Gamification for the Acquisition of Leadership Skills and Formation of Efficient Work Teams: An Interactive Workshop Based on an Analysis of the Film "The Seven Samurai"

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Abstract—In this work, we present a teaching experience based on emerging pedagogies and gamification to improve leadership skills and achieve efficient teamwork in scientific-technical areas of Engineering Projects. We designed the contents of a workshop and a virtual tool to create emotional contexts that improved the acquisition of soft skills. The combination of multi-sensory pedagogical strategies and hybrid inductive-deductive methodologies based on tests and team games, inspired by the story line of the classic film "The Seven Samurai" (Kurosawa, 1954), allowed us both to carry out, over a period of two academic years, an "on-the-ground" workshop-game, and a virtual tool to interact in the workshop, while under the COVID-19 restrictions. Despite the different formats and gamification elements used over the two academic years, the metrics for evaluating the efficiency of acquiring these soft skills produced very positive results and, on the whole, did not show significant differences. The cinematographic language and empathy with the story and the characters led the students to identify with and internalize the elements of efficient teamwork and leadership. Movies can provide simple but effective narrative lines on which to build games. Here, we present the contents and details of both workshops as a transferable experience, as well as making the open virtual tool available for the educative community.

Keywords—leadership, work teams, gamification, cinema, emergent pedagogies, virtual tool

1 Introduction

Emerging pedagogies link new technologies, methodological innovation, up-to-date contents and social interests together in the learning system. The term is mainly used to refer to innovative approaches and pedagogical ideas in continuous evolution, which, although they are best known for their technological and communicative aspects,

optimize the use of a wide range of available resources to enhance learning efficiency [1]–[3]. In this context of almost unlimited resources, however, the transmission of knowledge by the teacher and its acquisition and internalization by the students continues to be a challenge for teachers of all disciplines, particularly in Higher Education. This is particularly evident if we remember that the main aim at university should be the creation of professionals who are well-rounded in technical and humanistic terms. Indeed, not only should we expect the transmission of cutting-edge technical knowledge, but the new currents of thought and new neuroscientific findings should also contribute to forming fairer and happier societies. Considering that work in the future is likely to be highly automated, emotional qualities and talents or what are commonly called "soft skills" associated with empathy, collaboration and caring for others and, in general, personal growth, should be prioritized and actively promoted [4]. In this context, the "Recommendations on Key Competences for Lifelong Learning" for the area of education – last updated in 2018 [5] – promote competences and skills such as problem solving, critical thinking, the ability to cooperate and creativity, among others. Other institutions such as the International Project Management Association (IPMA) and Project Management Institute (PMI) also endorse the figure of the expert project manager based on analogous behavioral competencies. Despite the fact that transversal skills such as leadership and the formation of efficient work teams are included in most study plans in Higher Education, its real application in lectures and learning programs is not usually perceived as "effective", particularly in scientific-technical fields.

Cinema is widely seen as a powerful medium to bring about positive change in the thinking and behavioral patterns of students worldwide, as well as in professional competences through experiential learning in different educative levels. For instance, [6] has cited the Cinema na Universidade project, carried out between 1996 and 2003 in the Brazilian University of Unochapecó among other pioneering educative projects related with the cinema. This author also published a study in Brazil on the use of the cinema by teachers from different disciplines to describe the pedagogical strategies of the routine use of movies in the classroom. In India, [7] described the benefits of film-based learning curricula to introduce life skills among teenagers. Ref. [8], in Portugal, proposed an interesting course in medical sociology for medical students to work on aspects such as interpersonal communication, social equity, healthy aging, end of life issues, medicalization, quality of life, ethics, complementary medicine, patient satisfaction and the health of doctors. Ref. [9], in higher education for general teachers of basic education, art and cultural managers, also in Portugal, created a series of successful practical workshops on filming, teaching cinematographic language and techniques and optimizing the potential of audio-visual tools. In the field of engineering, [10] included "cinema clubs" in Ukraine as an extracurricular activity to improve communicative competences and thus, the competitiveness of professionals in the labor market. Finally, [11] also prepared an educational project with immigrant students based on the analysis of Italian cinema.

Authors such as [12] used the term "ludification" to relate the influence of the cinema with the construction of game-like avatars and cultural practices in the use of new media or of elements of gaming. In this context, the term "gamification" was coined for the first time by [13] as the "use of elements of game design within non-game contexts". Gamification has now become a key element for motivation and engagement in numerous organizations and fields such as marketing [14], work training [15], and

education [16]–[18]. In fact, these elements are usually employed by highly successful companies such as Google [19] or Amazon [20]. The components of gamification have been identified with the acquisition of leadership and other soft skills by different authors (e.g. [21]–[27]). Most of these authors describe as key elements of gamification: i) a system of levels and/or points; ii) badges/awards for certain activities and tasks; iii) collaboration and competition; iv) visual representations of players (and/or avatars); v) narratives and stories to provide a suitable context; and vi) the inclusion of an element of free choices.

