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GEM

Guidance and Entrepreneurship
Mind-Sets through Games

Impact study of the GEM game



Co-funded by the
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For more information on the project

www.gemproject.eu

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0. Executive summary

The impact study presents an analysis of the impact of the use of the GEM game (Guidance and Entrepreneurship Mind-Sets through Games).

GEM game is an innovative, ICT based guidance game that helps to foster the assessment of transversal and entrepreneurship skills of students of primary and lower secondary school. The game introduces the students to the world around them beyond the classroom, through the exploration of some professions and the transferable entrepreneurship skills which these professionals need to carry out their work.

Between January and June of 2017 the partners of the GEM project carried out the pilot of the project. In total, 398 students between 9 and 13 years old participated, and also more than 40 teachers or guidance practitioners.

The study reflects that, although the game has impact in 3 of the 7 transversal and entrepreneurial skills, is a useful and complementary resource to foster the assessment of transversal and entrepreneurship skills of students. A resource that should be used within an activity or with the support of teachers.

Finally, GEM game was valued by the students with a score of 7.59 on a scale from 0 to 10, and teachers valued their experience with a 6.8 on a scale from 0.10.



1. Introduction

GEM (Guidance and Entrepreneurship Mind-Sets through Games) seeks to foster the assessment of transversal and entrepreneurship skills of students through an innovative, ICT-based guidance game.

In order to analyse the impact of the GEM game on the entrepreneurship mindsets of the students who used the game and also the perceptions of teachers and guidance practitioners, the consortium of the project developed data collection tools. A pretesting survey was completed in order to have an initial overview of the entrepreneurship activities carried out by teachers as well as the entrepreneurship mindsets of students. This baseline then was compared with the results of a post-test survey and completed by observations and focus groups.

Between January and June of 2017 the partners of the GEM project carried out the pilot of the project. In total, 398 students between 9 and 13 years old participated. And also 45 teachers and guidance practitioners who used the GEM game.

Below are the entities from Spain, Italy and United Kingdom that participated in the pilot:

Organization	Country	Participants	
		Students	Teachers or guidance practitioners
Escola Garbí Pere Vergés – Esplugues de Llobregat	Spain	72	4
Escola Jesús Maria - Sant Gervasi	Spain	61	1
Escola Solc	Spain	30	2
Escola Thau – Barcelona	Spain	21	1
Escola Virolai	Spain	56	1
Blanquerna - URL	Spain	-	26
Primaria G. Pieraccini (IC2 Poggibonsi)	Italy	46	7
Primo grado L. da Vinci (IC2 Poggibonsi)	Italy	43	
Primaria Don Lorenzo Milani (IC Monteriggioni)	Italy	19	1
Primaria Don Lorenzo Milani (IC Monteriggioni)	Italy		
Pheonix St Peters Academy	UK	64	1
Queensgate Primary	UK	34	1



In order to carry out the impact study, partners followed the steps detailed below:

1. **Testing plan.** Partners elaborated a plan of where and how to carry out the testing of the GEM game with students as well as online. Here the data collection tools (surveys and guidelines for observations and focus groups) were developed.
2. **Pre- test survey.** A pre-test questionnaire was developed (one version for students and another for teachers and guidance practitioners). This was then used to analyse the impact of the GEM game on learning outcomes and entrepreneurship mind-sets.
3. **Testing phase.** The game was tested in eleven schools of Italy, Spain and United Kingdom. In this phase partners observed students using the game and held one focus group with teachers and/or guidance practitioners who have tried the GEM game.
4. **Post-test survey.** A post-test questionnaire was developed (one version for students and another for teachers and guidance practitioners) to be completed once they have tested the game. This was compared with the pre-test survey to analyse the impact of the GEM game on learning outcomes and entrepreneurship mind-sets.
5. **Impact study.** The impact study is going to analyse the impact and change of the GEM game on the entrepreneurship mindsets of the students who used the game and also the perceptions of teachers and guidance practitioners. The impact study includes the results from the pre-test and post-test surveys, the observations and the focus groups¹.

¹ See the electronically surveys below (in English):

- Pre-test survey (students): <https://educaweb.typeform.com/to/T1ZkMk>
- Post-test survey (students): <https://educaweb.typeform.com/to/dR47IL>
- Pre-test survey (teachers): <https://educaweb.typeform.com/to/ladu0X>
- Post-test survey (teachers): <https://educaweb.typeform.com/to/llJTJv>



2. The impact of the GEM game

The following are the results obtained through the different data collection tools.

First, the impact and change of the GEM game on the entrepreneurship mindsets of the students who participated in the pilot is presented. Then, the analysis is complemented with the perceptions of teachers and counsellors obtained through questionnaires and focus groups.

