

## Results of the questionnaires administrated in Italian and Turkish pilot schools

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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 permits 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 feel 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 administered 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'<sup>1</sup>.

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 administered 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, some 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.

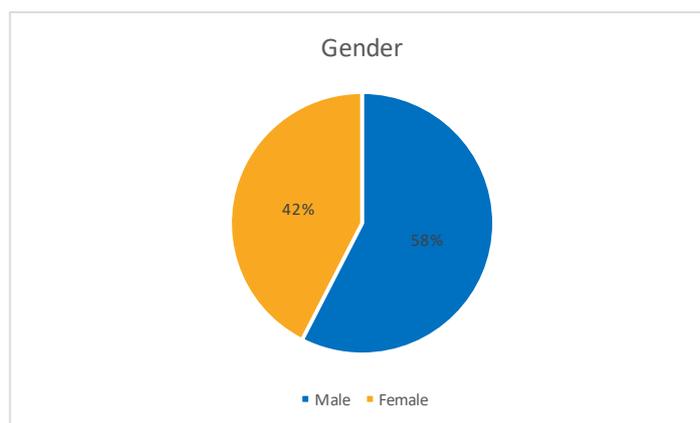


Figure 1 Gender

<sup>1</sup> Kier, M.W., Blanchard, M.R., Osborne, J.W. & Albert, J.L. (2014). *The Development of the STEM Career Interest Survey (STEM-CIS)*. *Research in Science Education*, 44, 461-481. doi:10.1007/s11165-013-9389-3

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).

