Results of the questionnaires administrated in Italian and Turkish pilot schools

1° Questionnaire – March 2017
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INTRODUCTION

The impact of DIGITgame didactic approach, in facing STEM underachievement and lack of interest, has been documented using a pre and post testing strategy; method popular (even if a bit controversial in literature), easy to apply and characterize by a not time-consuming application for students and teachers (low dropout rate). In this project the method, based on targeted questionnaires, will permit to check student's and teacher's changes particularly in attitudes and behaviour toward science specific subject and related learning/teaching strategies. With the pre/post-testing investigation, students and teachers are asked to share the knowledge or attitude they had toward particular aspects in approaching teaching/learning science before DIGITgame experience and after. In general when participants are asked to respond to a question about how much they are conscious about a particular behaviour, they are unconsciously more able to accurately reflect, during and after specific and aimed actions (DIGITgame activities), on the degree of change in knowledge or attitude (Rockwell & Kohn, 1989). Furthermore, respondents oftentimes are not aware on particular behaviours or mindset in specific daily and usual contexts. With the retrospective questionnaires respondents are given an opportunity to fell and to test how much they face considered issues by a passive attitude. With these aims DIGITgame foresee three types of questionnaire;

- an initial set of questions to investigate the approach and behaviour, both of students and teachers, in considering and using devices (Smartphone, PC, tablet) and Internet support in investigating science subjects,
- a set of questions, shared at the end of the project operative activities, to understand the changes in devices and Internet utility awareness,
- a final questionnaire to test the effective level of appreciation and fun experienced by the project actors during the activities and in general in the project participation.

Questionnaires methodology

The main aim of "questionnaires actions" in DIGITgame project is to understand the impact of the activities and resources and efforts exploited. Concerning the reference methodology we decide to apply the approach proposed by Kier, M.W., Blanchard, M.R., Osborne, J.W. & Albert, J.L. (2014) (1) in a simplified version fitted to the project activities and deadlines.

In the project the "questionnaire activity" represented a small survey aimed to give indications related to attitudinal, habits and preferences, it isn't a systematic data collection concerning student's information across all of the STEM subject areas. This surveys measuring is however important to contribute to develop measurements and investigations toward STEM context and high school students' interest in STEM.

In this study, we adopt the STEM Career Interest Survey (STEM-CIS), which is a type of 5-point-Likert scale, in Turkey and Italy. The questionnaires were administrated to 113 students and 23 teachers.
QUESTIONNAIRES RESULTS

Overview on Italian and Turkish students

The aim of this document is to understand the knowledge of young students about STEM subjects. To reach this goal a questionnaire has been administrated to young students, from 12 to 17 years, in two schools partner countries: Italy and Turkey.

CNR-IBIMET has developed the template of the questionnaire based on the adaptation of the ‘Research and Science Education questionnaire’.

It is realized to achieve the following results:

- Identify the knowledge on STEM
- Identify the use of smartphone to study
- Identify the level of knowledge of science topics that will be increased during the project

The same questionnaires, with some changes will be administrated at the end of the pilot activity to understand and compare the level of knowledge before and at the project end.

The template of the questionnaire has been planned in different sections to detect different aspects.

The survey results were displayed in simple descriptive statistical tables and graphs.

In the first part of the questionnaire, same general information about young students will be collected, such as age, gender, school.

In Figure 1 we find the results about gender from Italian and Turkish schools. We immediately see a balanced percentage between males (58%) and females (42%) who completed the questionnaire.

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The second section of the questionnaire detects to know the skills in relation to Science, Technology, Engineering and Mathematics (15 items). Students were asked to indicate the results on a five points scale (1=strongly disagree; 2=disagree; 3= neither agree nor disagree; 4=agree; 5=strongly agree).

**Figure 2 Science skills**

- I am able to get a good grade in my science class
- I am able to complete my science homework
- I plan to use science in my future career
- I will work hard in my science classes
- If I do well in science classes, it will help me in my future career
- My parents would like it if I choose a science career
- I am interested in careers that use science
- I like my science class
- I know someone in my family who uses science in their career
- I have a role model in a science career
- I would feel comfortable talking to people who have a career in science
- I use the smartphone/PC to study Science
- I use the smartphone/PC to deepen Science topics treated at school
- I like online quizzes with Science questions
- Online games (quizzes) could make me love more Science.