2.1 Students results

The sample consisted of 398 students between 9 and 13 years from Spain, Italy and the United Kingdom. The age of the sample was quite different between countries. While the sample from Italy and Spain includes students aged between 10 and 13, the UK sample includes students aged 9 to 12.

In order to know the impact of the GEM game on the entrepreneurship mindsets of the students, they answered a questionnaire prior to the testing phase and another later to do the comparison. They were also observed playing with the GEM game.

Pre and post survey focussed on the knowledge of the students regarding the following transversal and entrepreneurship skills: teamwork, taking initiative, creativity, responsibility, perseverance, self-confidence and problem solving. The students had to match the scenario (between 3 scenarios) that best described with the entrepreneurial skills mentioned above.

The results obtained by comparing the previous and subsequent questionnaire are presented below. The percentage of improvement or worsening of knowledge of each transversal and entrepreneurial skill, divided by age, gender and country, is presented. For country results, see annex 1.



As shown below, the transversal and entrepreneurial skills in which there has been impact have been three: teamwork, taking initiative and creativity.

Teamwork	+ 9,2%	Taking initiative	+ 1,5%
Age		Age	
9	+19,6%	9	+10,7%
10	+12,1%	10	+2,6%
11	+6,6%	11	-1,3%
12	+10,3%	12	+3,9%
13	+6,7%	13	+13,3%
Gender		Gender	
Female	+8,3%	Female	+2,3%
Male	+9,2%	Male	+0,7%
Country		Country	
Italy	+9,4%	Italy	+8,9%
Spain	+11,5%	Spain	-0,4%
United Kingdom	-2,0%	United Kingdom	+4,6%

Creativity	+ 1,3%
Age	
9	7,1%
10	-4,6%
11	+3,2%
12	+0,6%
13	+13,3%
Gender	
Female	+1,2%
Male	+1,5%
Country	
Italy	-4,8%
Spain	+2,7%
United Kingdom	+1,8%

The above tables show that the skill with the greatest impact has been teamwork with a 9.2% improvement in their knowledge.

The improvement of the knowledge of the transversal and entrepreneurial skills is different according to the age and country. In general, there has been more impact on groups of students aged 9 and 13. And regarding the country, the impact is quite different across countries. Each country has improved the knowledge of two skills and has worsened the knowledge of another (a different skill in each country).

However, there has been no significant gender difference. While female gender has scored better in teamwork and initiative, the male gender has scored better on creativity.



On the other hand, there are four skills in which there has been no impact: responsibility, problem solving, perseverance and self-confidence.

Responsibility		- 7,5%	
Age			
9		23,2%	
10		-5,8%	
11		-11,3%	
12		-5,4%	
13		26,7%	
Gender			
Female		-9,6%	
Male		-5,2%	
Country			
Italy		-7,6%	
Spain		0,0%	
United Kingdom		-5,3%	

Problem solving		- 5,4%	
Age			
9		+10,7%	
10		-11,8%	
11		-6,4%	
12		+0,6%	
13		+33,3%	
Gender			
Female		-11,5%	
Male		+0,7%	
Country			
Italy		+1,2%	
Spain		-6,4%	
United Kingdom		-11,7%	

Perseverance		- 5,3%	
Age			
9		+17,9%	
10		-7,2%	
11		-8,4%	
12		-1,4%	
13		+13,3%	
Gender			
Female		-7,9%	
Male		-2,8%	
Country			
Italy		-6,1	
Spain		0,0%	
United Kingdom		-2,3%	

Self-confidence		- 2,4%	
Age			
9		+23,2%	
10		-0,5%	
11		-3,9%	
12		-4,4%	
13		+13,3%	
Gender			
Female		-1,6%	
Male		-3,1%	
Country			
Italy		-6,8%	
Spain		-2,6%	
United Kingdom		-2,0%	

With a -7.5%, responsibility is the skill with the least impact of all, followed by problem solving (-5.4%), perseverance (-5.3%) and self-confidence (-2.4%).

