quite good and they encourage the organization of other events that exploit gamification for educational purposes.

Keywords: educational game; motivational effects; gamification; escape room; teamwork; interdisciplinarity

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1. Introduction

The importance of combining ludic activities with didactic ones or of carrying out mixed ludic–didactic activities has also by now been established also for higher education [1,2]. Gamification has also been shown to help students transition to higher-level studies, making it easier to integrate themselves in the first year of the degree course [3], and to increase student motivation and stimulate learning ability [4], also resorting to competitive activities to improve students' involvement in the learning process [5]. Therefore, continuous studies on the possibility of using games in the educational path are carried out [6]. The use of games as didactic tools has also taken hold in the various sectors of engineering education in recent years [7–17]. The motivational role of games in engineering studies has been addressed, discussed and recognized in the literature [18,19]. Furthermore, in addition to motivating youths to study, activities are needed that are able to stimulate social relationships, which are overly sacrificed for virtual ones, the ability to work in a team, and the desire to live in the areas of one's university. Especially after the COVID-19 pandemic, young people have acquired the tendency to live in an isolated manner and to make contact with others only at a distance [20]. Among the games that most effectively stimulate the aptitude for teamwork, there is undoubtedly the escape room, which is currently very popular and appreciated by school and university-age kids. The escape room consists of finding a way out of a room in which a team is locked within a limited time. To be able to escape from the room, the members of the team usually have to solve puzzles, tests, and quizzes. Usually, the competitors find themselves having to understand what to do directly within the game; they do not have any rules or indications before the start. Some escape rooms have a leitmotif that unites the tasks to be faced. Due to the nature of the game, the escape room is also used by companies to evaluate or enhance teambuilding skills [21] and it has become an excellent teaching tool in education to improve student learning and attitudes [22–24]. In the scientific literature, examples of escape

rooms in education are present that comprise all levels, from primary school [25] to higher education, and all fields, such as music [26], pharmacy [27], physics and chemistry [28], computer science [29], mathematics [30], history [31], and English [32], and students report high engagement, testifying that the escape room is a game that helps to learn and acquire new skills [33].

Recently, escape rooms have also been established as a "hot topic" in engineering education [34]. However, in [34,35], in-depth reviews were conducted which highlighted some of the limitations to be addressed in the application of the escape room game in education. In [35], the authors urge the educational research community to progress research on escape rooms to help teachers in their search for new approaches and methods to meet the needs linked to the creation of new educational paths and curricula. The review paper in [34] highlights that educational escape rooms covering interdisciplinary scenarios are still missing and that a more systematic approach is needed to design games whose structures can be easily adapted to different realities. Wanting to try to fill the gaps highlighted in [34], the research question of our work was to verify whether or not it is possible to organize an interdisciplinary activity in the form of an escape room, involving not only students belonging to a single course, but even those in an entire department, trying to outline the criteria followed for the organization in order to make the game repeatable in other institutes. Based on these considerations, and listening to the needs and wishes of the students, as will be illustrated in the next section, we have organized an escape room extended to all degree courses in the department (hence the name of the event, "Escape Department"), focusing on multiple educational objectives: learning about activities carried out in degree courses other than the one to which one student belongs; studying and working in a team, and learning the division of tasks and responsibilities; encouraging students to develop a sense of belonging to the institution and to experience the spaces of the department as their own.

In the next section, the motivation for the organization of the event is explained; in Section 3, the organization of the game is illustrated; in Section 4, the results of the experiment are detailed; in Section 5, the results are critically discussed; and in Section 6, conclusions are drawn briefly.

2. Motivation

With the organization of university studies which, in Italy, has led to scheduling lessons mainly in the morning, it has been noticed that students stay less and less in department rooms. In order to encourage socialization, teamwork and a sense of belonging to one's university, sporting, recreational and recreational–didactic initiatives have been launched in our department. With reference to the latter, given their particular importance, being recognized as educational activities that contribute to educational careers, some events were decided to be organized after consulting the student representatives. With their contribution, an empathy map was drawn up to understand what the students' wishes were. The map is reported in Figure 1.

From the empathy map, it is evident that what the students think, say and feel are in contrast with what they do. Their stay in the department is reduced to what is necessary to attend lectures or to take exams, and they need a stimulus that provides them with a sort of confidence with the spaces (classrooms and laboratories) and colleagues. Given their desire to socialize, and to get to know colleagues and their studies, probably hindered by the recent pandemic that forced them into isolation, and the advice of the representatives who proposed the escape room as one of the most popular activities for children of their age, we decided to proceed with the organization of an event that could meet the expectations of the students. Considering that the issues that emerged were common to all the students of the department, based on the lack of literature on the subject, as evidenced by the study conducted in [34], we decided to experiment with an interdisciplinary escape room that was extended to all students, to verify its effectiveness both in educational and social terms. Although the initiative was set up to address a situation in our department, we believe it

could be helpful to share the details and findings so teachers can replicate or adapt it at their universities.