The main objective of this work was the development a transferable teaching experience based on gamification to promote the acquisition of leadership skills and the formation of efficient work teams, which we then compared using two different work methods. The experience was aimed particularly at Agronomy and Forestry engineer students in order to i) set up emotional contexts (binomial training-cognition) that improve the acquisition of knowledge through the use of highly sensitive, immediately identifiable, material [28]; ii) combine multisensory pedagogical strategies in line with the latest neuro-educational learning tendencies [29]; and iii) use hybrid inductive-deductive methodologies based on gamification that combine points, special awards and a collaborative, competitive quiz to understand the learning process [30] which follows the story line of the movie "The Seven Samurai" (Kurosawa, 1954).

Initially, the different documents and audio-visual material were designed to contextualize the professional and emotional demand for the transversal skills of leadership and team building in engineering. Next, a skill-based, competitive game was staged using elaborative interrogation, written tests and musical dynamics, based around the film, featuring different situations of conflict associated with leadership and team building. We chose to set the game in a rural socio-economic context, which is more in line with Agronomy and Forestry, in order to interest the students more. The experience, as mentioned above, was repeated under different formats in two different academic years and feedback surveys (opinion and outcomes/usefulness) were conducted with a sample of students. The first year, the workshop was directed completely by the teacher with the students working in teams, while in the second, an interactive tool for individual use was created on the Genially platform (https://www.genial.ly/es;) designed to be used on the students' own phones/PCs at home. This tool is freely available to the academic community (https://view.genial.ly/60856895256e570d364e5025/presentation-taller-sobre-la-formacion-de-equipos-de-trabajo-eficiente).

2 Material and methods

2.1 Design contents: learning outcomes, preparation and components

The expected learning outcomes were the creation of an emotional context aimed at both students and teachers, in order to acquire and test transversal skills though a competition by taking advantage of the sensitivity and empathy towards the stories, characters and common language of classic cinema. Moreover, we wanted to approach other cultures through the context of universal professional problems and conflicts, with a team of heroes that we hoped Agronomy and Forestry engineers would identify with. The specific transversal skills considered for the design were: capacity for leadership, communication

and transmission of knowledge, skills and abilities in the social spheres of action, and the ability to work efficiently in multidisciplinary and multicultural work teams.

In the first academic year, we prepared the material and a pilot workshop (Tables 1 and 2). Our aim was to use multisensory pedagogical techniques based on the interpretation of scenes, music, lighting, characters and nuances of the script, all relying heavily on cinematographic language, to relate: i) the use of engineering to resolve socioeconomic problems. We expected the engineers would identify with the 'heroes' or 'samurais', who were recruited by the farmers (owners) to fight against the bandits; ii) leadership skills, describing and delving further into the qualities and difficulties associated with the main characters, and in particular, with Kambei, the leader; iii) the formation of efficient work teams of samurais, where aspects such as strengths, weaknesses, restrictions, motivation, commitment and complementarity were developed.

Table 1. Design and features of workshop/tool to acquire leadership competences and efficient teamwork

Features	Workshop/Year 1	Virtual Tool/ Year 2
Subjects (and degrees)	Engineering projects (Degree of Forestry Engineering) Construction and Management of Rural Buildings (Degree of Agronomy Engineering) Company workshops (Both)	Engineering Projects (Degree of Forest Engineer) Construction and Management of Rural Buildings (Degree of Agronomy Engineering)
Material	Power Point presentation and videos	https://view.genial.ly/60856895256e570d364e5025/presentation-taller-sobre-la-formacion-de-equipos-de-trabajo-eficiente
Role of students	Volunteers and team competition	As a mandatory practical session, individual and autonomous use
Role of teacher	Active, as a director and speaker	Teacher supports the practical session only
Duration	Approx. 3 h	Between 2–4 h
Contents of design	**1. Introduction:** behavioral skills beyond the professional context 1.1. The professional future in engineering is emotional 1.2. Self-realization – Mihály Csíkszentmihályi and the flow state 1.3. Self-realization and the Japanese concept of *Ikigai* 1.4. Classic metrics in Engineering project versus complete understanding of systems: work team complementarity 1.5. Engineering institution – IPMA and its certification of behavioral competences **2. Quiz based on the movie 'The Seven Samurai'** 2.1. The project in the "idea" stage (1 question) 2.2. Understanding the project stakeholders (2 questions) 2.3. Recruiting candidates for a work team in a project (1 question) 2.4. The role of a leader (1 question and "Haiku" competition based on an excerpt from 'The Art of War', by Sun Tzu) 2.5. Project negotiations: resources, restrictions and remuneration (2 questions) 2.6. Motivation and efficient work team building (5 questions) **3. Evaluation questionnaire: metrics for continuous improvement** 3.1. Description of students 3.2. Previous training in behavioral competences (3 questions) 3.3. Evaluation: 5 categorical questions to evaluate the usefulness of the workshops and 1 free question to criticize it	

Table 1–2 shows the details of the design contents and the main differences over the two academic years. The temporal sequence and main tasks are presented in Table 2, which shows: i) the preparatory stage of gathering information and material for the workshop (year 1); ii) the pilot test and feedback with teachers (year 1); iii) conducting the face-to-face workshop with small groups of students (year 1); iv) feedback and impact assessment (year 1); v) adaptation of the material as an online resource on the Genially open platform (year 2); vi) virtual sessions with the tool created to play the game on a PC or smartphone (year 2); vii) final evaluation and comparison (year 2). The contents of the workshop, together with the virtual tool, were structured into three blocks. In the first part (Table 1), the relevance of behavioral skills in the professional environments of engineering is shown, in which terms associated with self-realization such as "flow" [31] or "ikigai" [32] are explained to encourage the students to inquire about their vocation and their individual role in a team.