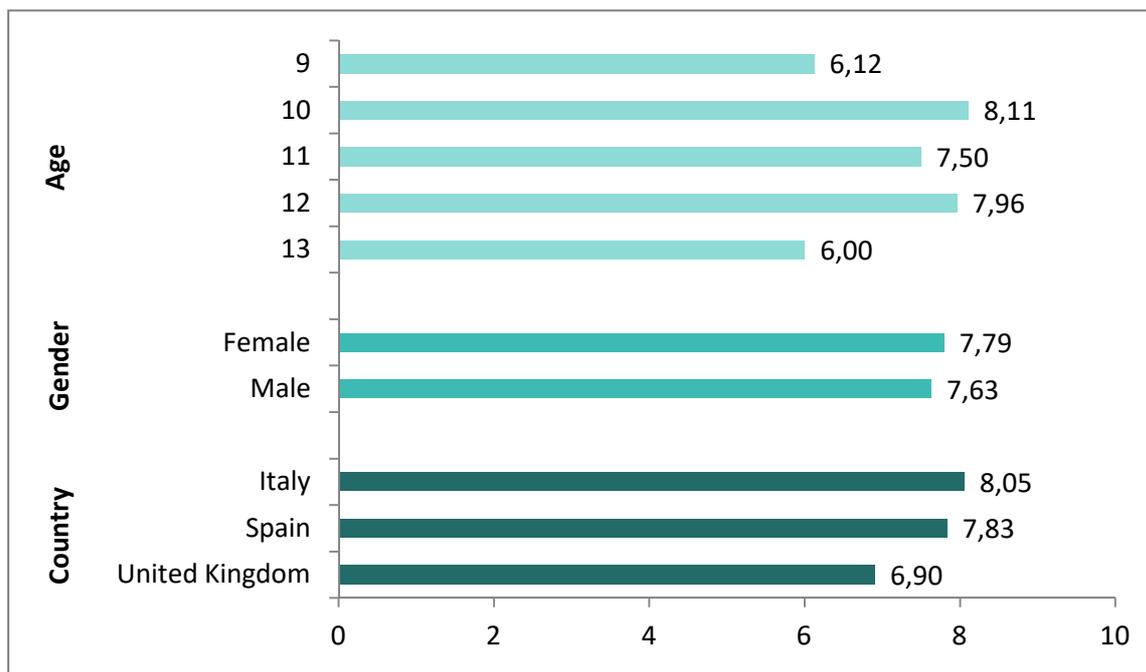
In the same way as with the skills in which there has been an impact, the improvement of its knowledge is different according to age, gender and country. As previously there is more impact on students with 9 and 13 years. Except in the case of problem solving skill in Italy, there has been no impact in any of the countries.

In general, female students have improved their knowledge less than male students. Except for the "self-confidence" skill, female students scored higher.



Even though the previous results reflect that there has been an impact only in 3 of the 7 transversal and entrepreneurial skills, students gave positive feedback on the game. The participants of the pilot valued the game with a 7.59 on a scale of 0 to 10.

The satisfaction after playing with GEM classified by age, gender and country is represented below.



Graphic 1. Satisfaction of students after playing with the GEM game

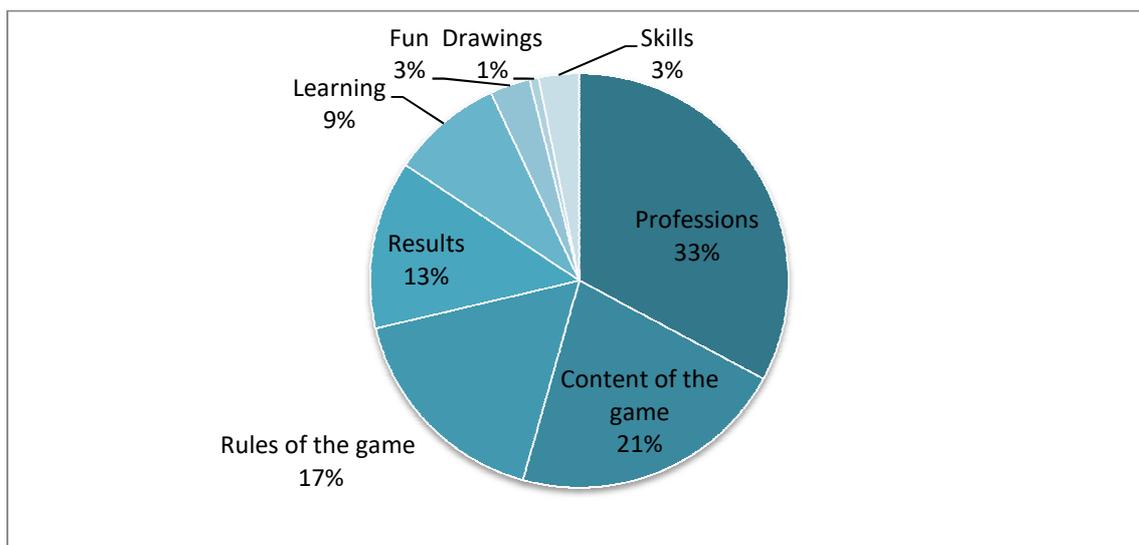
The graph shows quite a few differences in grades between ages and countries, while it does not show many differences between genders.

Ages between 10 and 12 score the game better than students with 9 and 13 years. Specifically, the ages in which there has been more impact are those that have scored worse experience with the game.