**Figure 3 Mathematics skills**

- I am able to get a good grade in my mathematics class
- I am able to complete my mathematics homework
- I plan to use mathematics in my future career
- I will work hard in my mathematics classes
- If I do well in mathematics classes, it will help me in my future career
- My parents would like it if I choose a mathematics career
- I am interested in careers that use mathematics
- I like my mathematics class
- I know someone in my family who uses mathematics in their career
- I have a role model in a mathematics career
- I would feel comfortable talking to people who work in mathematics careers
- I use the smartphone/PC to study Mathematics
- I use the smartphone/PC to deepen Mathematics topics treated at school
- I like online quizzes with Mathematics questions
- Online games (quizzes) could make me love more Mathematics.
The figures (2, 3, 4, and 5) show a different level of knowledge and interaction with the STEM subjects. We can see a lower level of knowledge and interaction in Engineering and Technology compared to Mathematics and Science. At the same time, we can highlight the results related to the question ‘I have a role model in an engineering/technology/mathematics/science career’. In this case a lot of students have attributed a low score to this question.
The third section of the questionnaire detects to know the use of smartphone/pc to increase STEM subjects (13 items). Students were asked to indicate the results on a five points scale (1=strongly disagree; 2=disagree; 3=neither agree nor disagree; 4=agree; 5=strongly agree).

![Figure 6 Use of smartphone/pc](image)

From the results (Figure 6) a constant trend can be observed about a use of smartphone/pc. The two questions with a slightly lower score are ‘I spend a lot of time to play on/off line with the pc/smartphone’ and ‘Our school offers us on/off line homework’.

Another part of the questionnaire detects to know the knowledge level on some topics that will be explored during the project (6 items). Students were asked to indicate the results on a five points scale (1=Very poor; 2=Poor; 3=Fair; 4=Good; 5=Very good).

![Figure 7 Knowledge level](image)
The results show a level of knowledge less than ‘4-good’ for all items. In particular, the figure highlights a lower score of knowledge level of ‘VOC-Volatile Organic Compounds’ and ‘Measurement of the VOC’.

The last part of the questionnaire is designed to know if students are interested to search information about the topics that will be explore during the project.

![Figure 8 Will you search information with your smartphone/pc about the topics?](image)

68%
32%
Will you search information with your smartphone/pc about the topics?
Yes
No

The figure 8 shows that more than 50% of students will search information about the topics that will be treated during DIGITgame project. The main topics that the students will be looking for are: VOC, Smart Cities and Engineering (Figure 9).

![Figure 9 Word Cloud](image)
Focus on Italian students

In this section of the document we focus our attention on the results of Italian students’ questionnaires. The survey results were displayed in simple descriptive statistical graphs related to STEM subjects and divided by male and female. The aim of this work is to know the different vision on STEM skills and use of smartphone per gender.

The first results are related to Science skills (Figure 10). The answers that have been given by males and females are fairly balanced for all items (15). There is only one item with a marked different score from male and female. It is the question ‘I use the smartphone/pc to increase science topics treated at school’. In this case, we can find a higher score given by males than females.

![Figure 10 Focus on Science skills in Italy]
The following figure (11) is related to Mathematics skills. The answers that have been given by males and females are balanced for all items (15).
The following Figure (12) is related to Technology skills. The answers that have been given by males and females are balanced for all items (15). The results highlight a lower score that is attributed by females to questions about the use of the smartphone/pc (such as the question: 'I use the smartphone/pc to deepen technology topics treated at schools') and online quizzes (such as the question: 'I like online quizzes with technology questions').
The below Figure (13) is related to Engineering skills. The results highlight a lower score that is attributed by females in all items (15). In particular, we can find a presence of ‘strongly disagree’ in all questions compared to males.
This section (Figure 14) is designed to detect the use of smartphone/pc. The answers that have been given by males and females are balanced for all items (13).
The last part of the questionnaire is related to the knowledge level on the topics that will be treated during DIGITgame project. In general (Figure 15), in Italy males affirmed a higher level of knowledge of the topics compared to females.

Figure 15 Focus on knowledge level in Italy

Figure 16 shows that in Italy more than 80% of female and male students will search information with smartphone/PC about the topics that will be treated during the DIGITgame project.

Figure 16 Will you search information with your smartphone/pc about the topics?
In this section of the document we focus our attention on the results of Turkish students’ questionnaires. The survey results were displayed in simple descriptive statistical graphs related to STEM subjects and divided by male and female. The aim of this work is to know the different vision on STEM skills and use of smartphone per gender.

The first results are related to the Science skills (Figure 17). The answers that have been given by males and females are fairly balanced for all items (15).
The following figure (18) is related to the Mathematics skills. The answers that have been given by males and females are balanced for all items (15).
The Figure below (19) is related to the Technology skills. The answers that have been given by males and females are balanced for all items (15).
The following Figure (20) is related to the Engineering skills. The results highlight a lower score that is attributed by females in all items (15).

Figure 20 Focus on Engineering skills in Turkey
This section is designed to detect the use of smartphone/pc (Figure 21). The answers that have been given by the males and females are balanced for all items (13).

![Bar charts and graphs showing responses to various survey questions related to the use of smartphones and PCs in Turkey.](image-url)

*Figure 21 Focus on use of smartphone/pc in Turkey*
The last part of the questionnaire is related to the knowledge level on the topics that will be treated during DIGITgame project.