Table 2. Summary of applied methodology

Tasks	Schedule
Task 1 – PREPARATION Preparation stage of the workshop: selection of material on leadership skills and work team formation. Simultaneously, selection of scenes, discussion and design of tests and training activities to be developed in the workshop.	Month 1–3 – Year 1
Task 2 – PILOT TEST WITH TEACHERS Pilot-test of the workshop with teachers where times, development, efficiency and potential improvements are evaluated. Teachers were invited and interviewed to evaluate the weaknesses and strengths of the material and the development of the workshop itself.	Month 4 – Year 1
Task 3 – WORKSHOP WITH STUDENTS Workshops with the students of the Company Workshop, Construction and Management of Rural Building and Engineering Projects, including prize-giving for the winners.	Months 6 – Year 1 and Months 1 & 2 – Year 2
Task 4 – FEEDBACK AND IMPROVEMENT Reflection and evaluation of the impact on student learning: use of an efficiency questionnaire to evaluate the students' opinion and to include improvements.	Months 7 – Year 1, and Month 3 – Year 2
Task 5 – ADAPTATIONS Adaptation of the workshop material, including videos, Power Point presentations and educational documentation as an online resource on the open platform Genially for virtual use.	Months 7–12 – Years 1 and 2

The second part is the quiz (Table 1), which uses excerpts from the movie as a narrative line. 'The Seven Samurai' was directed by Akira Kurosawa in 1954 and is considered by many as one of the greatest and most influential movies in cinema history. The action takes place in 16th century Japan, where the inhabitants of a rural village, fed up with being periodically assailed by hordes of bandits decide to do something about it (the problem to solve in the project). The oldest member of the village suggests hiring a group of samurai to defend them (analysis and studies in the stage "idea" of the project). The farmers (owners) attempt to find some samurai (engineers) willing to fight to guarantee their food supply (poor economic remuneration and resources), but they only manage to find one, named Kanbei (the leader) who decides to help them.

Thanks to Kanbei, they manage to gather a group of seven samurai with different qualities, interests, strengths and weaknesses, who will defend the village more for their courage, virtuosity, thirst for adventure, ethics and friendship, than for the two daily handfuls of rice offered to them (analysis of motivations and complementarity).

At the end of the quiz, the marks were computed to award (year 1) or evaluate (year 2) participation. Finally, we designed a form to evaluate the outcomes and/or improve the usefulness of the workshop/tool. In year 1, the form was given to the participants as a printed handout, which they could complete if they wished, while for the year 2, we created a link to a Google form (https://docs.google.com/forms/d/14Libs47L6zLGhVd16MmPrh5HvP0i6-JBKVrkYT_OD3E/edit). The answers were analyzed to evaluate and improve the different versions of the workshop.

The work sessions were limited to one 3-hour block or two 2-hour blocks, depending on the subject and its schedule. The face-to-face workshop was carried out in year 1 (academic year 2020–2021), whereas the sessions with the tool (some students in the room and others at home), took place in year 2 (academic year 2021–22). We included 11 questions and two individual challenges in the workshop for year 1, while for year 2, the musical challenge was integrated as an extra question in the tool (12 questions and a challenge). The individual tasks or challenges included were: i) the composition of a haiku or poem of exactly 33 words on real leadership based on an excerpt from the book "The Art of War" by Sun Tzu; and ii) to identify and reproduce the music to announce the teams of samurais in the movie.

2.2 Evaluation and learning metrics

Learning and gaming metrics. For year 1, the workshop was voluntary and small prizes were awarded to the winning team (two sticks, pens and samurai sweatbands) as well as to the winners of the two individual challenges (flash memories). Each team's score was calculated at the end by the teacher-tutor. Each team had to agree to appoint a leader and all the members' opinions had to be taken into account to produce the final answer to each question. For year 2, the session was a mandatory individual practical task with a weight of 14% in the final mark for the practical activities. Each student had to submit their final score and their written composition via the Moodle platform. Different combinations of slides were tested to design an algorithm that optimized their number and computed the number of hits, to produce an automatic score. As a result, each student was given a score at the end of the game. The scale of hits/marks and the messages shown in the tool are as follows: between 9–12 hits was awarded a Grade A ("You are a true Samurai who will work in efficient work teams, but do not forget to enjoy yourself and stay in your flow zone"; between 6–9 hits was a Grade B ("Well done! Why not do the questionnaire again to improve your leadership skills and/or efficient teamwork? You could also go to Kendo classes"); finally, <6 hits was a Grade D ("Don't do harakiri, but you can do better – try doing the quiz again thinking about improving your role in an efficient work team"). In this latter case, the students had another opportunity to change their score. The best poems were also published on Moodle and contributed an extra mark of 0.25 points on top of the final mark for the subject.