There are also quite differences between countries. With an 8.05 a scale from 0 to 10, Italy is the country with the highest score of all, followed by Spain (7.83) and the United Kingdom (6.90).

Below are those aspects that students have found most interesting, as well as improvement proposals.

On the one hand, the most interesting aspects above 10% are the professions, followed by the content of the game, the rules of the game and the results.



ents

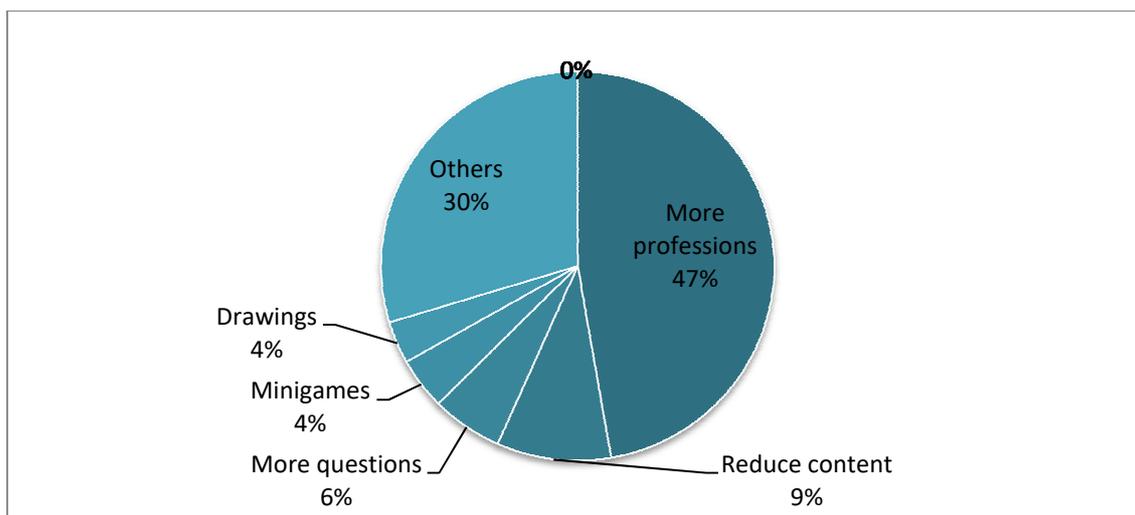
Students highlighted as the most interesting aspect of the game the possibility to choose between different professionals to play and step into their shoes.

Regarding the content of the game, they highlight the challenges posed and the different options to solve them. These challenges allow them to know the daily life of each professional.

On the rules of the game, students emphasize the possibility of answering questions and being able to choose between different options of answer (multiple-choice questions).

And finally, concerning the results they emphasize the possibility of getting a score to find out how they did the game.

On the other hand, students made the following improvement proposals. The aspects mentioned above 5% are more professions, reduce game content, include more questions, and introduce more drawings and a mini-game.



students

The most outstanding improvement of the students has been incorporating more professions in the game. During the testing phase, students played with the beta version of the game which had 4 professions, nevertheless the final version will have a total of 10 professions.

Students also commented that the content (text) of the games should be reduced. Nevertheless, they demand more questions or professional challenges. For that reason, the texts have been revised and the following texts (pending professions) will be shorter.

Another proposal was to introduce more drawings or animated drawings and mini-games. Unfortunately, this proposal cannot be incorporated in the final version of the game since it was not planned and requires a new rethinking of the tool.

Finally, “others” refers to those proposals mentioned by less than 10 students. Some of the proposals are: more interactive, improve the game mechanics, introduce open responses, improve the results, introduce more languages, introduce audio support, etc.



Students were also observed using the game in each country (see the observation guidelines in annex 2). In general, students have not got problems to understand the functioning of the game, so it could be considering easy and intuitive for students.

However, some students had difficulties to read all the situations, depending about the level of reading capacity of the students. For this reason, is desirable that the game be used with the support of teachers.

The results of the game also need to be explained by a teacher. Without explanation, the results can be misinterpreted. Even so, the results were very motivating for students.

In general, students presented high motivation to test the game and curiosity about the professions. In fact, students proposed plenty of professions for the final version of the GEM game.

2.2 Perceptions of teachers and counsellors

The following are the perceptions of teachers and guidance practitioners who have used the GEM game. Perceptions have been obtained through questionnaires and focus groups.