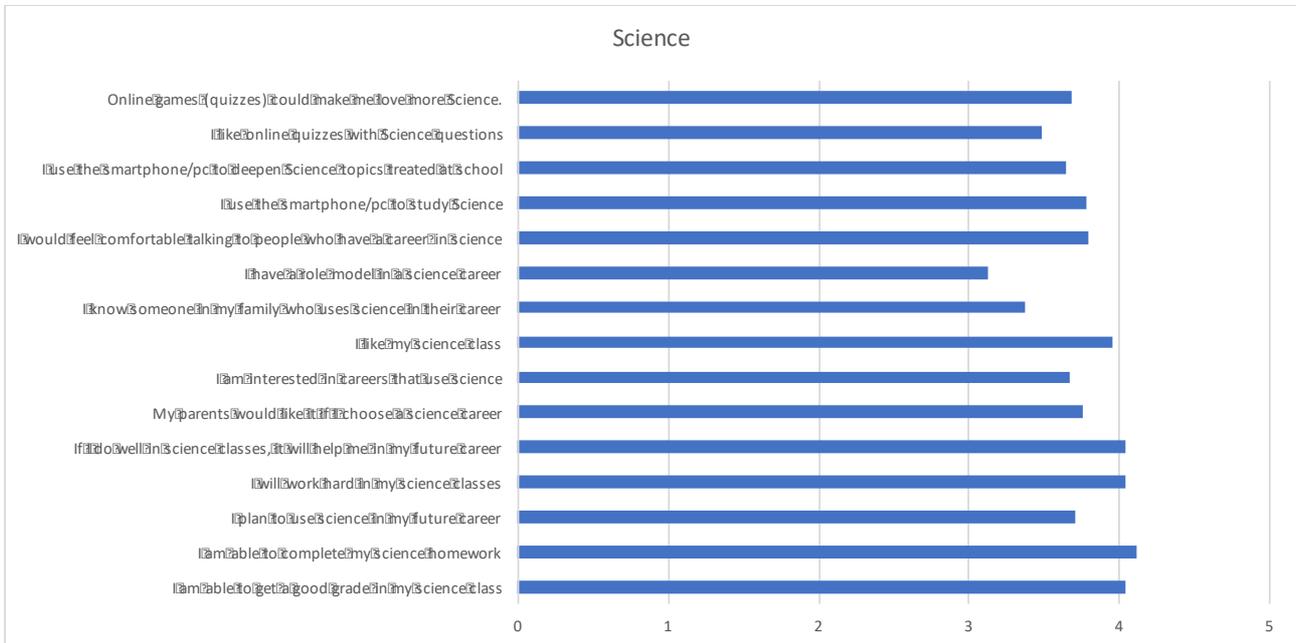


Figure 2 Science skills

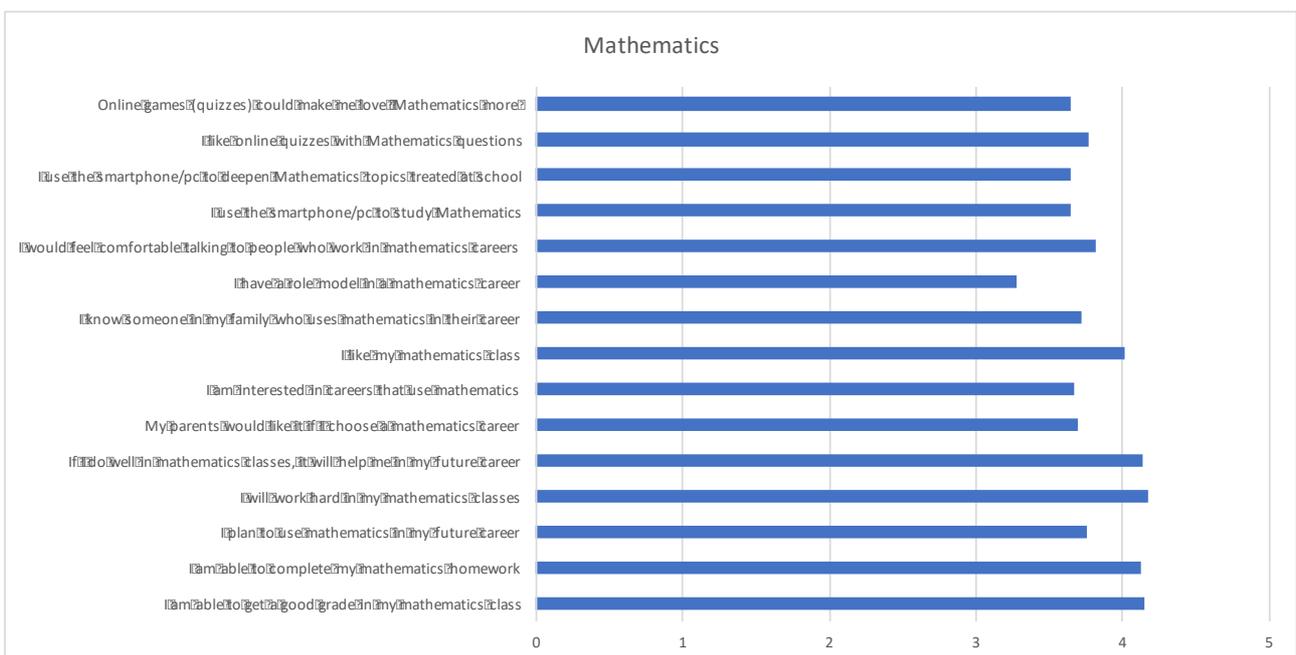


Figure 3 Mathematics skills

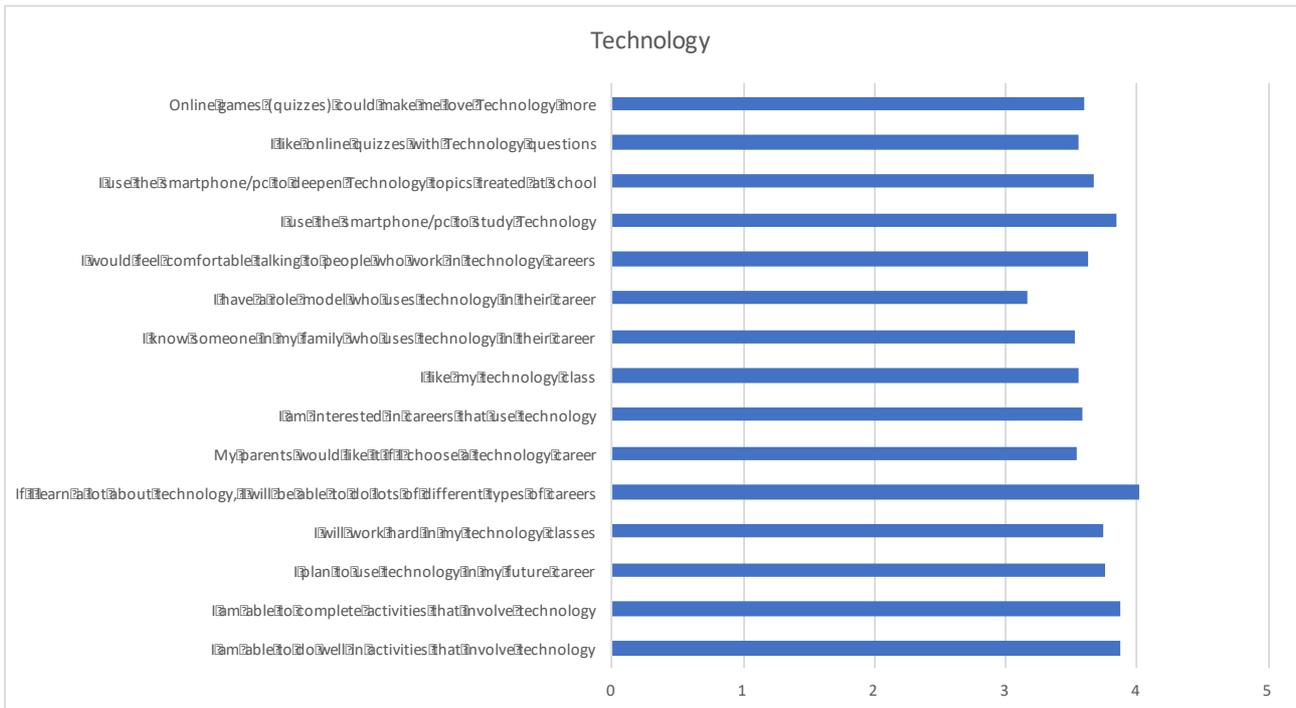


Figure 4 Technology skills

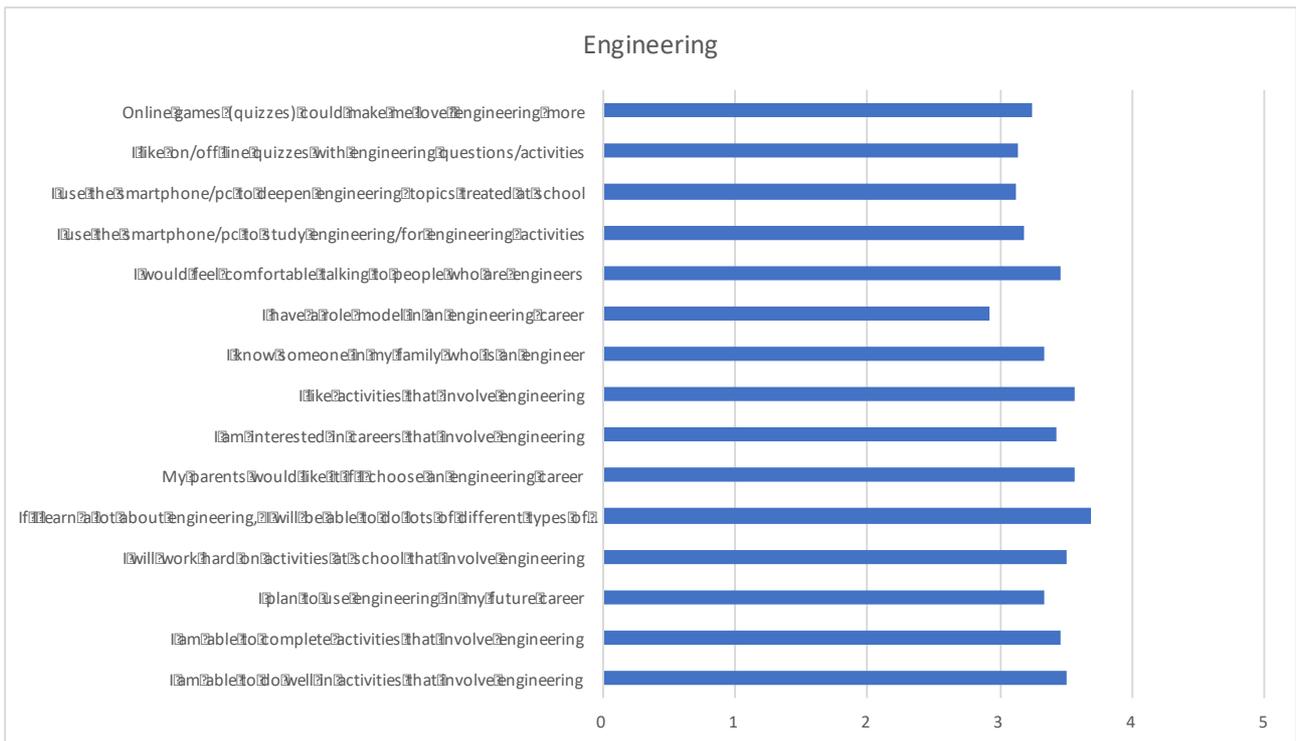


Figure 5 Engineering skills

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).

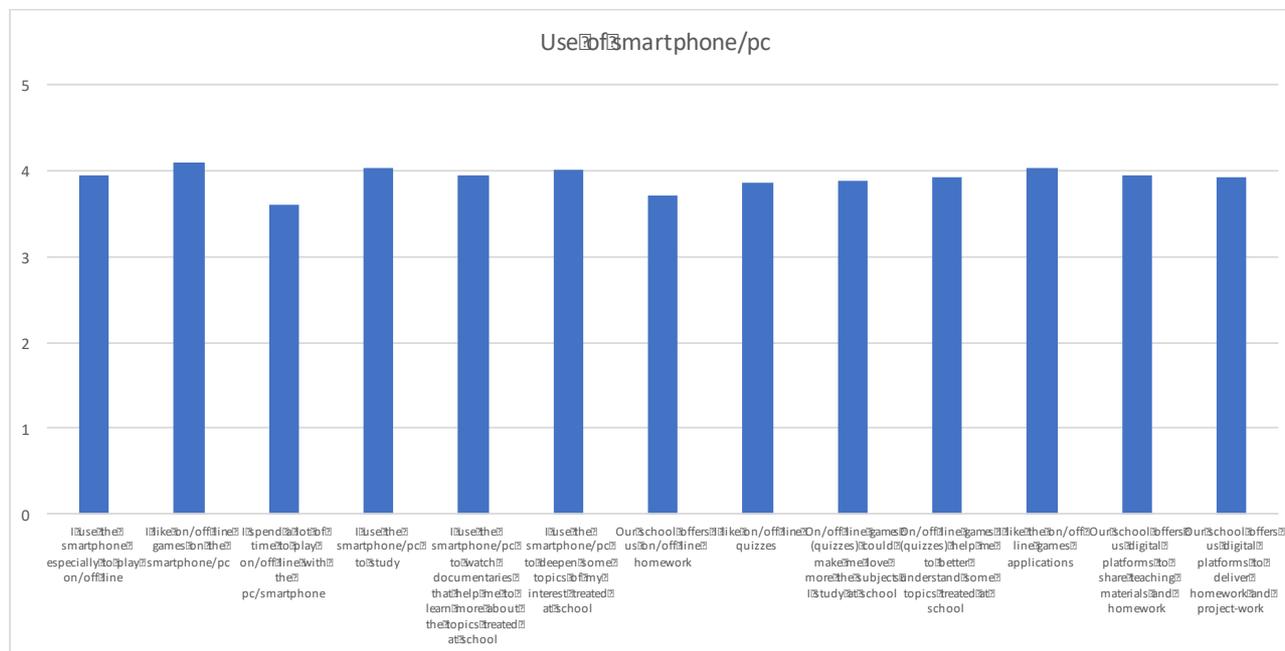


Figure 6 Use of smartphone/pc

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).