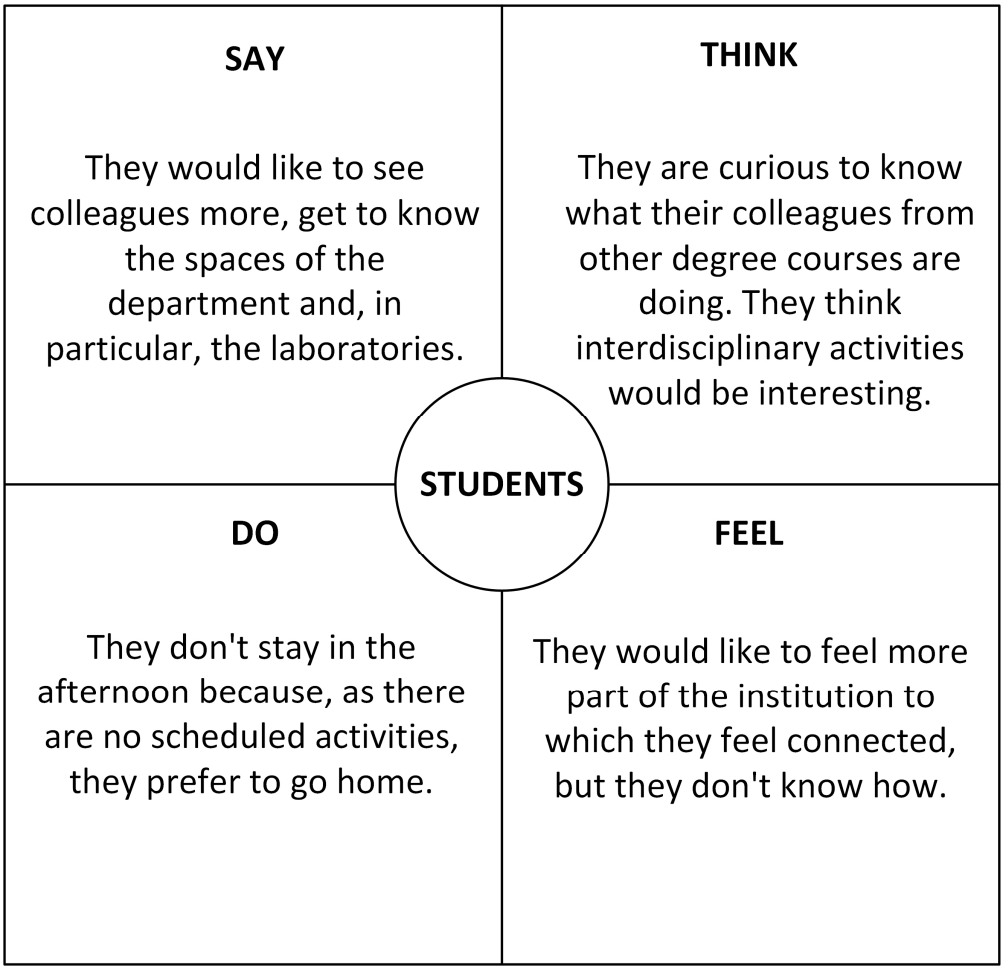

Figure 1. Empathy map drawn up with student representatives, to understand what kind of event to organize.

3. Materials and Methods

The event was supposed to consist of a series of tasks, in laboratories and classrooms, to be performed in a limited time to be able to "escape" from the department.

To organize the game, the procedure outlined in Figure 2 was followed. Once the duration of the game had been established (a whole afternoon), it was determined how many trials would be carried out and how long each trial would last. Then, based on the availability of the teachers and the availability of the structures, we moved on to organizing the tasks. For the easy management of student access to the department structures and in consideration of the duration of the game, we decided to set the maximum number of participating teams at 20, for a maximum of 120 students. We did not fix the number of members per team in a rigid way, but preferred to keep a range of 4–6 members, to aid the students at an organizational level. In organizing the tasks, three objectives were considered: to ensure a balance between the different degree courses, to ensure a balance between the different years of the courses, and to ensure moments of relaxation or fun to break the tension of the competition. To meet such requirements, the actions reported in Table 1 were put into practice.