The results obtained through the questionnaires are presented below. Teachers and guidance practitioners valued the knowledge of their students regarding the transversal and entrepreneurial skills before and after using the game, and their responses were as follows:

Skills	Pre	Post
Teamwork	7.4	6.8
Taking initiative	6.73	6.3
Creativity	8	6.9
Responsibility	6,47	6.3
Perseverance	5.87	5.9
Self-confidence	6.47	6
Problem solving	6.93	6.1



As the above table shows, participants perceived an improvement of the knowledge in 1 of the 7 transversal and entrepreneurial skills. It will be necessary to follow the assessments with a broader group of teachers who have used all the tools of the GEM project (final version of the game, Manual and Moodle).

They were also asked about their experience with the resources they have used to develop entrepreneurial skills. Before using the GEM game they valued the resources with a **5,87** on a scale of 0 to 10, and after using the game their value was **6.4** on a scale of 10.

Teachers and guidance **practitioners valued their experience using the GEM game with a 6,8** and they mentioned positive aspects as well as improvements to introduce into the game.

The positive aspects mentioned by the teachers were: the students reason and put into practice the decision making, students put themselves into the shoes of different professionals, students can face a conflict in different ways (multiple answer), the characteristics of the professions are well described and the results are motivating for the students.

And finally, the proposals for the final version of the game were: make the game more interactive and visual (including cartoons, for example) include more instructions about the rules of the game, simplify the text of the game, include more professions, create a support material for teachers, link the game with the curriculum and include an audio support.

Teachers and counsellors also evaluated the game through focus group in each country (see the focus group guidelines in annex 3). The main aspects discussed during the focus group were the following.

First, participants were asked about their experience with the entrepreneurship education. In general, they told that entrepreneurial skills are worked transversally, not in a specific subject. And except the United Kingdom, the rest of the teachers do not have specific resources to work the entrepreneurial skills.



Then, participants were asked about the game, with which teachers are receptive.

Regarding the pedagogical aspects, participants commented that although it is a good resource to introduce students to the world of the work and explore entrepreneurial skills, the game is a bit complex (level of the language and some concepts) for the younger students.

They also commented that the game requires the support of teachers, with an explanation of skills and results or also integrating the game into other activities. And finally, they consider that results are motivating for students.

And finally, about the functional, technical and esthetical aspects participants commented that navigation is intuitive and the graphical design (colours, drawings...) are nice, even though it could be more interactive or animated. Finally, some teachers proposed to activate a user, introduce some mini-games, change the typography, etc.



3. Conclusions

The GEM game has been tested by an extensive group of students and teachers or guidance practitioners. The sample will be expanded once the final version of the game is available. Teachers and guidance practitioners will have access to Moodle designed within the framework of the project and through this course they will give feedback on the final version of the game and the rest of the tools (Moodle and manual).

Although there are some aspects to improve and there has been no impact in all skills, the study confirms that GEM is a useful resource to foster the assessment of transversal and entrepreneurship skills of students.

During the testing, students played with the game once and with little information on transversal and entrepreneurial skills. It needs to be considered that GEM is a complementary learning tool for entrepreneurship. Therefore, it should be used with the support of the teacher's explanation or within an activity. The manual for teachers and guidance career practitioners includes guidelines for using the game.

To conclude, below are the improvements that will be included in the final version of the game because of this impact study:

- Broadening of professions. The final version of the game will include a total of 10 professions.
- Review of game content. The text of the game will be reviewed to reduce the text and its complexity.