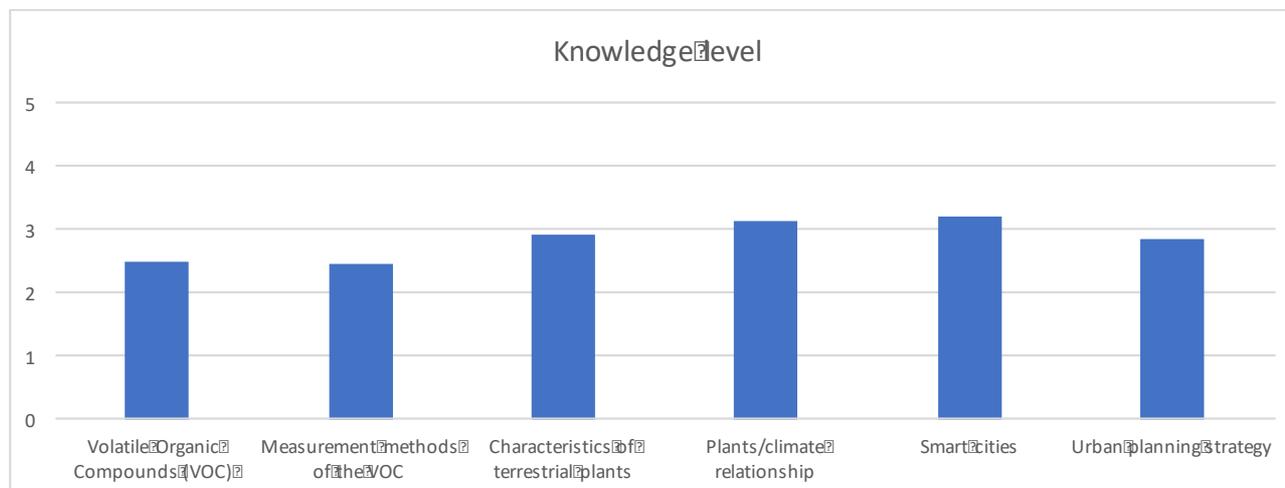


Figure 7 Knowledge level



## 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.

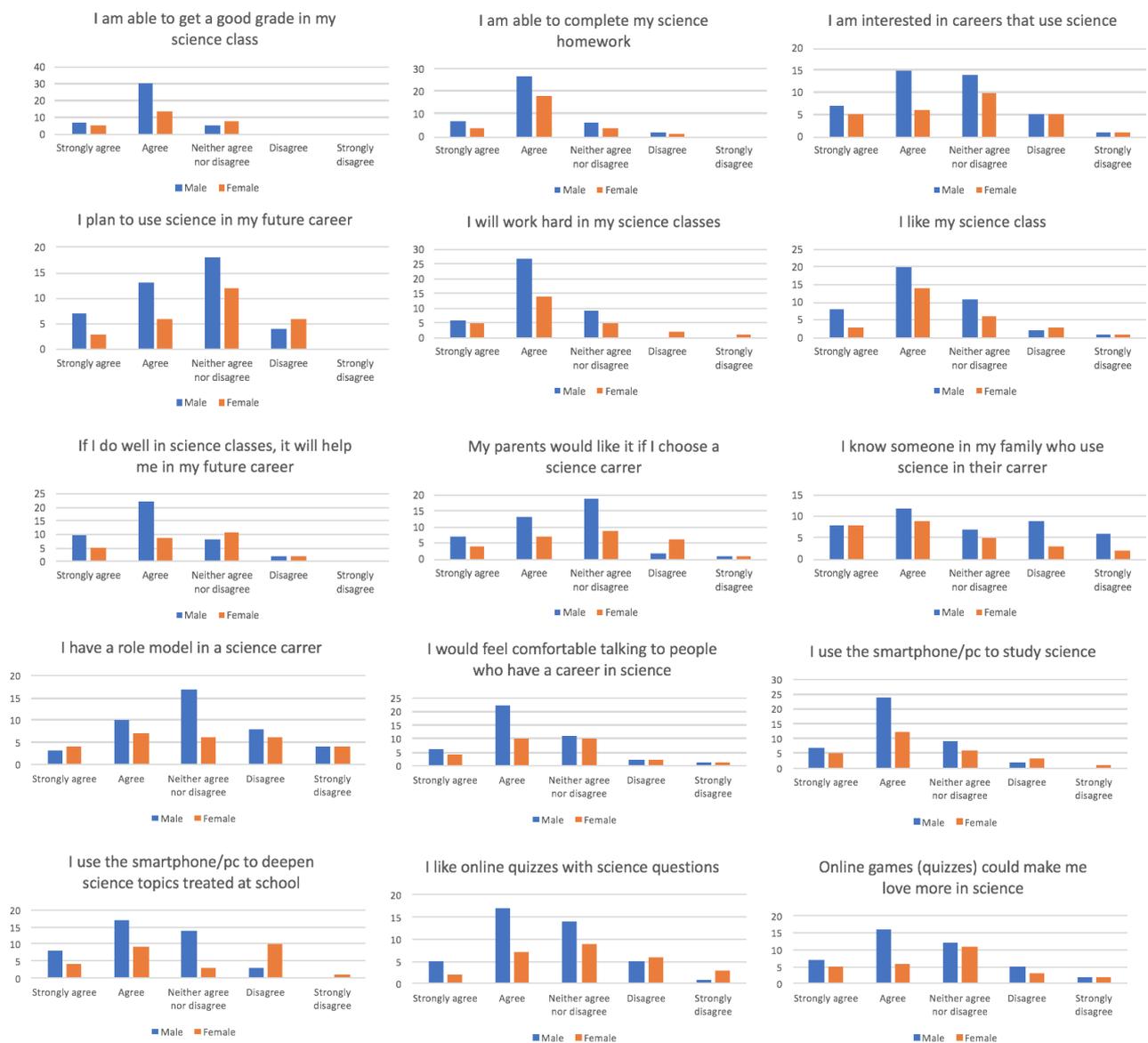


Figure 10 Focus on Science skills in Italy

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).

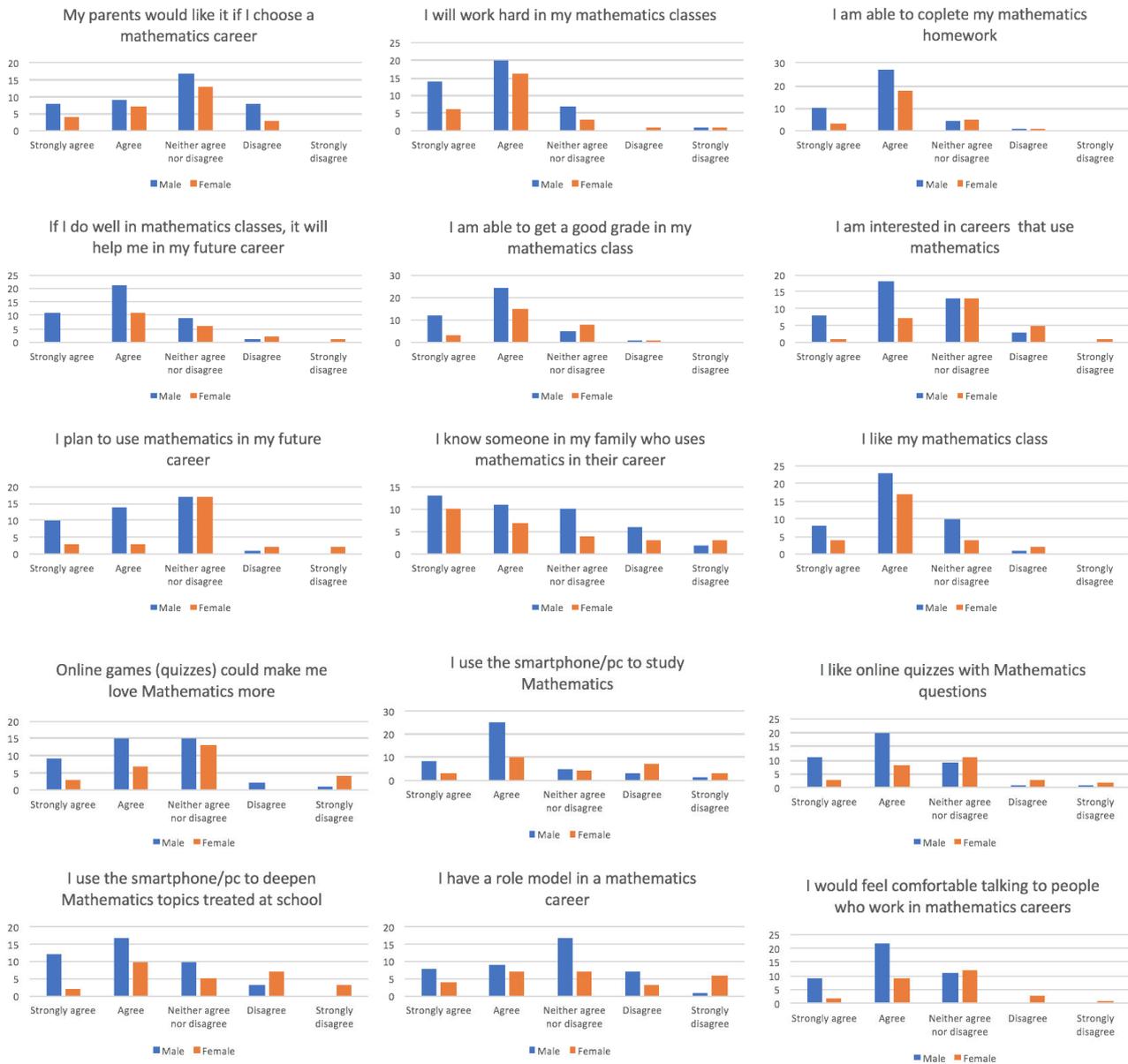


Figure 11 Focus on Mathematics skills in Italy

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').