Usefulness and opinion metrics. To evaluate and compare the teaching experiences for years 1 and 2, three blocks of questions were prepared for the participants to answer on a voluntary basis. Our aim was to: i) describe the students; ii) learn about their previous training in behavioral competences; iii) rate the usefulness and learning outcomes of the experiences.

The first block contained the following items: age, sex, degree and city/village, which were analyzed statistically to determine the mean and standard deviation of the samples. In both years, 20 students answered the questionnaires. For the second and third blocks, we designed closed questionnaires with scales of 5 categories, following the observational criteria described by [33]. Two open questions were also included to ask about other subjects involved in the acquisition of soft skills as well as to give additional comments (second and third blocks, respectively). The questions in the second block were the following: E1) Evaluate the personal importance you give to the acquisition of behavioral skills related to leadership and efficient work teams in your degree studies; E2) Evaluate the degree of training/teaching you have received during your studies in the acquisition of behavioral skills related to leadership and efficient work teams in your degree studies; E3) What subjects and/or activities have fostered the acquisition of these skills? Finally, in the third block, the students had to rate the degree of agreement in relation to learning outcomes (I strongly agree; I agree; I disagree; I strongly disagree; I would not know what to say) for the following statements: R1) I have a better understanding of the duties and responsibilities of performing tasks as a group leader; R2) I have been able to identify the need for motivation and obligations that the members of a group must assume in order to work efficiently; R3) I have been able to identify the need for complementarity between the individuals of an efficient work group; R4) The use of cinema, as a teaching resource, allowed me to empathize with the characters and understand similar situations that can occur in my professional life; R5) These types of activities are important to improve the training of professional skills in addition to technical contents. R6) Please add a couple of positive and/or negative adjectives or phrases about the workshop. This last question was open, with a blank square to fill in.

The responses received were analyzed based on the response frequency (histograms, mean and standard deviation). In addition, a Pearson Chi-square test was used to compare the answers in years 1 and 2. The null hypothesis would be that the variables "preference" and "year (method)" were independent; Chi-square for the corresponding freedom degrees (df) of each question and significance (p) were calculated. For the open-question E3, the percentages of answers were calculated and for R6, all the comments were collected as to help improve the project.

3 Results and discussion

3.1 Development of the teaching experiences

The students of "Engineering projects" in the degree of Forestry Engineering (29 students in year 1; 24 students in year 2); "Construction and Management of Rural Buildings" in the degree of Agronomy Engineering (12 students, year 1; 17 students, year 2) and "Company Workshops", which was common to both degrees (only year 1,

with 10 students) took part in the workshops over both academic years. Figure 1 shows some of the presentation slides used for year 1. A video presentation (Figure 1a) used in a voluntary class on soft skills had previously been uploaded to the Moodle platform, and this was used to carry out the session. The teachers explained the contents and the rules (Figure 1b and c) and ensured that all the participants collaborated in the team. The students organized their teams and a leader was chosen to answer the questions, which were included in a printed handout (see Figure 1c). At the end of the workshop, the scores for each team were calculated (Figure 1d) and the best poems and musicians were also chosen by teachers.

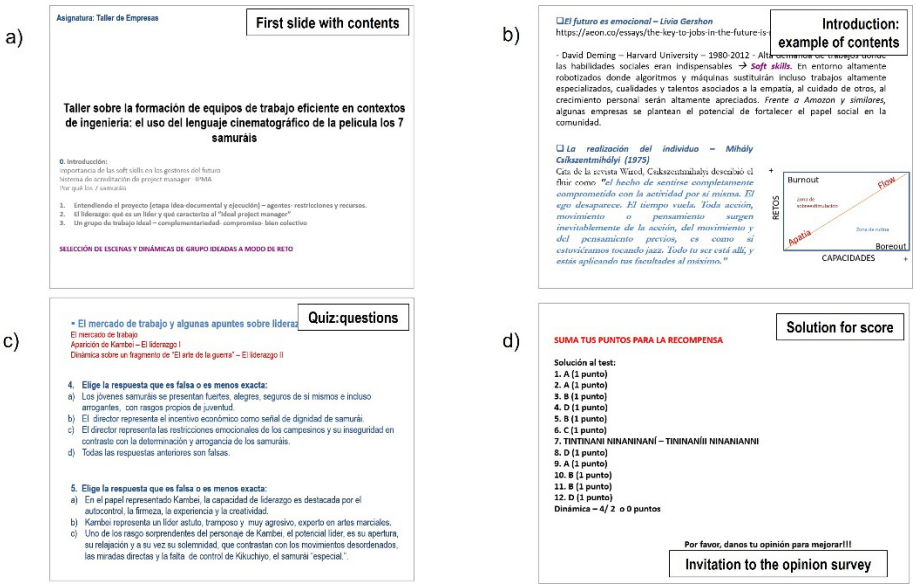

Fig. 1. Examples of slides for the workshop presentation carried out for year 1: a) first slide with the contents of workshop; b) slide to illustrate contents of Introduction; c) example of questions from the quiz after watching the corresponding movie scene; d) slide to adjust final score with the link to the option on Google Forms