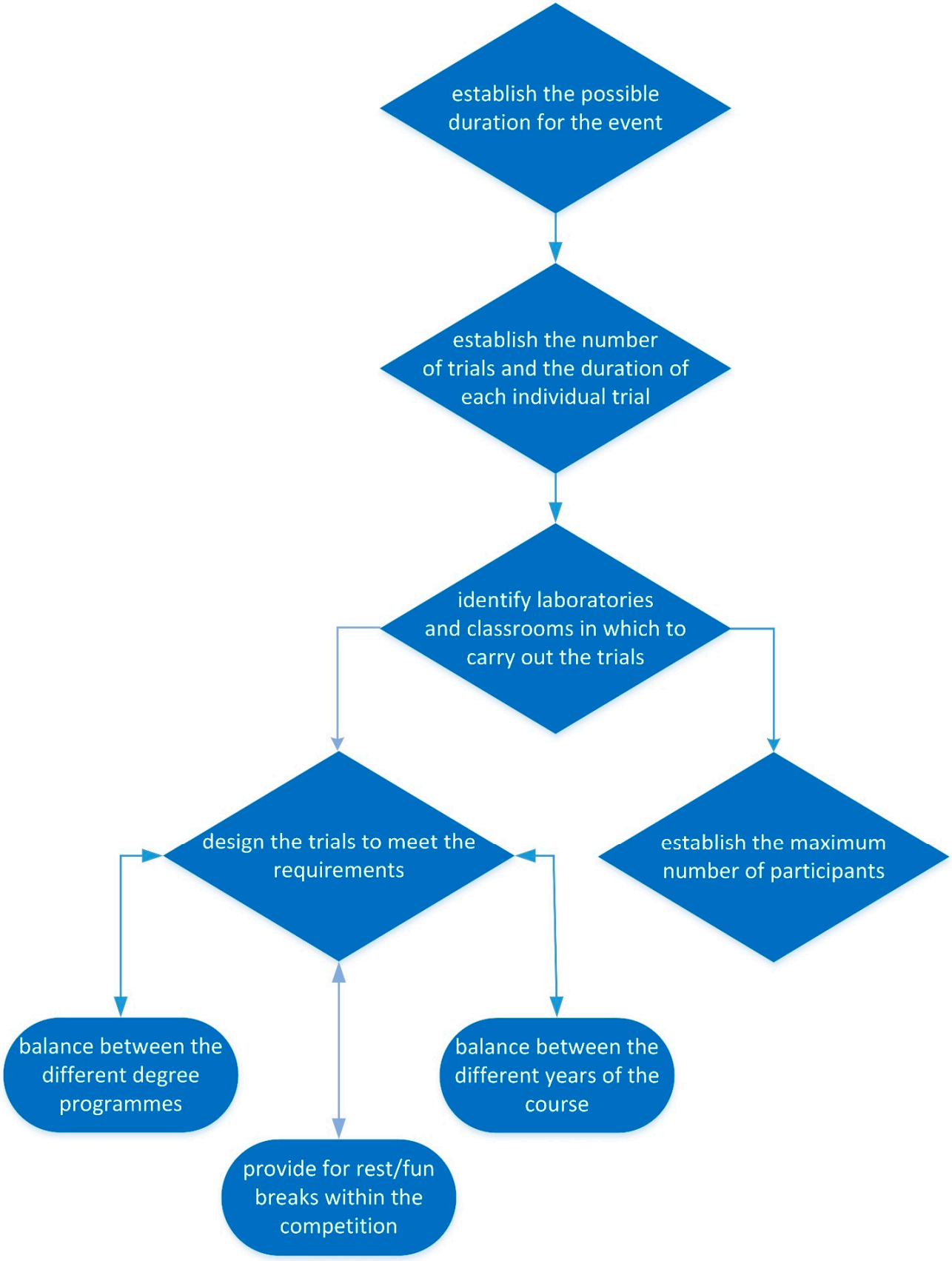

Figure 2. Flow diagram representing the steps followed for the organization of the event.

Table 1. Requirements to be met in the organization of the game and actions implemented.

Game Requirements	Actions
Balance among different degree programs	• The degree courses of the department were grouped into three areas: information, civil/building, industrial. • Each area had a "workhorse" trial. • To ensure everyone arrived with the same level of preparation, 20 days before the game the captains of each team were contacted and provided with information on the tasks, tools to study together with their teams, and exercises to perform. • The didactic material was prepared so that each student could perform each task, regardless of the nature of the task and the student's course.
Balance among different years of the courses	• 5 laboratory tasks were envisaged, with an advantage for the upper-year students, and 5 tests on basic subjects, with an advantage for the first-year students.
Provision of rest/fun breaks within the competition	• A sport test and a musical task were included.

The degree courses of the department were grouped into three areas: Information (electronics, informatics, and bio-engineering), civil/building (civil, and building engineering), industrial (industrial, mechanics, naval, and management). As schematized in Figure 3, two laboratory tests were designed on courses common to all areas (physics and computer science); the other three tasks were chosen so as to each be a "workhorse" for one area and a new topic for the other two, and in order to generate curiosity and involvement. In detail, an electronics task was chosen, characteristic of the information area, to stimulate the spirit of observation and the ability to optimize; an urban architecture task was chosen, characteristic of the civil/building area, to involve the students for the curiosity of better knowing their city; and an industrial 3D CAD (computer aided design) task was chosen, characteristic of the Industrial area, that could be also useful in the other areas.

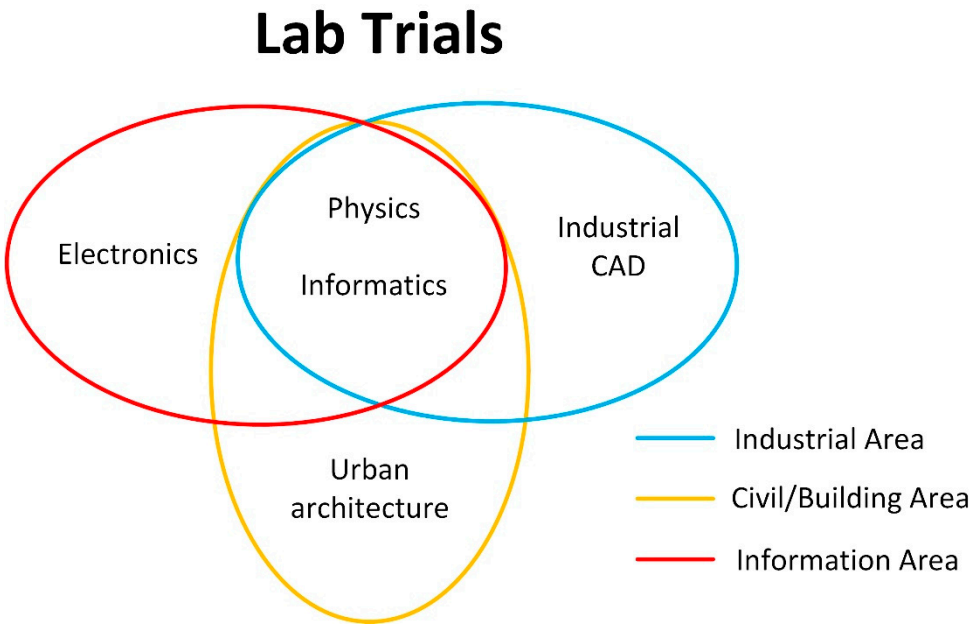

Figure 3. Topics of the laboratory trials and their placement in the three areas in which the degree courses were divided. To make the game balanced between the different areas of belonging of the students, two laboratory tasks were designed on courses common to all areas (physics and informatics) and the other three tasks were chosen so as to each be a "workhorse" for one area and a new topic for the other two.

To balance the competition, all students were put in a position to have all the necessary skills to face all the tests. Table 2 summarizes the tasks and actions implemented to prepare the students.

Table 2. Subjects of the laboratory trials and actions implemented to prepare the students to face them.