Figure 12 Focus on Technology skills in Italy

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.

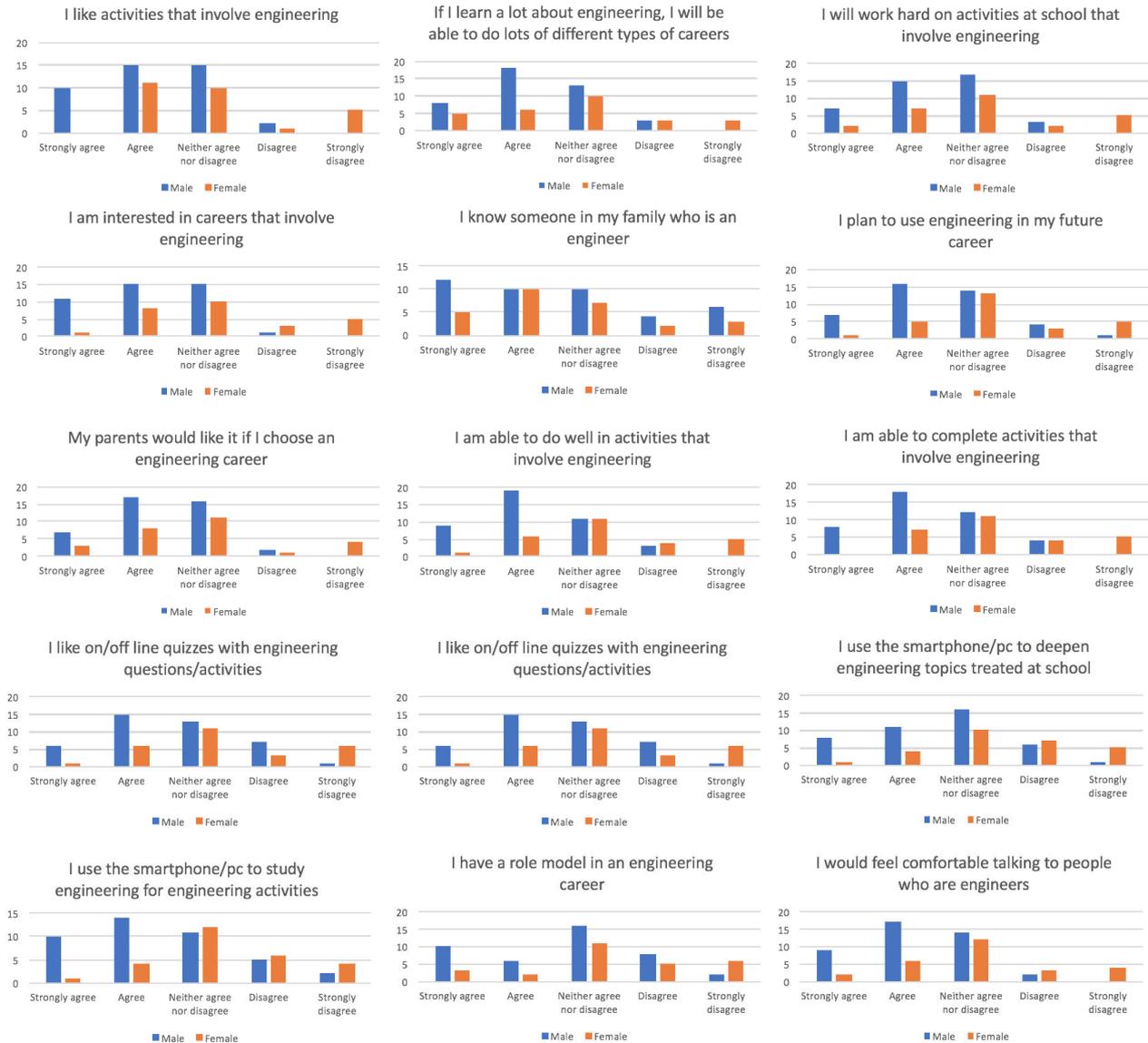


Figure 13 Focus on Engineering skills in Italy

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).

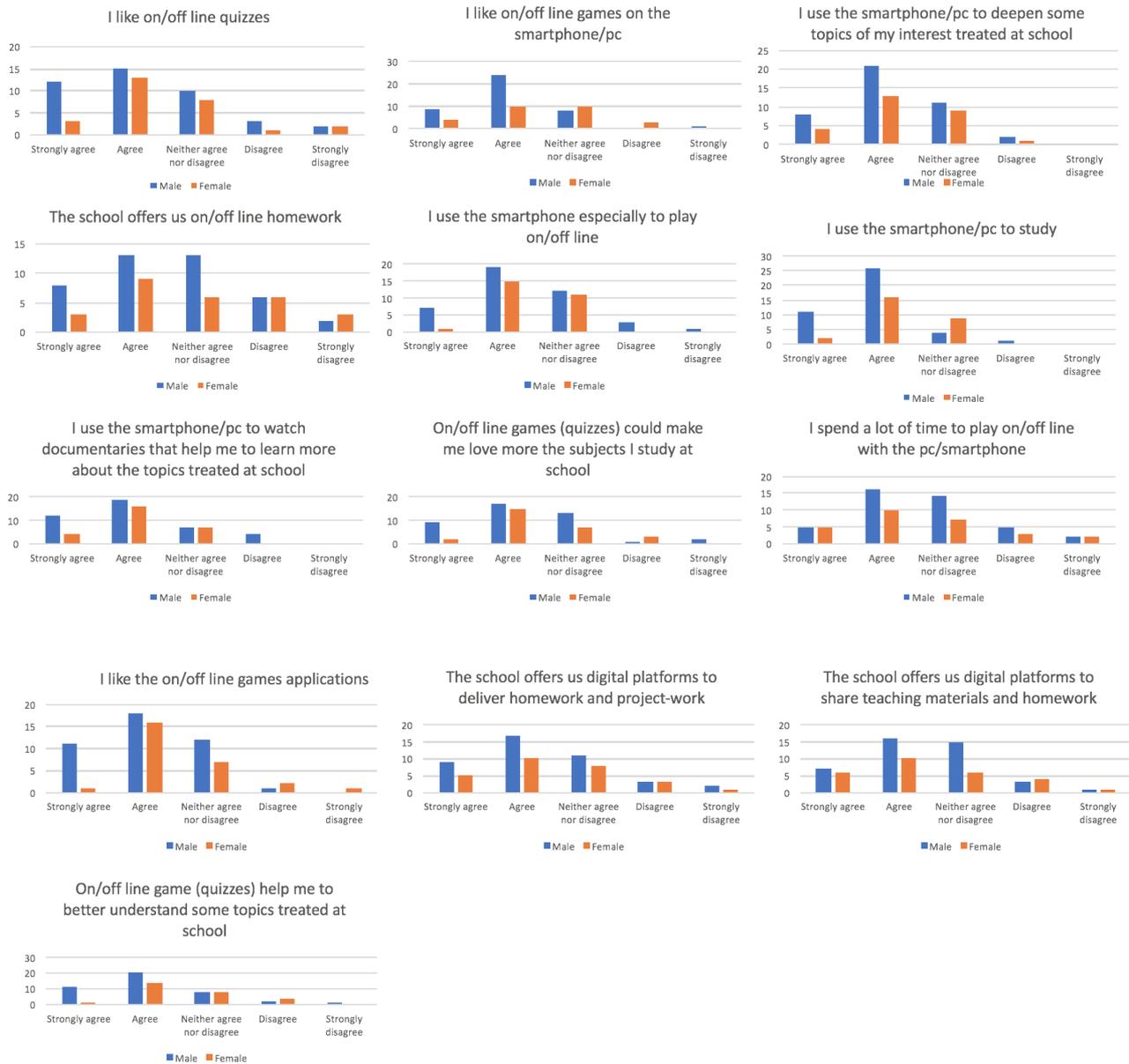


Figure 14 Focus on use of smartphone/pc in Italy

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.