The teachers also handed over the prizes to the winners. Extra-curricular activities, such as workshops, are well-supported by other authors in the field of engineering due to their complementarity and because the abundance of specific contents can provoke the decrease in training of general competencies in the study contents [10]. However, the COVID-19 restrictions, which have prevented students gathering together in groups, have reduced the number of this type of activities and/or are leading to design new formats, including online teaching and meetings. In fact, in year 2, the COVID-19 restrictions, in particular the need for social distancing, led to the work being organized individually. In this case, each student could be present in the room with their laptop/ smartphone or work from home. The workshop was compulsory and was included as a practical session in the teaching guide for these subjects. The link to Genially, where the presentation and the game were developed, was published the previous week on the Moodle platform, so that the students could familiarize themselves with it (Figure 2a).

During the session, a teacher briefly explained how to explore the contents of the tool with the interactive buttons and encouraged the students to explore the added contents (Figure 2b). After approximately 30 minutes, they had to start the quiz. The students could use headphones to listen to the movie in the room, and the teacher gave support continually during the workshop. For the group studying "Construction and Management of Rural Buildings", the students asked the teacher managing the quiz (Figure 2c) if they could do it simultaneously without headphones. This group also asked the teacher for extra information about the introduction, and said they felt electronic devices were being used too much in class. At the end of the session, each student received their score (Figure 2d), and had to submit a screenshot with their points and the Haiku about leadership on the Moodle platform.

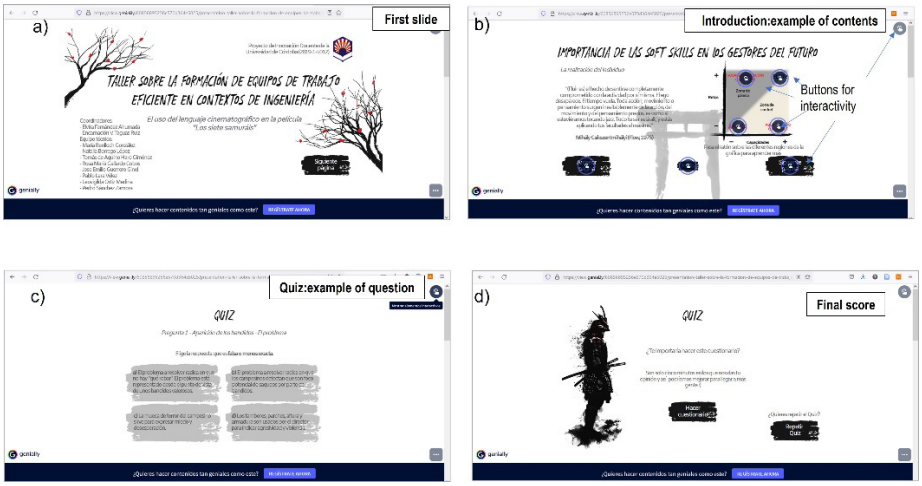

Fig. 2. Example of screens from the open virtual tool created with the platform software Genially for year 2: (https://view.genial.ly/60856895256e570d364e5025/presentation-taller-sobre-la-formacion-de-equipos-de-trabajo-eficiente): a) first slide to present the tool; b) screenshot to illustrate contents of Introduction; c) example of questions from the quiz after watching the corresponding movie scene; d) example of final score obtained

For both years, at the end of the sessions, the teachers insisted on the need to answer the opinion questionnaires, to repeat the workshops or not in the future and to know how to improve. In fact, for year 2, the results of the pilot experience with teachers and the surveys of year 1 had been analyzed and interpreted to prepare the virtual tool. In addition, the readability of the quiz questions was also reviewed. We were aware of the importance of a suitable design for the challenges according to the students' ability, because attempts at gamification did not always result in increased motivation or performance, as underlined by [34] and [35], among others.

We noted that even for year 2, the figure of the teacher was essential, to enrich the environment, as an information node and to summarize some of the contents. These functions of the teachers have been also highlighted in the context of emergent pedagogies by authors such as [1]. On the other hand, it is relevant to highlight how the gamification elements, such as the badge system and competition/collaboration, varied when we compare the rules for years 1 and 2. In agreement with [27], these elements

would be linked to the following leadership features: self-observation, self-rewards, feelings of competence, feelings of self-control, and feelings of purpose.

3.2 Evaluation

The number of surveys collected in the years 1 and 2 was 40 (n_{y1}=20 and n_{y2}=20), although in the year 2, one survey produced only a few answers. In addition, the open question R6 was answered by 16 students in year 1 and by 11 in year 2. The main differences between the samples from year 1 and year 2 were that in the year 2, the students were slightly older, mostly male, and with fewer students from Cordoba (Table 3).