Laboratory	Trial	Action to Prepare Students
Electronics	Assemble and operate a circuit, using as few connections as possible.	The students were provided with a possible electrical diagram of the circuit, the diagram of the connections of the board, and an explanation of the operation. From the study of the provided material, the students were able to optimize the connections between the electronic devices in order to build the circuit in a short time, with fewer components and ensuring correct operation.
Urban Architecture	Recognize the main buildings of the city, and examples of modern architecture, and place them on the map.	The students were asked to study, locate, and observe the examples of modern architecture, from the post-war period to today, present in the city.
Industrial 3D CAD	Design complex interlocking solids.	Students were given a 3D CAD design software on which to practice drawing complex solids. Each team was given a 3D print of the solid to reproduce. The dimensions of the solids to be reproduced were kept secret until the trial.
Informatics	Write a numerical conversion program, starting from a known program with all the instructions disordered.	The students were instructed to install a basic programming software. A binary–decimal conversion program with a control procedure was provided. The students had to study how the program worked, understanding every single instruction.
Physics	Build a reflection system to emulate a hologram projector.	This task was designed to be purely manual. Therefore, there were no indications before the game. The students figured out what to do at the time of the test. A brief explanation of the holography was provided to each team at the time of the competition for educational purposes.

We decided to give the students a maximum of fifteen minutes to carry out each task, to which 5 min were added so that the teachers could assign the scores. The scores, which took into account both the time taken to solve the tests and the degree of correctness, were expressed in thirtieths, i.e., the same mark that is used, in Italian universities, to evaluate an exam. This choice was also made because, as required by the escape room format, it is possible to choose a theme, a plot which is the leitmotif of the game. In our case, we chose the engineering university career as the leitmotif. Therefore, before the start, each team was given a "university booklet" in which the teachers marked the "marks" obtained in the tasks. Each teacher was also equipped with a personal register, on which to annotate the marks, both for control and to subsequently speed up the calculation of scores. To better manage the students in classrooms and laboratories, we decided to organize 5 different groups which, in rotation, faced the various tasks. As will be detailed in the Section 4, 5 groups of 4 teams each were organized. In Figure 4 photos, taken during the laboratory trials are shown. After the 5 laboratory tests, we planned to move the game to the classroom department. Four classrooms were been equipped for 4 tests of logic combined with tests of knowledge of basic subjects (mathematical analysis, physics, and calculus), as summarized in Table 3. In each classroom, one or more teachers performed the task of "classroom guardian". In order to "escape" from the classroom, the team had to give the guardian a password, obtained as a result of the performed test. To escape from each classroom, the teams had ten minutes. For synchronization reasons, if any team solved the test ahead of the deadline, the solution time was marked on the teacher's register, but all teams of a group were made to leave the classroom (and enter the next one) at the same time.

Figure 4. Details of the five laboratory tests: (**a**) 3D CAD design; (**b**) information technology; (**c**) electronics; (**d**) physics; (**e**) urban architecture.

Table 3. Second block of tasks, held in the classrooms, with themes of the basic subjects.

Trial	Subject	Description and Educational Aspect
Open a safe	Calculus	Each team found a small safe (closed) and a sheet with a symbolic calculation on a bench. The value of one of the symbols was the code to open the safe. Once the safe was opened, inside was a further calculation question on the results obtained for the first symbols. The password for escaping the classroom was the sequence of required results. Students had to demonstrate numeracy skills.

Table 3. *Cont.*

Trial	Subject	Description and Educational Aspect
Compose a puzzle	Mathematical Analysis	Each team found (fifty) pieces of a puzzle to put together. Once the puzzle was composed, the image represented was the statement of a mathematical analysis theorem. The password to escape from the classroom was the name of the theorem. Students had to demonstrate manual dexterity, quick eyesight and knowledge of mathematical analysis.
Solve a labyrinth	Physics	Each team found a labyrinth on a bench. The labyrinth was littered with numbers. Following the correct way out of the labyrinth formed a sequence of numbers. The students had to figure out that that sequence was a phone number and dial it. A teacher answered the calls and formulated a different physics question for each team. The password to escape the classroom was the answer to the question received over the phone. Students had to demonstrate quickness, intuition, and knowledge of physics.
Unlock PDF files on PCs	Physics	Each team, in a computer room, sat in front of a PC. Next to the keyboard was a sheet with a physics question. A folder containing four PDF files was visible on the PC screen, all of which were protected by a password. The answer to the physics question was the password to open just one of those files. When opened, that file contained another physics question. The students had to understand that the answer to that question was the password to open 1 of the 4 other protected PDF files on a PC placed on the same desk as the first. After opening this file as well, each team was faced with another physics question. The answer to this question was the password to escape the classroom. Students had to demonstrate speed of reasoning and knowledge of physics.

In Figure 5, photos showing the execution of the four logic tests are shown.

To break the tension created by the didactic trials, two relaxing tests were also included in the trial circuit of the second block: a recreational sporting trial and a musical trial. The two trials, to be carried out in the same ten-minute period, saw two team members engaged in a flash tournament of table football and the other members engaged in deciphering and playing a mysterious score on the piano. To facilitate the conduct of the musical test, the students, in the preparation period, were advised, if there was no music connoisseur in the team, to bring (even on their mobile phone) the diagram of a piano keyboard and the explanation of the notes on the pentagram. Once the entire journey, we planned to give to each team the last clue. Since the storyline of the game was centered around engineering university studies, the only way to "escape" from the department was to get to the degree. Therefore, the clue, once revealed, led the teams to the Aula Magna, where each team found a small thesis, containing engineering notions to be learned in a maximum of 10 min. With a view to equalize the number of tests favorable to younger students with the ones favorable to older students, the thesis of the final test, although usually, in real life, the thesis is of a technical specialist nature, was prepared on physical and chemical constants and notable quantities known even to first-year students. When the time was up, or as soon as they were ready, each team had to repeat their thesis to a commission made up of teachers. Only the teams who repeated in the allotted time escaped from the department. The time taken to learn the thesis and the number of errors made in the discussion marked the score of the final exam.

A google form was created for team registrations, which were opened about a month before the event and closed after ten days. In this way, 20 days remained for the teams to prepare for the tests.