Figure 22 Focus on knowledge level in Turkey

The following figure 23 shows a similar situation between male and female, because in both cases more than 50% of students will not search information with smartphone/pc about topics treated in the questionnaire.

Figure 23 Will you search information with your smartphone/pc about the topics?
Overview on Italian and Turkish teachers

In the present chapter, we focus our attention on the results of Italian and Turkish teachers’ questionnaires. The aim of this questionnaire is to understand the opinion of teachers in relation to students’ skills and use of smartphone about STEM subjects. The survey results were displayed in simple descriptive statistical graphs related to STEM subjects. The aim of this work is to know the different vision on STEM skills and use of smartphone/pc to deepen and study STEM subjects. The first part of the questionnaire is designed to detect about general information of teachers, such as gender (Figure 24) and teaching subject (Figure 25).

![Gender](image1.png)

*Figure 24 Teachers’ gender*

![Teaching Subject](image2.png)

*Figure 25 Teaching subject*
The second section of the questionnaire detects to know the opinion of teachers in relation to the students use of smartphone/pc to deepen and study Science, Technology, Engineering and Mathematics subjects (5 items). Teachers were asked to indicate the results on a five points scale (1=strongly disagree; 2=disagree; 3= neither agree nor disagree; 4=agree; 5=strongly agree).

**Figure 26 Science opinion**

**Figure 27 Mathematics opinion**
Figure 28 Technology opinion

- Students use mobile devices/PC to study technology
- Students use mobile devices/PC to deepen technology topics treated at school
- The use of on/off line games (quizzes) helps students to learn more about technology
- The use of on/off line games/quizzes makes students more active during the technology lessons
- The use of on/off line games/quizzes stimulates the students during the lessons

Figure 29 Engineering opinion

- Students use mobile devices/PC to study engineering
- Students use mobile devices/PC to deepen engineering topics treated at school
- The use of on/off line games (quizzes) helps students to learn more about engineering
- The use of on/off line games/quizzes makes students more active during the engineering lessons
- The use of on/off line games/quizzes stimulates the students during the lessons
The third section of the questionnaire detects to know the use of school’s platforms to share teaching material and homework to students. Students were asked to indicate the results on a five points scale (1=strongly disagree; 2=disagree; 3= neither agree nor disagree; 4=agree; 5=strongly agree).

![Use of smartphone/pc](image)

**Figure 30 Use of smartphone/pc**

The last section of the questionnaire detects to know the students’ knowledge level on some topics that will be explored during the project (6 items). Students were asked to indicate the results on a five points scale (1=strongly disagree; 2=disagree; 3= neither agree nor disagree; 4=agree; 5=strongly agree).

![Level of knowledge](image)

**Figure 31 Level of knowledge**
Overview on students and teachers’ results

In the present chapter, we focus our attention on the results’ comparison between teachers and students’ questionnaire in Italy and Turkey. The aim of this questionnaire is to compare some topics and understand the opinion of teachers in relation to students’ skills and use of smartphone about STEM subjects.

The survey results were displayed in simple descriptive statistical graphs related to STEM subjects.

The figures 32, 33, 34 and 35 show the opinion of teachers in relation to the students use of smartphone/pc to deepen and study Science, Technology, Engineering and Mathematics subjects (3 items). Teachers and students were asked to indicate the results on a five points scale (1=strongly disagree; 2=disagree; 3= neither agree nor disagree; 4=agree; 5=strongly agree).

Figure 32 Students and teachers’ opinion on Science

Figure 33 Students and teachers’ opinion on Mathematics
Figure 34 Students and teachers' opinion on Engineering

- The use of on/off line games (quizzes) helps students to learn more about engineering
- Students use mobile devices/pc to deepen engineering topics treated at school
- Students use mobile devices/pc to study engineering

Figure 35 Students and teachers' opinion on Technology

- The use of on/off line games (quizzes) helps students to learn more about technology
- Students use mobile devices/pc to deepen technology topics treated at school
- Students use mobile devices/pc to study technology
This part of the analysis detects to know the compared opinion about use of school’s platforms to share teaching material and homework to students. Students and teachers were asked to indicate the results on a five points scale (1=strongly disagree; 2=disagree; 3= neither agree nor disagree; 4=agree; 5=strongly agree).

![Use of smartphone/pc](image)

**Figure 36 Students and teachers’ opinion on use of smartphone/pc**

The last section of the questionnaire detects to know the students and teachers' opinion on level of knowledge (6 items). Students and teachers were asked to indicate the results on a five points scale (1=strongly disagree; 2=disagree; 3= neither agree nor disagree; 4=agree; 5=strongly agree).
Figure 37 Students and teachers' opinion on level of knowledge