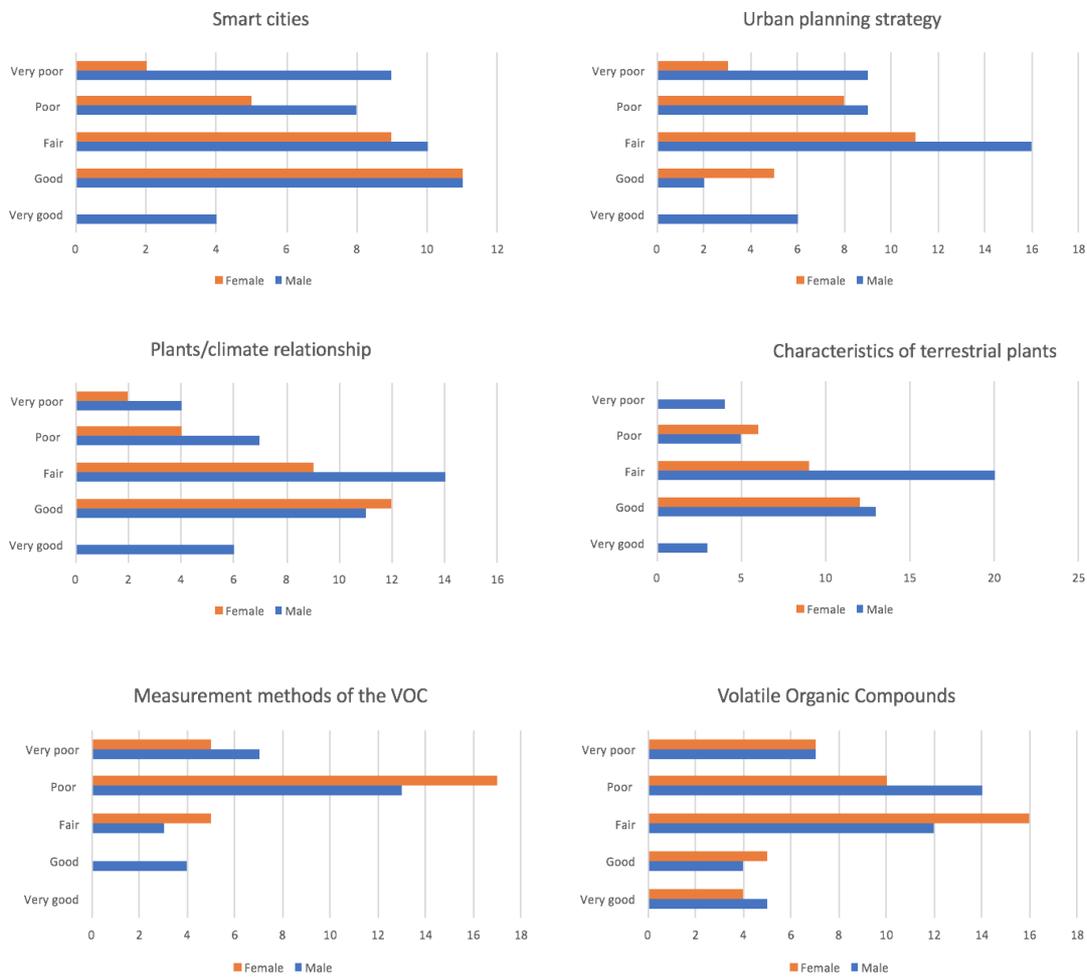


Figure 15 Focus on knowledge level in Italy

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.

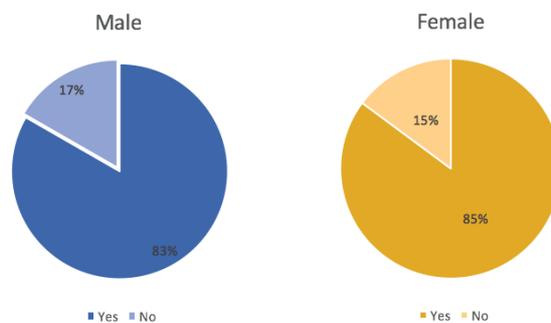


Figure 16 Will you search information with your smartphone/pc about the topics?

## Focus on Turkish students

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).



Figure 17 Focus on Science skills in Turkey

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).

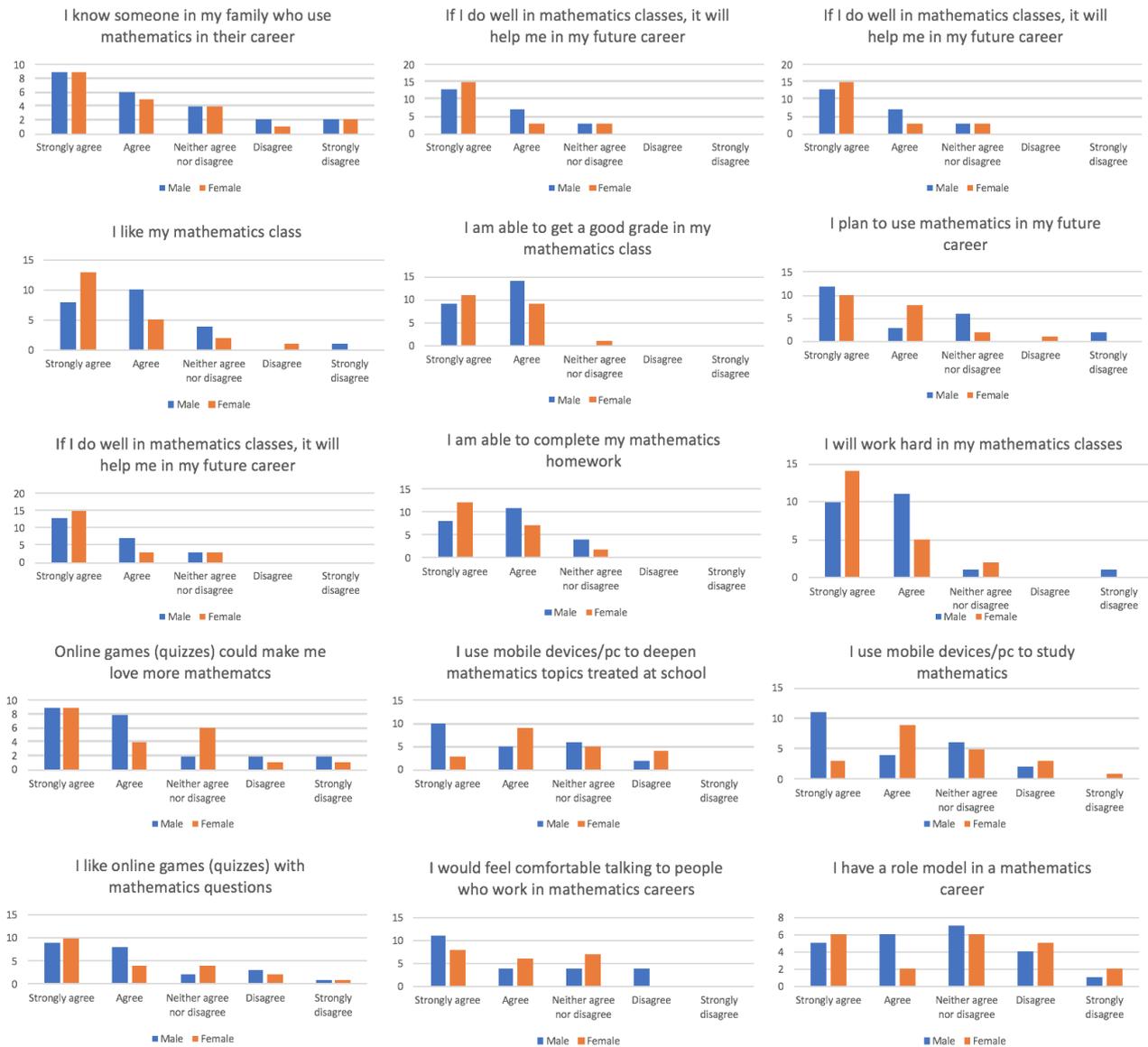


Figure 18 Focus on Mathematics skills in Turkey

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).