4. Annex

4.1 Annex 1. Impact result within countries

Spain

Teamwork	+ 11,5%
-----------------	----------------

Age	
9	-
10	+29,1%
11	+2,8%
12	+12,1%
13	+50,0%
Gender	
Female	+16,2%
Male	+7,2%

Taking initiative	+ 9,5%
--------------------------	---------------

Age	
9	-
10	+1,3%
11	-3,2%
12	+1,0%
13	+50,0%
Gender	
Female	+0,1%
Male	+0,4%



Creativity	+ 0,7%
-------------------	---------------

Age	
9	-
10	-13,7%
11	+2,4%
12	+3,2%
13	+50,0%
Gender	
Female	+0,3%
Male	+1,1%

Responsibility	- 7,6%
-----------------------	---------------

Age	
9	-
10	+7,9%
11	-17,0%
12	-0,9%
13	0,0%
Gender	
Female	-11,5%
Male	-3,2%



Perseverance	- 6,1%
---------------------	---------------

Age	
9	-
10	-11,2%
11	-9,0%
12	+2,5%
13	-50,0%
Gender	
Female	-2,1%
Male	-9,9%

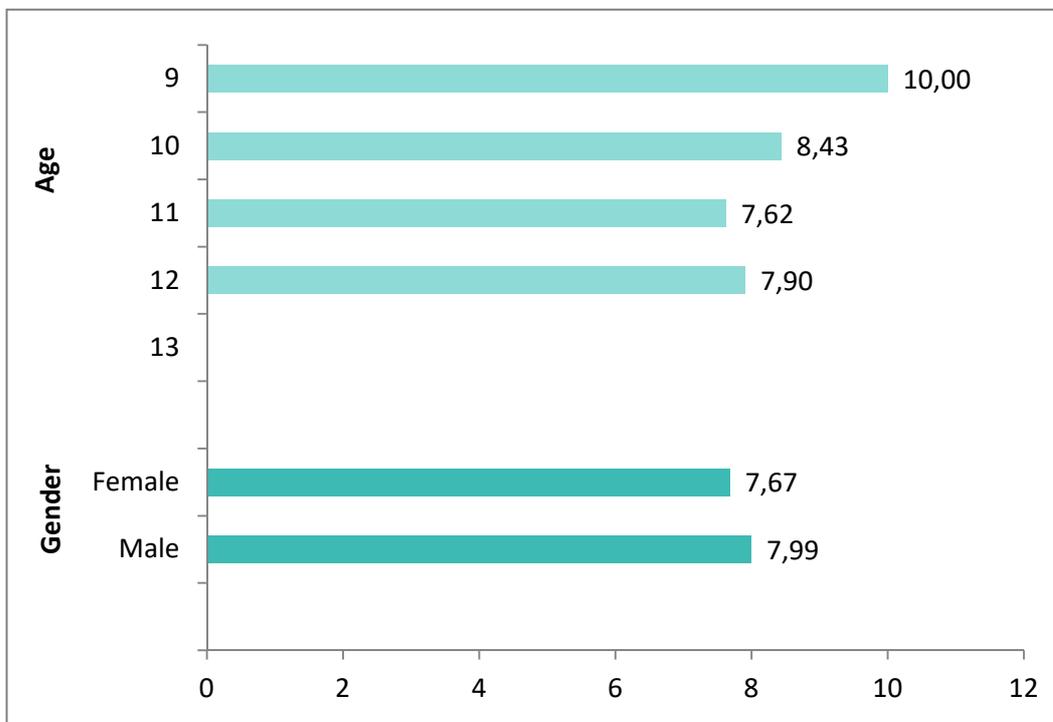
Self-confidence	- 2,6%
------------------------	---------------

Age	
9	-
10	-5,2%
11	-1,3%
12	-4,7%
13	+50,0%
Gender	
Female	-4,8%
Male	-0,0%



Problem solving	- 6,4%
Age	
9	-
10	-13,6%
11	-8,1%
12	+0,9%
13	+100,0%
Gender	
Female	-12,4%
Male	-0,3%

Experience with the game	7,83
---------------------------------	-------------





Italy

Teamwork	+ 9,4%
-----------------	---------------

Age	
9	0,0%
10	-10,0%
11	+19,4%
12	+1,9%
13	-16,7%
Gender	
Female	+8,1%
Male	+10,6%

Taking initiative	+ 8,9%
--------------------------	---------------

Age	
9	0,0%
10	+10,0%
11	+2,6%
12	+15,7%
13	0,0%
Gender	
Female	+7,3%
Male	+10,4%



Creativity	- 4,8%
-------------------	---------------

Age	
9	0,0%
10	-10,0%
11	-3,1%
12	-9,5%
13	0,0%
Gender	
Female	+5,6%
Male	-13,5%

Responsibility	- 5,3%
-----------------------	---------------

Age	
9	0,0%
10	-10,0%
11	-0,4%
12	-24,8%
13	+50,0%
Gender	
Female	-0,3%
Male	-9,4%



Perseverance	- 2,3%
---------------------	---------------

Age	
9	0,0%
10	+20,0%
11	-8,7%
12	-18,1%
13	+50,0%
Gender	
Female	-15,9%
Male	+9,6%