Figure 5. Details of the execution of the four logic/basic subjects tests. (**a**) Puzzle with mathematical analysis theorem; (**b**) symbolic calculation to open a safe; (**c**) labyrinth with phone number sequence; (**d**) unlocking of PDF files on PC by answering physics questions.

Each participant was given a backpack with the event logo, in which to carry the educational material necessary for the game. The backpacks were purchased by the department with student funds.

4. Results

At the end of enrollment, the maximum of 20 teams was achieved with 110 students from all degree courses in the department that had signed up for the game. Most of the enrolled students came from courses in the information engineering area, as is shown in Figure 6. It must be said that, although the industrial area is the one with the most degree courses, in the department in question the information area courses are the ones with the most students.

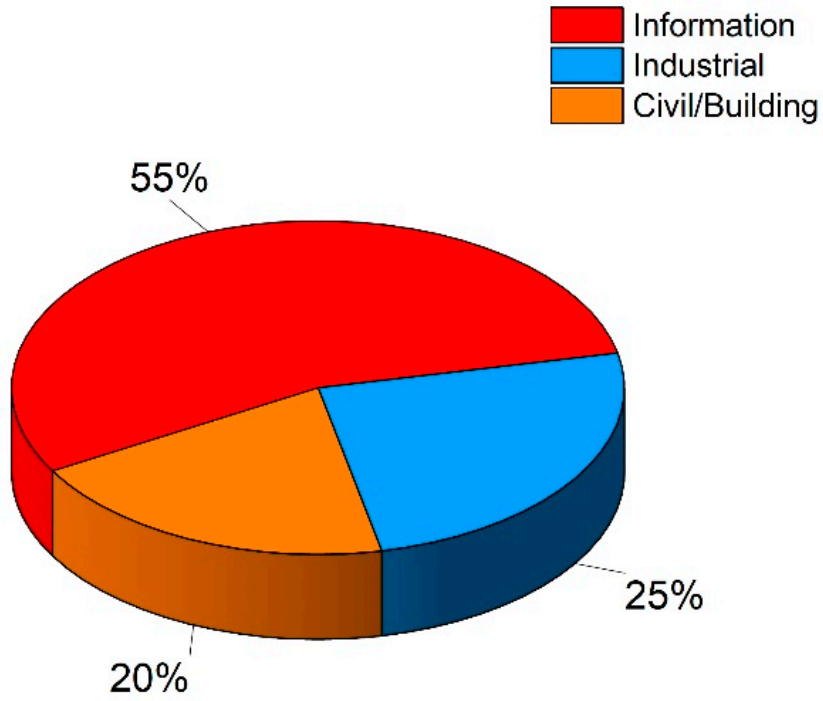

Figure 6. Distribution of students enrolled in the Escape Department by area. Most of the enrolled students came from courses in the information engineering area, but this was not surprising because in the department the information area courses are the ones with the most students.

As can be seen from Figure 7, the distribution of students over the course years was fairly homogeneous, except for a prevalence of first-year students.

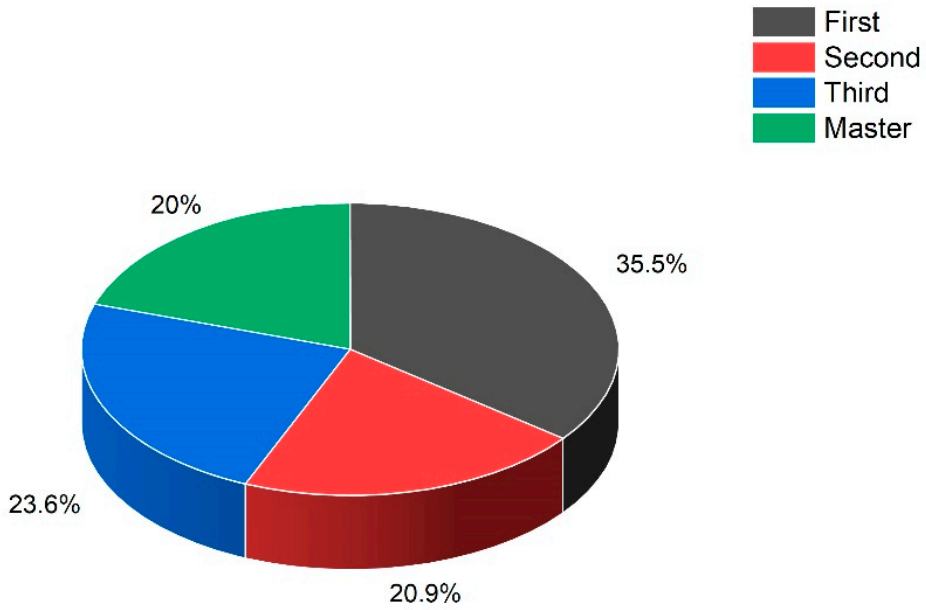

Figure 7. Distribution of students enrolled in the game by year of course.

In composing the teams, the students followed different approaches, as summarized in Figure 8. Most students formed teams with colleagues from the same degree programs. Someone instead preferred to form mixed teams. This second strategy was implemented, according to the students, not so much for questions of friendship as to have a more competitive team (considering the different specializations of the trials).