Figure 19 Focus on Technology skills in Turkey

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).

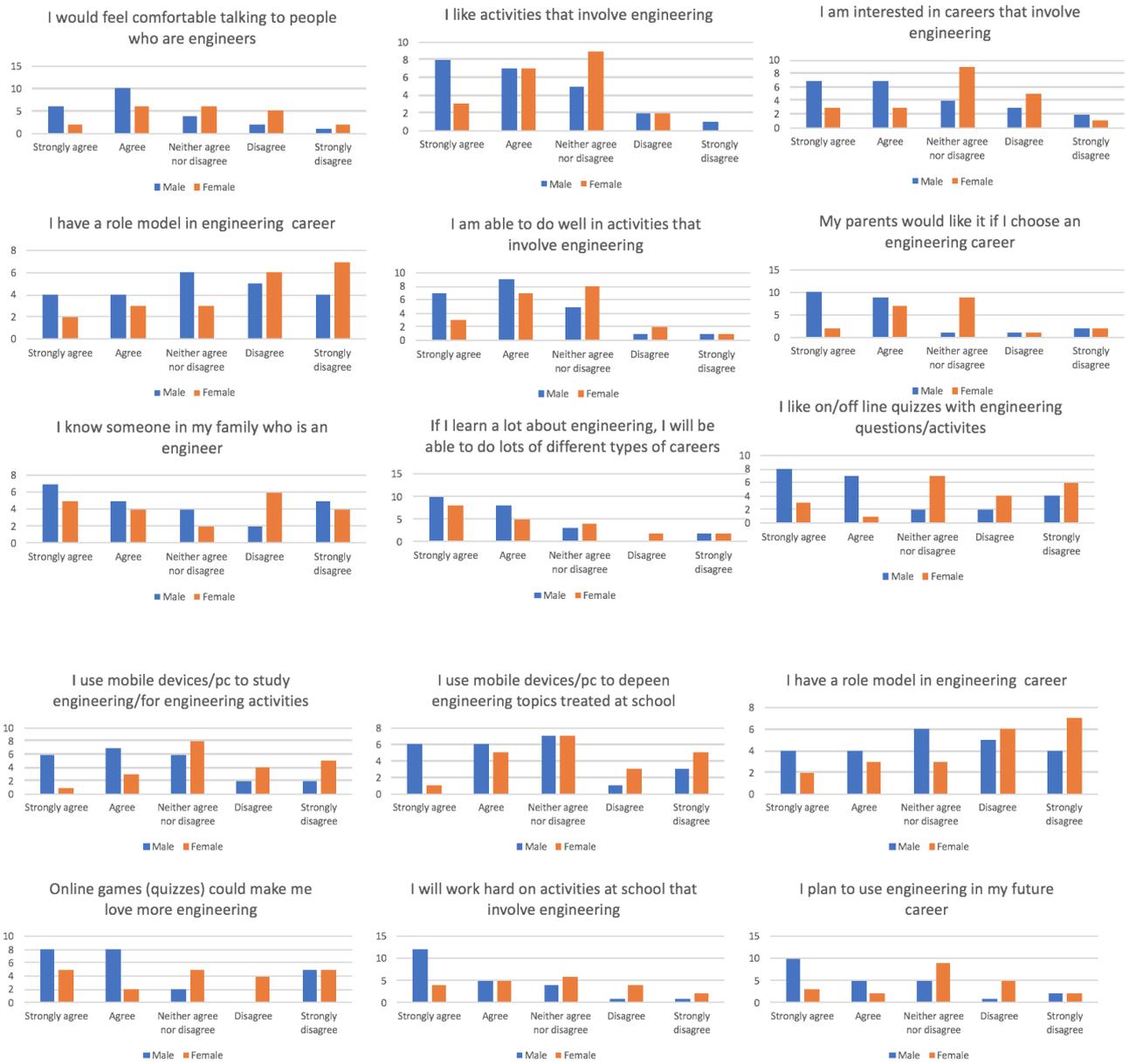


Figure 20 Focus on Engineering skills in Turkey

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).



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.

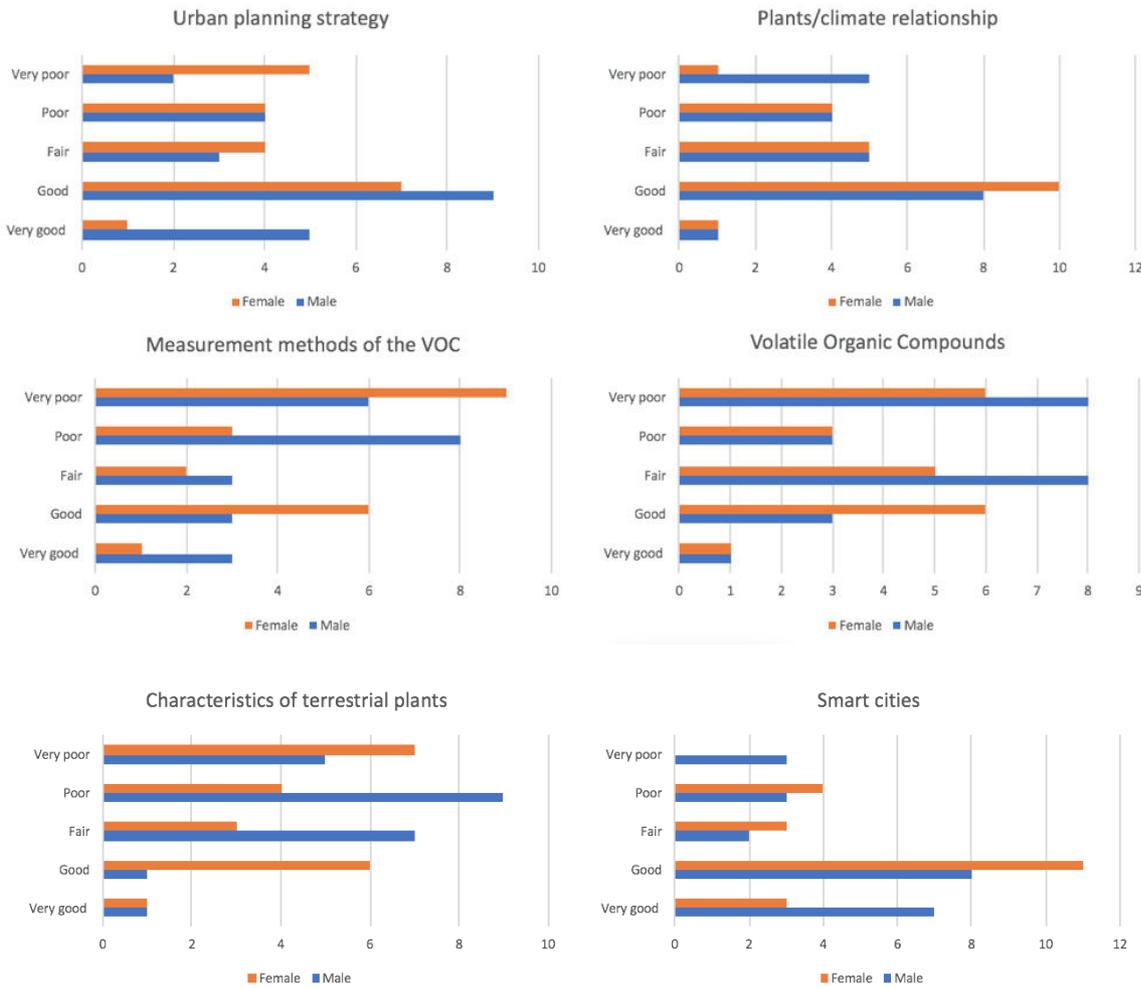


Figure 22 Focus on knowledge level in Turkey

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.