Table 3. Indicators to characterize the samples of students corresponding to the two academic years evaluated (block 1 of metrics; AED=Agronomy Engineering degree; Forestry Engineering degree; CO=Cordoba; Ja=Jaén; GR=Granada)

Features	Year 1 (n=20)	Year 2 (n=20)
Age	M=22.5y; Dt=1.8y	M=23.0; Dt=2.0y
Sex	16%W 84%M	0%W 100%M
Degree	32%AED 68%FED	32%AED 68%FED
City	32%CO; 32%JA; 11%GR; Other 25%	47%CO; 21%JA; 11%GR; Other 21%

As far as the evaluation block is concerned (Figure 3 and Tables 4–5), there were no significant differences between the answers for years 1 and 2 ($p>0.05$, Table 5). Figure 3 and Table 5 show how the most of students agreed that learning soft skills was "very important" or "quite important" (E1) and most of them considered the training acquired for the degree was more than "enough" (E2, Table 5). In Tables 4 and 5, it is worth noting how 16% of year 1 students found that all subjects of the degree fostered the acquisition of soft skills in their contents, whereas 4% of year 2 students stated that none did so (E3). On the other hand, in both samples, the general subjects of Engineering Projects, Forest Politics and Sociology, Management of Wildfires, Construction and Management of Rural Buildings were mentioned.

Table 4. Percentage of answers on previous training on behavioral competences (Second block – E3: What subjects and/or activities have fostered the acquisition of these skills?)

Main Answer Categories	Year 1	Year 2
No answer	16.0%	29.6%
None	0.0%	3.7%
All	16.0%	3.7%
Engineering Projects (and Environmental Impact Assessment)	28.0%	25.9%
Forest Politics and Sociology	4.0%	7.4%
Company Training	4.0%	0.0%
Management of Wildfires	16.0%	3.7%
Construction and Management of Rural Buildings	8.0%	7.4%
Others	8.0%	18.5%

Table 5. Analysis of the independence between "preferences (survey choice marks)" and "year (method)" with Pearson Chi-square test (Marked in bold p<0.05)

Questions	Chi-Value	p-Value
E1: Evaluate the personal importance you give to the acquisition of behavioral skills related to leadership and efficient work teams in your degree course	1.73	0.189
E2: Evaluate the degree of training/teaching you have received during your studies in the acquisition of behavioral skills related to leadership and efficient work teams in your degree course	8.00	0.238
E3: Subjects and/or activities which have fostered the acquisition of soft skills	15.75	0.202
R1. I have a better understanding of the duties and responsibilities of performing tasks as a group leader	0.04	0.839
R2. I have been able to identify the need for motivation and obligations that the members of a group must assume in order to work efficiently	7.26	**0.007**
R3. I have been able to identify the need for complementarity between the individuals of an efficient work group	2.01	0.156
R4. The use of cinema, as a teaching resource, allowed me to empathize with the characters and understand similar situations that can occur in my professional life	6.00	0.199
R5. These types of activities are important to improve the training of professional skills in addition to technical contents	17.20	**0.000**

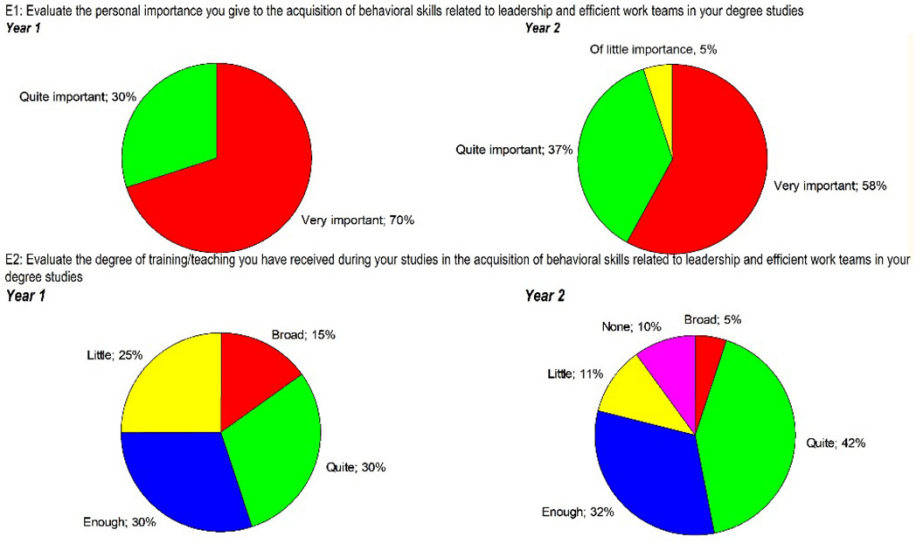

Fig. 3. Results of the questionnaires corresponding with the block on initial evaluation (E)

Figure 4 and Tables 5 and 6 show the results of the rate block. Although these only include the answers to R2 and R5, the differences were significant for the different years (p<0.05; Table 5), year 1 students expressed a slightly more positive opinion

about the usefulness of the workshop, which involved a simpler work material, competition in teams and voluntary participation. Figure 4 illustrates how most of students "strongly agreed" or "agreed" with the statements related to the workshop rate: "a better understanding of the duties and responsibilities of performing tasks as a group leader" (R1),"the identification of motivation and obligations of the members of an efficient work team" (R2), "the need for complementarity among them" (R3), "the usefulness of the cinema to help understand similar situations that can occur in my professional life" (R4) and "the importance of these type of activities to improve the training of professional skills in addition to technical contents (R5)".