Self-confidence	- 6,8%
------------------------	---------------

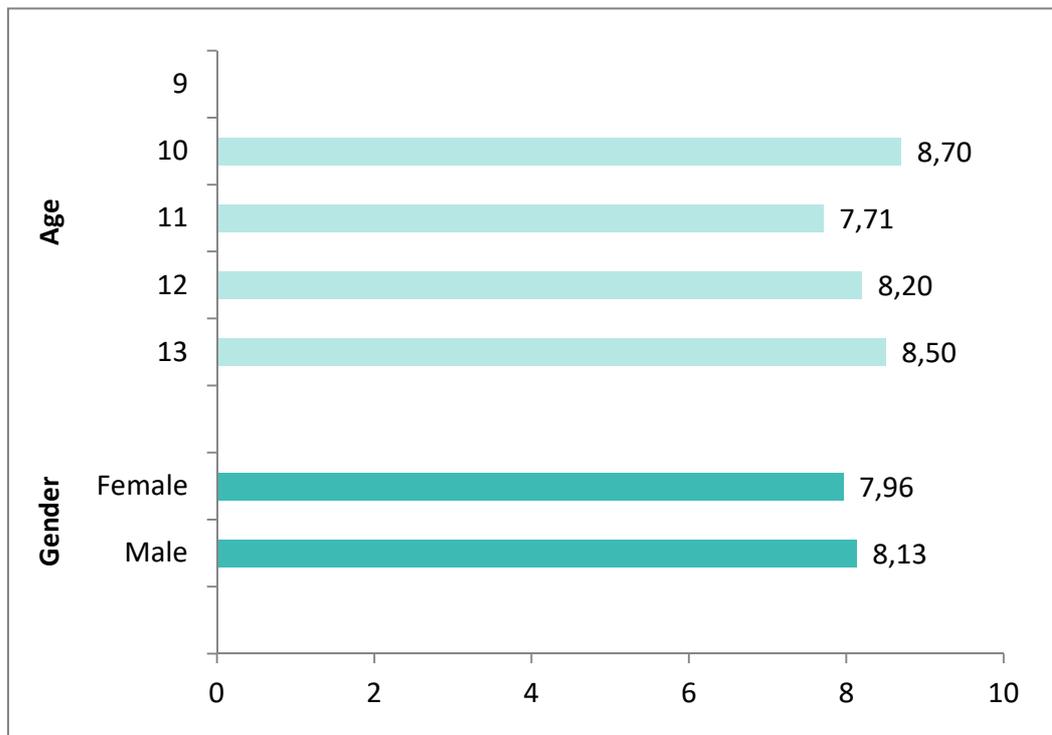
Age	
9	0,0%
10	-10,0%
11	-9,5%
12	-4,3%
13	0,0%
Gender	
Female	-7,4%
Male	-6,0%



Problem solving	+ 1,2%
------------------------	---------------

Age	
9	0,0%
10	-10,0%
11	+5,4%
12	-1,9%
13	0,0%
Gender	
Female	-11,3%
Male	+11,9%

Experience with the game	8,05
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United Kingdom

Teamwork	- 2,0%
-----------------	---------------

Age	
9	+14,3%
10	-10,6%
11	+4,3%
12	0,0%
13	0,0%
Gender	
Female	-11,8%
Male	+8,7%

Taking initiative	+ 4,6%
--------------------------	---------------

Age	
9	0,0%
10	+6,4%
11	-0,5%
12	0,0%
13	0,0%
Gender	
Female	+10,8%
Male	-4,3%



Creativity	+ 1,8%
-------------------	---------------

Age	
9	0,0%
10	+7,2%
11	-7,2%
12	0,0%
13	0,0%
Gender	
Female	+0,4%
Male	0,0%

Responsibility	+ 6,5%
-----------------------	---------------

Age	
9	+14,3%
10	-20,6%
11	+7,2%
12	0,0%
13	0,0%
Gender	
Female	-4,8%
Male	-8,7%



Perseverance	- 6,4%
---------------------	---------------

Age	
9	+14,3%
10	-10,6%
11	-9,6%
12	0,0%
13	0,0%
Gender	
Female	-23,1%
Male	+13,0%

Self-confidence	- 2,0%
------------------------	---------------

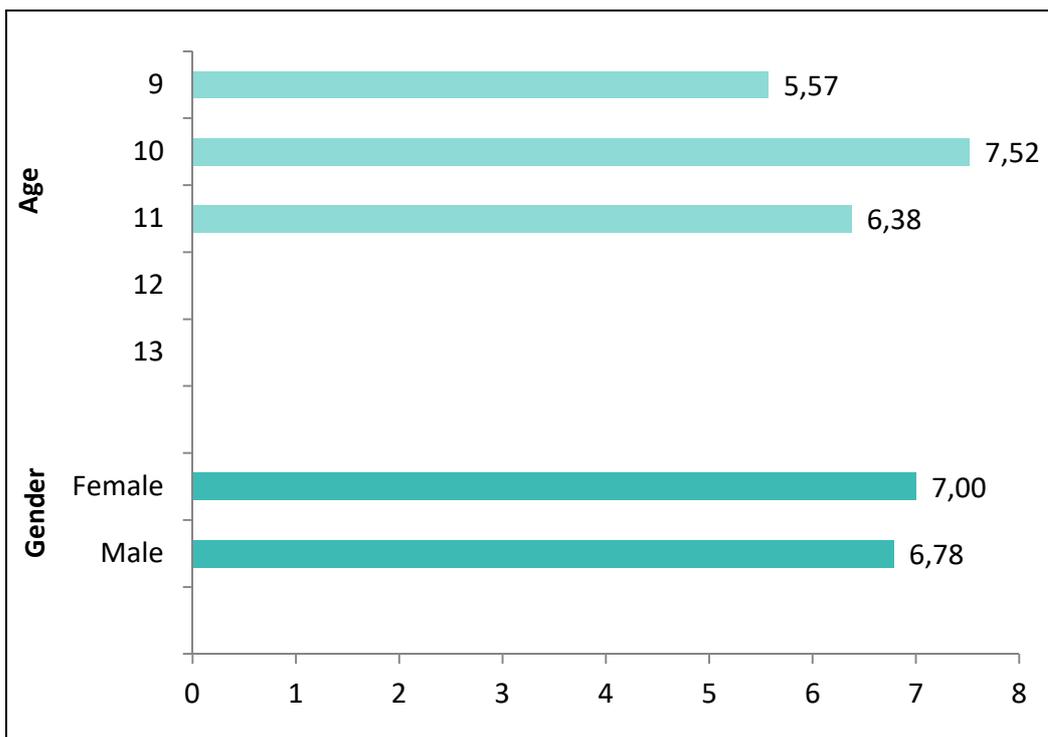
Age	
9	+28,6%
10	-0,3%
11	-23,6%
12	0,0%
13	0,0%
Gender	
Female	+10,6%
Male	-17,4%