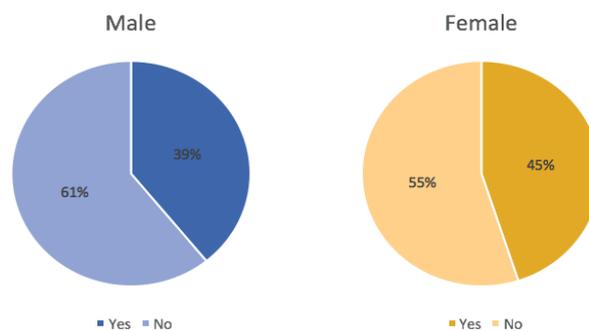


Figure 23 Will you search information with your smartphone/pc about the topics?

## 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).

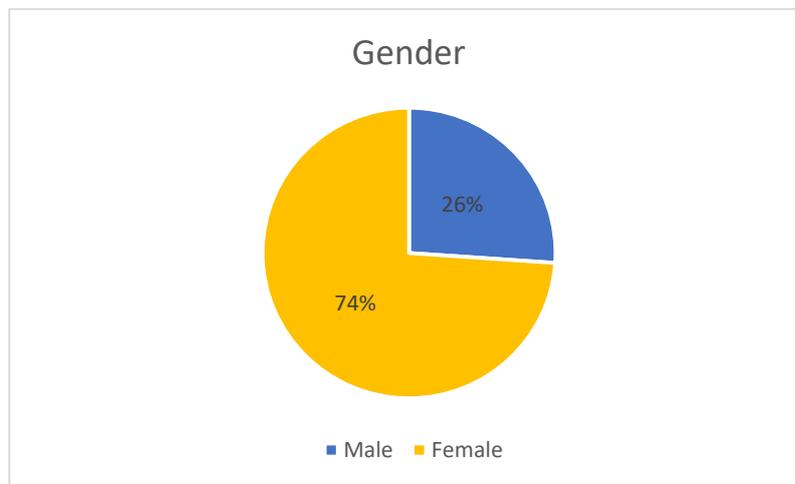


Figure 24 Teachers' gender

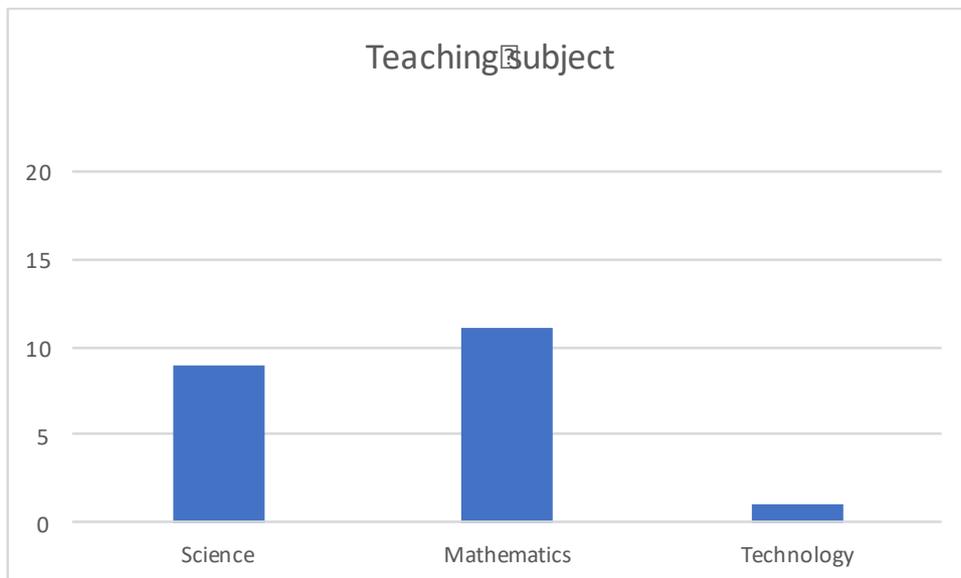


Figure 25 Teaching subject

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).