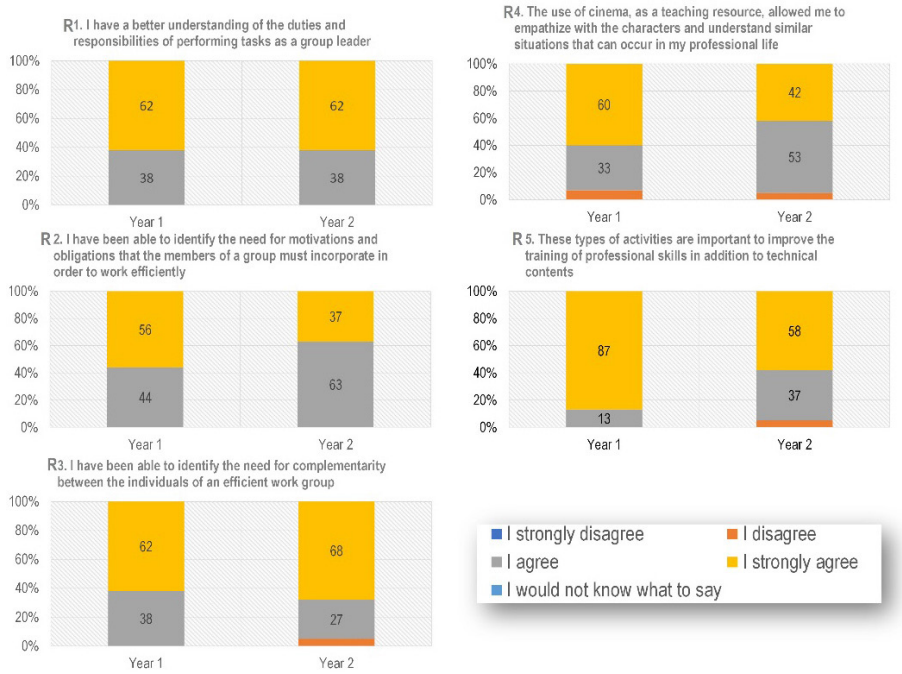

Fig. 4. Comparative results between both academic years corresponding with the evaluation questionnaire (block three, R1–R5) on the degree of usefulness of the workshop for the acquisition of skills

Finally, Table 6 shows the comments on the teaching experiences. It is relevant to note how year 1 students gave more answers, and in greater detail, compared to year 2, when they used the virtual tool and survey. Several year 1 students stressed words such as "reality", "real life" and/or "empathy", and they used in their answers terms which were used directly in the workshop such as "comfort zone" or/and "flow zone". Ref. [12] discussed how computer games are influenced by cinema and especially how computer games have a notable influence on the narrative structure of modern cinema. However, in this case, it is relevant how realistic the students felt the movie situations were. In this context, it is worth noting the contribution of the cinema to storytelling in any kind of game, which is very useful for new teaching experiences.

Table 6. Comments collected in Block 3, R6 "Please add a couple of positive and/or negative adjectives or comments on your opinion about the workshop"

Year 1 (voluntary and in teams; n=16 answers)
1. The first word that comes to mind is **"Reality"**, since one thing is what is studied in theory and another very different in practice; with these practices we can get closer, in the university environment, to what reality really is.
2. As it is an unusual workshop, I felt more willing to participate in class.
3. I think it is a necessary to have this type of content, but it's difficult to implement in the current teaching model that the school has. Perhaps doing this workshop earlier in the course would benefit the way students work as a team. What's more, it's fun.
4. Didactic learning. A good way to develop skills and bond with the other members of the group.
5. The workshop **has helped us to work as a team** since we had to reach an agreement with our colleagues to select the answer. It is also very useful to extrapolate the concepts seen in the organization of work using a **real-life case**, in this case a movie.
6. The workshop has a dynamic and participatory part that encourages students to participate with interest, so that, through interesting resources, such as cinema, he/she can learn basic skills that should be inherent in the skills which are necessary to know in engineering, such as leadership and management of a team. On a negative note, I would point out the brevity, and the lack of variety in the participatory tests.
7. Teamwork, cooperation and skills assessment.
8. Enriching and fun.
9. The workshop using cinema as a teaching tool has great **freshness**. The dynamism of the class fostered greater interest in the students.
10. It seemed very appropriate to me since in the degree they do not teach us to work or deal with work groups and in the workshop, this was done in a very pleasant way. It also took us out of our **comfort zone**, i.e., the world of engineering, working on these issues with the world of cinema.
11. I liked the part of the workshop that was **not compulsory practice**, so that only those colleagues who were really interested could participate and not harm the activity and its purpose.
12. I had not seen this learning methodology before and it was **innovative** for me. The class in which the workshop was held was interesting and lively, as well as fun. However, some metaphors between the film and the purposes pursued in the workshop were abstract and **not properly understood**.
13. It is a different, but at the same time **innovative**, way of showing how leadership skills can be learned, in this case, without the need to relate to any report or technical document, but rather the message that this activity conveys goes beyond a document without ever losing the main goal.
14. A simple activity, open to all kinds of personalities and public, with audiovisual communication that is very representative of the message, function or values that you want to convey.
15. Didactic, useful, different, expressive, **innovative**, appropriate, multifunctional, etc.
16. It helps us achieve a vision through **empathy**, and maintains a high level of attention from workshop participants.
17. They take you out of the monotony of ordinary classes and facilitate the understanding of certain ideas and/or concepts, and they take some activities out of your **comfort zone** that, although not pleasant at first, are definitely positive (for example, when inventing the poem).