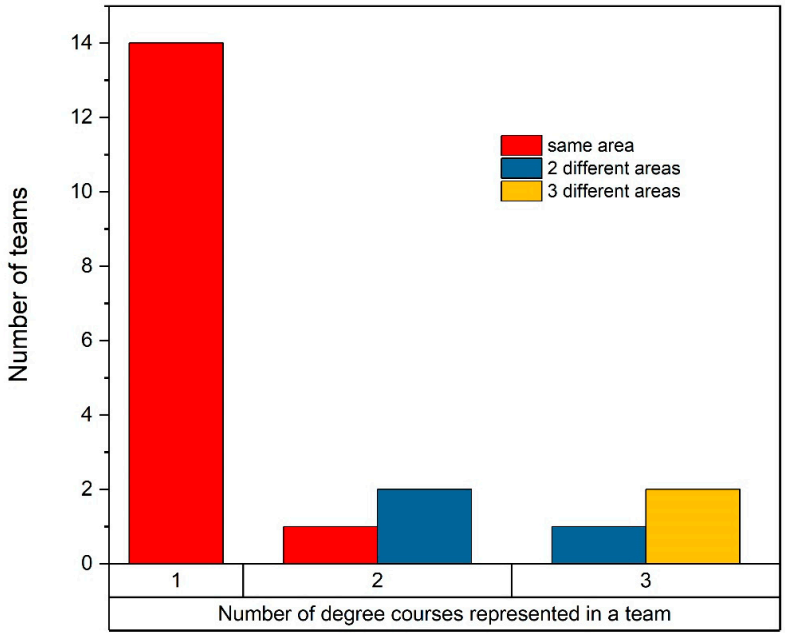

Figure 8. Composition of the teams. Briefly, 14 teams were made up of students from the same degree program; 1 team of students was from two different degree courses belonging to the same area; 2 teams of students were from 2 different degree programs belonging to 2 different areas; 1 team of students was from 3 different degree courses belonging to 2 different areas; 2 teams of students were from 3 different degree courses belonging to 3 different areas.

The goals set in the organization step were largely achieved, as explained in Table 4. For the verification of the first two objectives, the final ranking of the game was used.

Table 4. Summary of the goals set in the organization step and description of the degree of achievement.

Goals	Achievements
Balance among different degree programs	Although the first three positions of the ranking were achieved by three teams belonging to the information area, the other positions of the ranking showed an even distribution of all areas. It was therefore considered that the goal was achieved to a good degree.
Balance among different years of the courses	In the ranking, a uniform distribution of teams with students belonging to different years is evident. In particular, the first-placed team was made up of master's degree students, but the second-placed team was made up of first-year students. Therefore, the goal was considered fully achieved.
Provide rest/fun breaks within the competition	A sport test and a musical test were included. The two tests generated moments of pure fun, albeit always with a spirit of competition. At the end of the final test, while waiting for the results, the students were also offered a hearty snack. The goal was considered fully achieved.

To evaluate the effectiveness of the activity carried out from an educational point of view, we examined the marks reported for each laboratory test. We considered as "success" marks that were greater than or equal to 24/30.

As is evident from Figure 9, the two tasks designed on topics common to all degree programs had good results for more than half of the teams. The physics trial had good marks registered for 17 teams out of 20, with the informatics having good marks registered for 13 teams. An excellent result for urban architecture was registered as well. Although it is a characteristic subject of the civil/building area, the test having been calibrated on buildings and monuments of the city, it was passed by most of the students (15 teams out of 20) with satisfactory results. The two more specialized tasks, namely electronics and 3D CAD, ended with "good" results for less than 50% of the teams. This was probably foreseeable given that the degree of difficulty of these trials was higher. In particular, for the electronics trial it was verified that many teams (from all areas) making a mistake in

assembling the connections burned the integrated circuit and consequently failed to make the circuit work. However, we want to underline that the civil/building team that had good results obtained the highest possible mark in the electronics test, that is, 30/30 with honors.

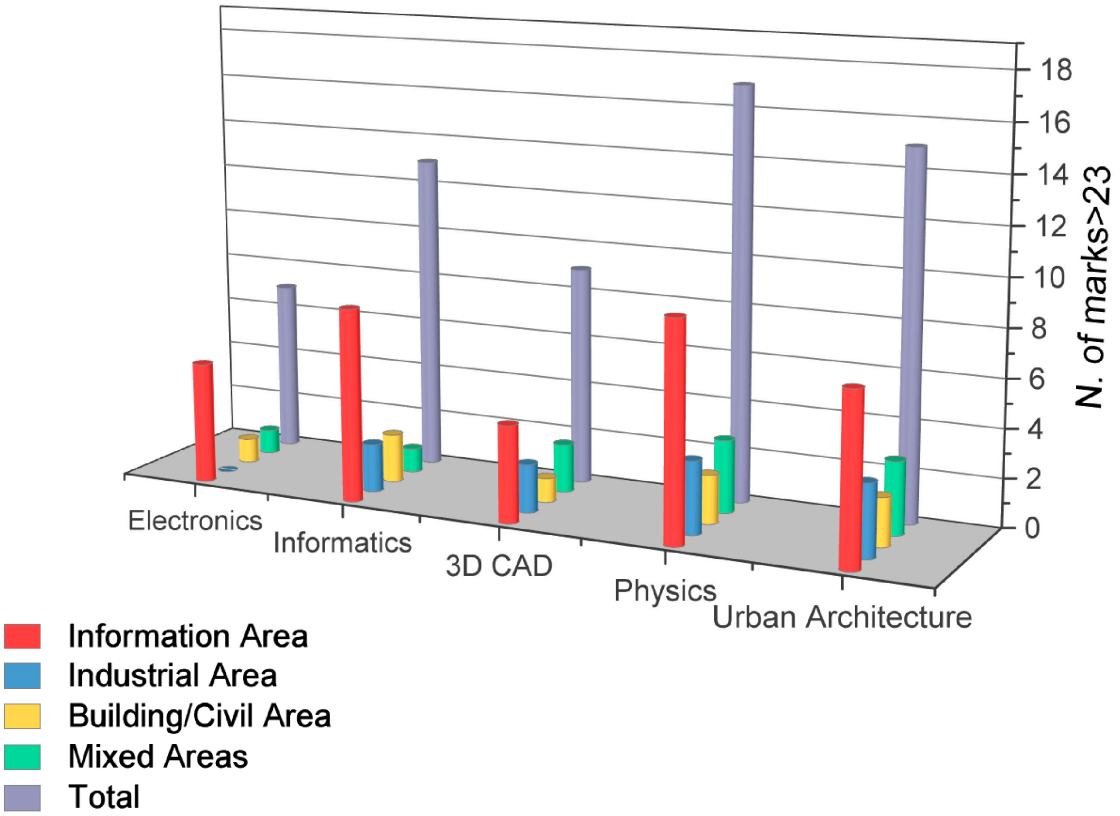

Figure 9. Distribution of marks of >24/30 for each laboratory trial and per area. The two tasks designed on topics (physics and informatics) common to all degree programs had good results for more than half of the teams, while other trials, except urban architecture, had lower success rates. This result seems to suggest that the experiment had good results, in terms of interdisciplinarity, for different subjects within the same degree course, while it gave worse results considering subjects from different degree courses.