Problem solving	- 11,7%
------------------------	----------------

Age	
9	+14,3%
10	-14,7%
11	-18,3%
12	0,0%
13	0,0%
Gender	
Female	-8,8%
Male	-13,0%

Experience with the game	6,90
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4.2 Annex 2. Guidelines for the observation

Observations O3/A5

Information about the observation

Date:	Duration:
School name:	
Number of participants (students):	Grade:
Number of boys:	Number of girls:
Number of teachers or guidance practitioners:	
Professions played:	
<input type="checkbox"/> Scientific- investigator <input type="checkbox"/> Chef <input type="checkbox"/> Singer <input type="checkbox"/> Tourist guide	

Observations

Fill in the section of observations and evaluate on a scale of 1-10 (with 10 being the strongest score) the observation made in each section.

GAME FUNCTIONING	OBSERVATIONS
Ease - difficulty understanding the rules and using the game (autonomy)	

1	2	3	4	5	6	7	8	9	10

CONCEPTUAL	OBSERVATIONS
Ease - difficulty understanding situations	



Interpretation of the results (entrepreneurship skills)	
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1	2	3	4	5	6	7	8	9	10

THECNICAL ASPECTS	OBSERVATIONS
Navigation (agile-intuitive)	

1	2	3	4	5	6	7	8	9	10

ATTITUDE	OBSERVATIONS
Predisposition to play with the game	
Motivation of the students using the game	

1	2	3	4	5	6	7	8	9	10
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OTHER OBSERVATIONS:

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4.3 Annex 3. Guidelines for the focus group

GEM Focus group O3/A5

Participants: At least 5 teachers and/or guidance practitioners who have used the GEM game.

INTRODUCTORY QUESTIONS - ENTREPRENEURSHIP IN PRIMARY

- What skills do you think are associated with entrepreneurship? Do you work these skills at school?
- How do you work the entrepreneurial skills at school? In a subject or transversely, with some resources or material...
- Do you use or know any games to work the skills associated with the entrepreneurial spirit in primary? And online games?

ABOUT THE USE OF THE GEM GAME

PEDAGOGICAL ASPECTS

- ¿How was your experience using the game? And what about the experience of the students?
- Do you believe that the game encourages the knowledge and identification of the skills associated with the entrepreneurial spirit?
- Do you consider that entrepreneurial skills are reflected in the situations raised in the game?
- Do you consider the results of the game (certificates) useful to identify the level of knowledge of entrepreneurial skills of students? And do you consider it useful to work on them later?
- Do you think that students can transfer and apply the knowledge acquired through play in their life and professional project?



- Do you believe that students can transfer and apply the knowledge acquired through play in their daily lives?
- Do you consider the game situations appropriate to the level of the primary students? (Vocabulary, level of abstraction...)
- Do you consider the tool sufficiently motivating for the primary students? Does the game arouse the attention and interest of students?
- The final version of the game includes a guide for teachers. What should contain to help professionals get the most out of the tool?

FUNCTIONAL, TECHNICAL AND ESTHETIC ASPECTS

- Do you consider navigation through the game agile and intuitive? (Structure-clear navigation map, speed).
- How do you rate the visual design of the platform? Do you think it is attractive for students? (Illustrations, colours, typography, arrangement of elements...).
- What do you think about the mechanics or the operation of the game? (Levels, Scores...).
- Have you found any other improvement over the game approach? (Situations, operational logics, results...).