(Continued)

Table 6. Comments collected in Block 3, R6 "Please add a couple of positive and/or negative adjectives or comments on your opinion about the workshop" *(Continued)*

Year 2 (obligatory, individual, with the virtual tool; n=11 answers)
1. **Creative**, exciting and **effective**.
2. **Creativity**, new teaching **methods**.
3. Interesting and **educational**.
4. Leadership and **empathy**.
5. The workshop is very **useful** because it encourages the acquisition of non-technical skills, that is, in social skills and relationships between people who must row in the same direction. I think that complementarity is a very important word that stands out quite well in this workshop, since a team needs people with different skills so that, together, all the necessary skills are covered. More initiatives of this type should be encouraged for students, since it trains us for the future world of work and at the same time for the personal sphere.
6. **Reflection**.
7. Poor quality of images and videos.
8. Work not only for our own benefit.
9. This type of workshop is important to better **understand the world of work** and to be able to carry out our work better.
10. Perfect.
11. **Creative**, motivating, **empathic**, confident.

In the case of year 2, perhaps the most commonly repeated term was "creativity/creative". Authors such as [23] proposed a board game to teach sustainability in science and engineering programs to reflect on the challenges faced in our society and their role as individuals to tackle them. This author insisted on the need for educational tools to encourage creativity, an open mind and lateral thinking. In this context, gamification and serious games engage students because they can be immersed in conflicts where they can reflect, and which stimulate their creativity to take decisions. On a negative note, year 1 students mentioned the brevity of the workshop, and that fact that some situations had not been properly understood, as well as the lack of variety in the game. For year 2 students, the poor quality of the images and videos used in the tool was their only negative comment. In general, both experiences were valued very positively by the students. Similar experiences based on gamification were also valued positively by other Spanish students, as was described by [36], in the Social Sciences department at the Faculty of Education of the University of Alicante (Spain).

Apparently, neither the presentation format nor the form of participation were significant factors in showing differences in students' opinions. Ref. [37] replaced a Genetics final exam for an escape-room to do "on-the-ground" or online activities to develop team skills in STEM. The results of this study illustrated how the escape room significantly raised the students' confidence in their team skills, independently of the "on-the-ground" or online application used. On the other hand, authors such as [24], who also developed a virtual tool (Freiya) based on gamification to support workshops to foster peace and culture among teenagers, observed that motivation improved when the virtual application was used. In order to deepen the analysis, more "on-the-ground" and online tests should be compared.

Ref. [27] gave great importance to the influence of elements of gaming and their variations as self-concordance triggers within groups. In our study, the change of rules and, in particular, of the reward system, did not lead to significant differences in the

effectiveness of the workshop. In our case, we found that power of the cinematographic language of a well-known, classic movie, which has even inspired automation software systems [38], and the careful and enthusiastic preparation of the contents and sessions based on the scenes, can be the key to preparing similar teaching experiences in different contexts, but in particular in Environmental Sciences where Ref. [39] have proved its usefulness. Other factors described to highlight the effective use of gamification for learning were: perceived utility, game design, and student perspective in the field of Information Systems education [40].

4 Conclusions

This work aimed to create a suitable emotional context in which to acquire and test soft skills based on the gamification principles. It was an educational experience which can be easily repeated, and in which capacity for leadership, communication and transmission of knowledge, skills and abilities in the social spheres of action and abilities to work in efficient multidisciplinary and multicultural work teams were promoted. Sensitivity and empathy towards the stories, the characters and the common language of the classic cinema was the key factor in obtaining excellent ratings given, despite the fact that different rules and ingredients of gamification were used over the two academic years. Although a very different cultural context was considered, the students appreciated the chance to address universal professional problems and conflicts, aimed specifically at practical applications of engineering in rural areas, for which the medium of cinema provided very effective narrative sources on which to build the game.

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