Figure 10 shows the results of the logic/basic subjects tests. Recall that the students had 10 min to complete them. We chose as a "good" result the completion of the tests correctly within a maximum time of 6 min. The test that was more difficult was the one that involved unlocking PDF files by answering physics questions. However, from observing the game, it was evident that the difficulty encountered was not in the physics questions, but in understanding how the test should be carried out (i.e., locate the PCs, locate the files, understand that the files had to be unlocked with the answer to the question, find the right file, and understand that one had to resort to a second PC and what it was).

In fact, we recall that a characteristic of escape rooms may be that of not having the rules before the game and that understanding what to do is part of the game itself. This task was the only one with a particularly complex development and this caused difficulties. In fact, it is certainly easier to understand what to do in front of a puzzle or a safe. Five teams failed to complete this trial and three did not complete the labyrinth trial. In the latter case, the labyrinth was solved, but the teams did not understand that the numerical sequence obtained was a telephone number to be dialed to receive the question whose answer was the password.

Finally, to verify the students' satisfaction, they were asked to answer a questionnaire, anonymously. Briefly, 84% of the participants answered the survey. Table 5 shows the questions, the possible answers and the respective percentages.

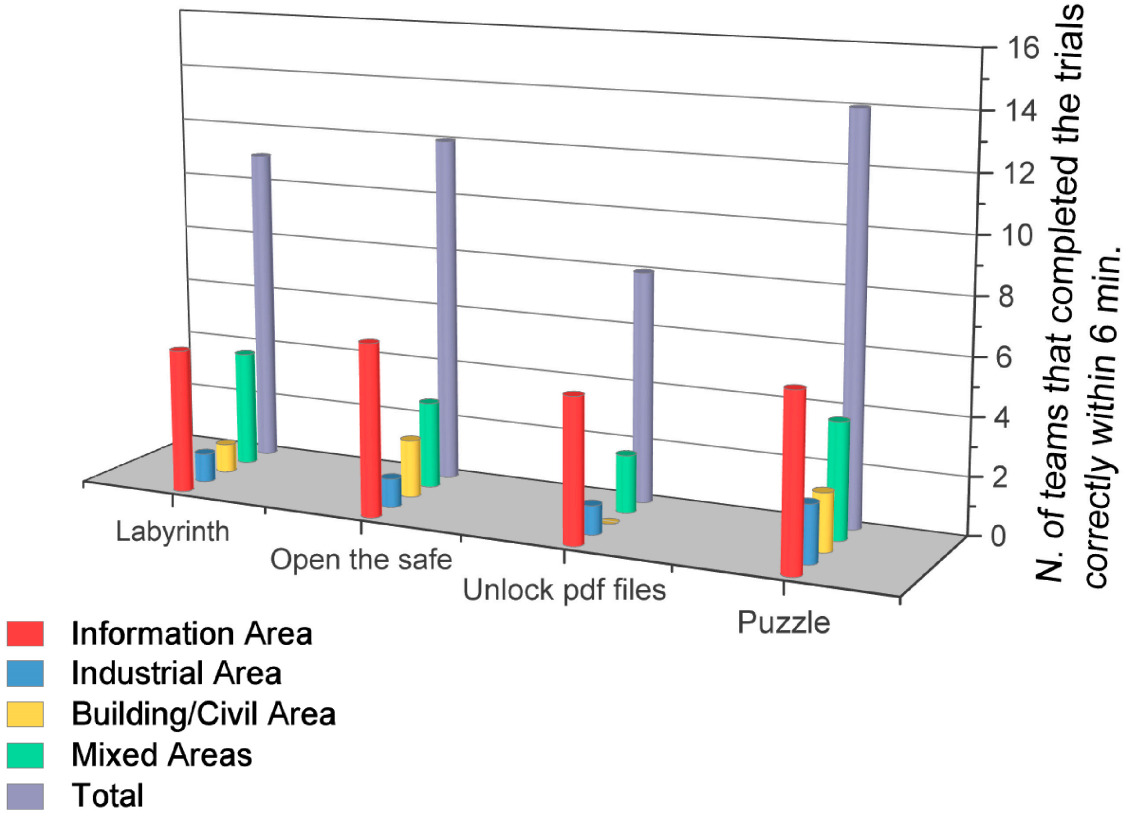

Figure 10. Number of teams that completed the logic/basic subjects trials within 6 min, per area. Although not evident from the figure, almost all teams completed the tests in the allotted time. What emerged is that the greatest difficulty in the games was understanding what to do, not how to do it. However, this is precisely a feature of escape rooms.

Table 5. Satisfaction survey given to students, with answers and percentages.

Question	Answers	Percentages
(1) Did you have fun this afternoon?	Yes	100%
	No	0%
(2) Would you repeat the experience next year?	Yes	100%
	No	0%
(3) Do you think the experience was helpful (multiple answers allowed):	To learn something new.	76%
	To learn more about the department's facilities.	90%
	To socialize with colleagues.	97%
(4) Which of the following aspects prompted you to participate? (Multiple answers allowed)	To spend a different afternoon with colleagues in the department.	97%
	The desire to compete with colleagues.	83%
	To enter the labs	90%
	The desire to learn something new, also about other degree courses.	72%
	To acquire training credit to spend on the university career.	36%
(5) What do you recommend changing for any future editions? (Free-answer question)	Nothing.	74%
	To decrease the duration of the game.	16%
	To better synchronize the duration time with public transport timetables.	6%
	To give more gadgets to the participants.	4%

5. Discussion

Although the results obtained are encouraging for the organization of events of the kind described, it must first of all be remarked that, in the case examined in this paper, these were activities to be recognized in the context of "activities chosen by the student", i.e., not in the context of compulsory courses. To organize an escape room based on mandatory educational programs, a greater severity should be used, especially in the evaluation part. Although the marks reported in the laboratory tests (those for which the students had to prepare before the game) can be considered overall satisfactory, it must be considered that they were group evaluations. It was not possible, due to the way the game was designed, to evaluate the level of preparation of a single student. Surely, there were students who learned new knowledge (we wanted to underline, in the previous section, the example of the civil/building engineering team that obtained the maximum results in the electronics test for this reason) but, equally, there would have been students who did not reach good levels of preparation in the proposed topics or who participated for the pure spirit of fun.

However, as remarked in Section 4 with reference to Figure 9, the results of the laboratory trials seem to suggest that the experimental Escape Department provided good results, in terms of interdisciplinarity, for different subjects within the same degree course, while it gave worse average results considering subjects from different degree courses. To overcome this limitation, in the student preparation step, it is probably not enough to provide didactic material to study, and it would be better to organize meetings with the teachers, who can explain the fundamental theory necessary to carry out the tasks. However, teachers must be advised to organize a few lessons in clear, synthetic and possibly not "heavy" but captivating terms, so as not to take away the sense of "fun" that a game must arouse. Therefore, as far as the purely didactic success of the experiment is concerned, it can be concluded that it is partial and the researchers or teachers wishing to try experiments of this type are advised to deepen the preparation of the students in topics outside their degree course before the game.

As for the logic tasks, they were all been completed by almost all teams. The preparation of the basic subjects was overall good. Difficulties arose on the logic/intuition part. This fact is reflected in what is often observed during the lessons of the various courses: the children study, and they even reach good levels of preparation, but the teachers notice a drop in reasoning skills. It is as if today's young people are losing their logical skills, probably due being used to having to work less hard to get results due to the technologies available. Let us think, for example, of the excessive use of calculators or PCs that cause students to lose the habit of performing calculations in their mind, drawing graphs with pen and paper, thinking about what one can expect from a given simulation and so on. Studies on the subject show that technology can affect critical thinking in children [36], with inevitable consequences in activities where logic and decision-making ability are required. Considering that in all sectors these are important skills and that they are fundamental for anyone wishing to undertake a profession in the engineering field, and given the success of gamification among young people, one could think of combining educational activities in the classic sense with play activities, such as the one just described, which are totally devoted to the development of logical skills.

In terms of overall success, Figures 6 and 7 demonstrate that the participation in the initiative was shared by all the students of the department, without particular distinctions of year or course, and that the maximum limit of enrollable teams was reached shows that the game was appreciated. This last consideration was confirmed, after playing the game, by the answers to questions 1 and 2 of the satisfaction survey.

From the answers to the survey, however, it emerged that the main reason that prompted the students to participate was not of an educational nature, but of a social nature. The answers to question 4 also show that the students had a strong sense of competition and that the desire to learn was not merely linked to the need to acquire training credits to complete the career. From questions 3 and 4, it was evident that students have a strong desire to attend laboratories, considering laboratory activities much more

attractive than face-to-face lessons. This indication should prompt teachers to include more laboratory exercises in courses where the teaching program permits. The curiosity to know about the laboratories and the relative activities of the degree courses not usually attended certainly played a fundamental role.

According to question 5, some considerations on the duration of the game emerged. Someone considered the game too long and a little tiring, while someone else, referring to public transport timetables for their travels, advised them to be taken into consideration for next year's organization. The request for more gadgets, although it may seem trivial and came from a few participants, actually allows us to focus on an important detail. Gadgets with the department, degree course or university logo provide students with a sense of pride and belonging, which are essential to foster, in order to push them to carry out their studies more and more enthusiastically. It is of fundamental importance to carefully manage the funds dedicated to students, with the capability to balance the equipment necessary for teaching and motivational tools.

While not evident to students, an aspect to underline is organizational difficulty. In particular, not all teachers are willing to adopt gamification, and some, even if willing, may not have the necessary imagination [37]. In these cases (as in the case described in this paper), organization rests on a few people and could become very onerous. It would certainly be much less onerous to organize an escape room within a single course, but in this case, we decided to proceed as described because the main objectives were not only teaching, but also socialization and interdisciplinarity. In general, strategies should be devised to involve teachers and make them aware of students' attitudes.

6. Conclusions

This paper describes an experimental escape room that involved all the degree courses of an engineering department. The details of the organization and implementation are described. The results obtained are very good from a social point of view. The research experiment, aimed at verifying the feasibility of an interdisciplinary escape room, also certainly gave very encouraging results from an educational point of view. Although the assessments of the tasks show that it is certainly more difficult to work with different degree courses while interdisciplinarity can be more easily achieved within the same degree course, the criteria for designing the tasks have been identified, leading to the conclusion that it is nevertheless appropriate to organize a more in-depth preparation phase prior to the game. We believe that with this expedient whose need has emerged, the escape room structure that we have proposed can also be reproduced in other contexts. Of course, we must remark that even though different degree courses were involved in the experiment, they were still all from the engineering area. Surely it would be interesting, with the purpose to provide young people with a broader culture, to study the possibility of creating interdisciplinary escape rooms mixing technical, scientific and humanistic knowledges.

At the end of the Escape Department, the degree of student satisfaction was very high, and therefore it is certainly worth continuing to investigate how to also apply gamification in the educational path at the university level.

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