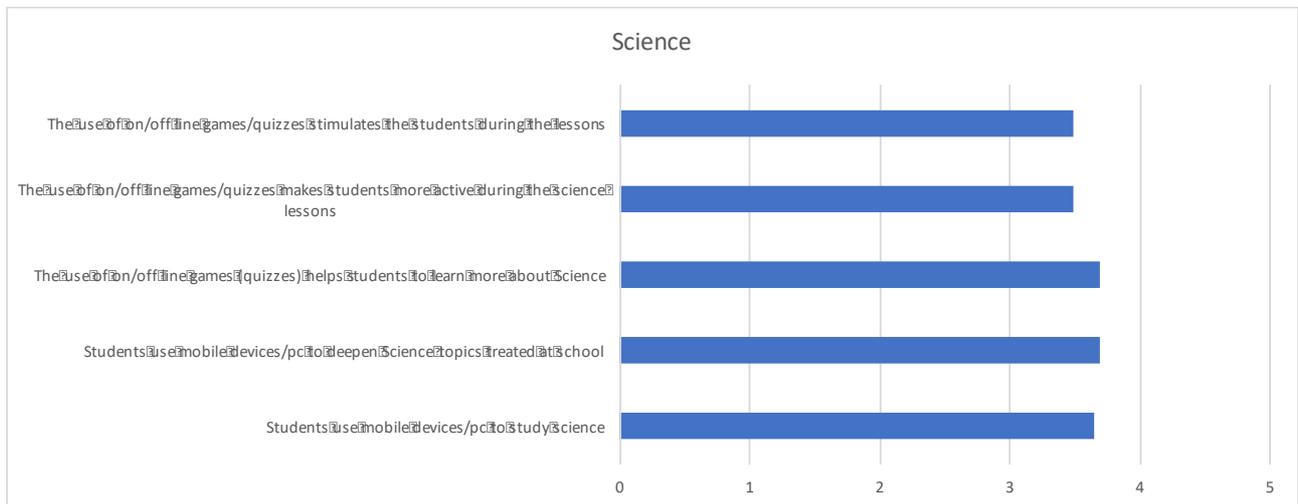


Figure 26 Science opinion

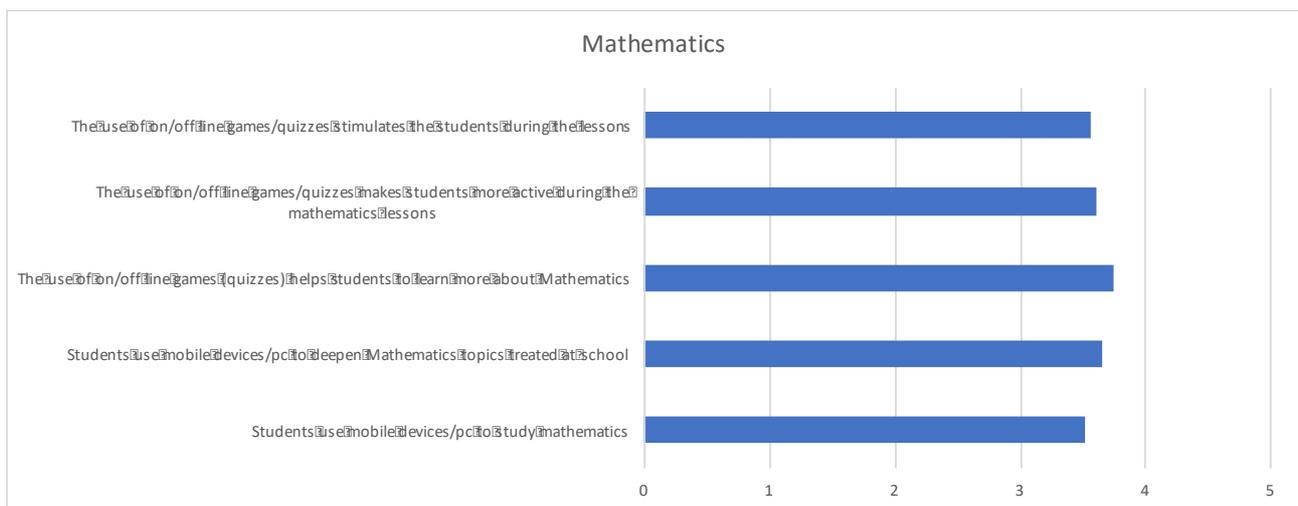
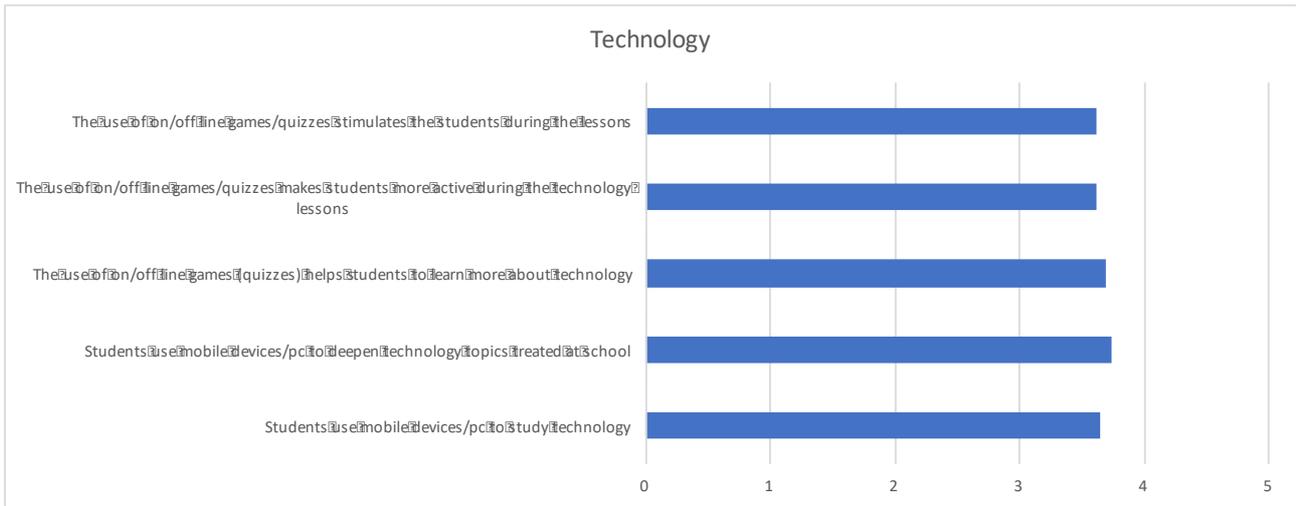
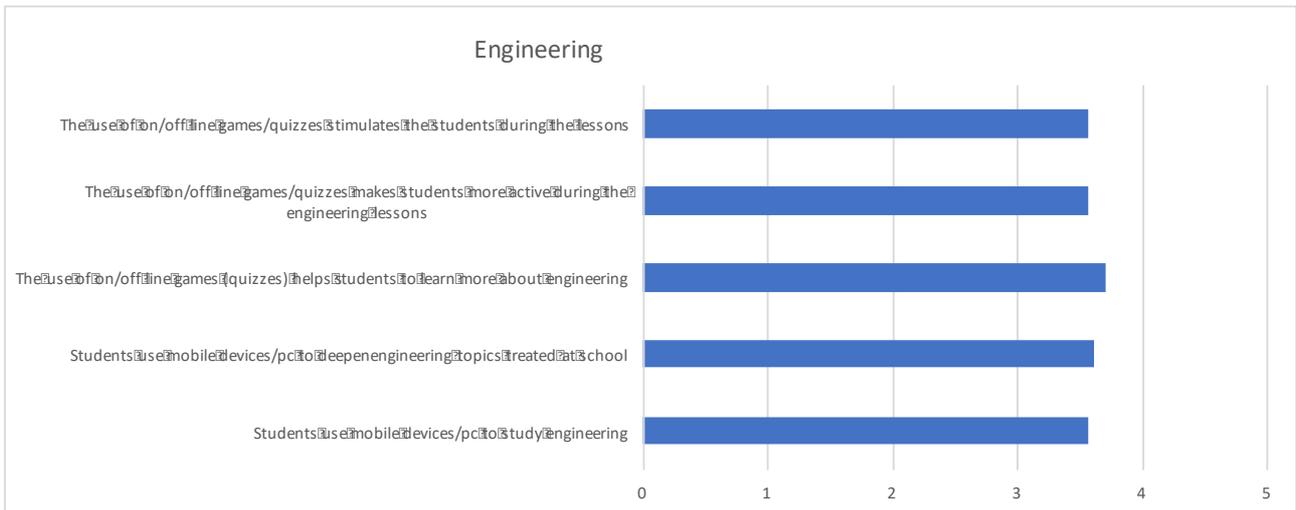


Figure 27 Mathematics opinion



*Figure 28 Technology opinion*



*Figure 29 Engineering opinion*

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).

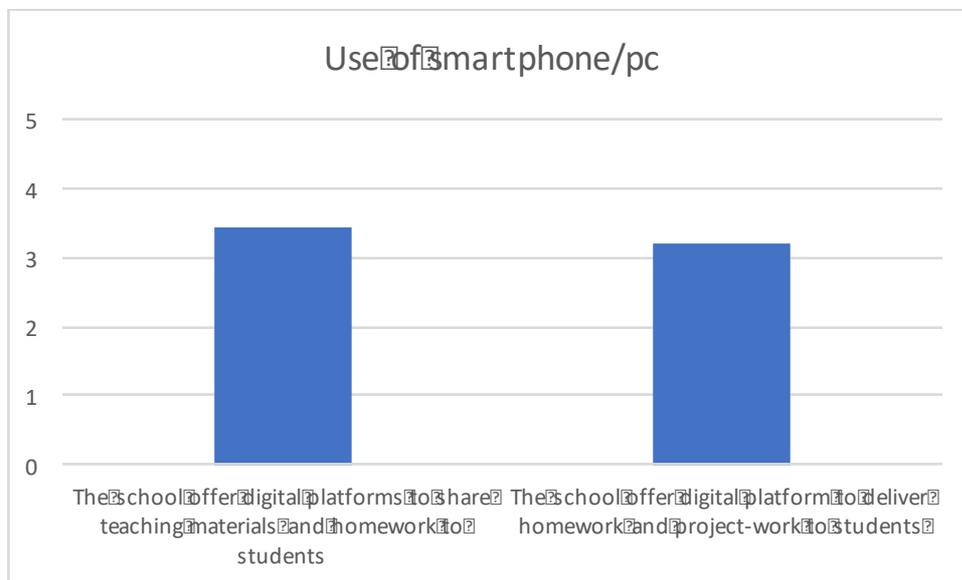


Figure 30 Use of smartphone/pc

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).

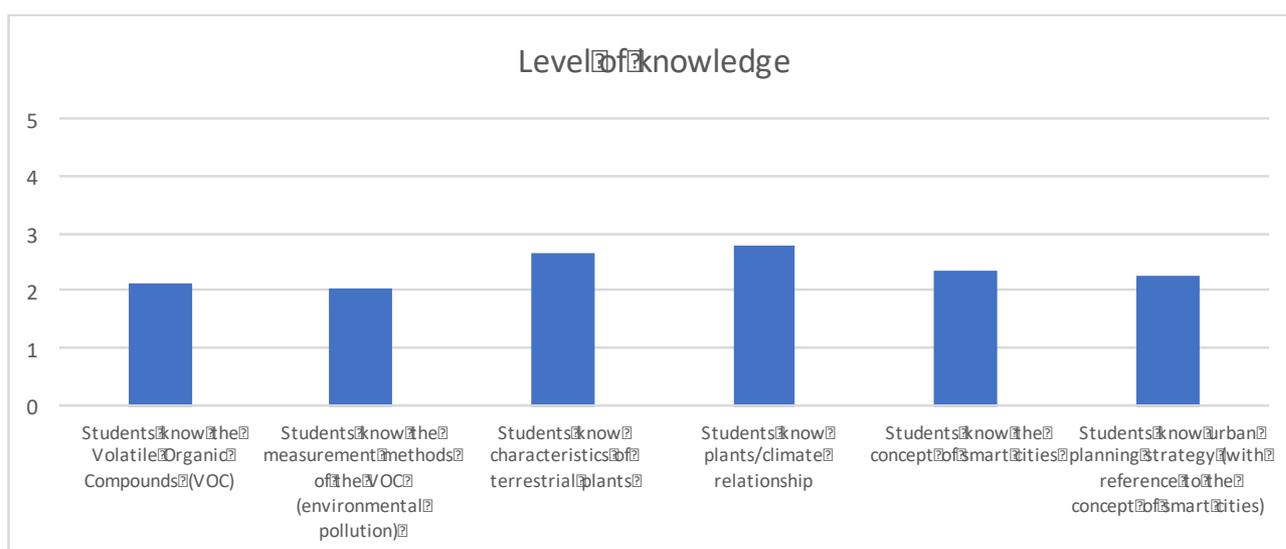


Figure 31 Level of knowledge

## 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).

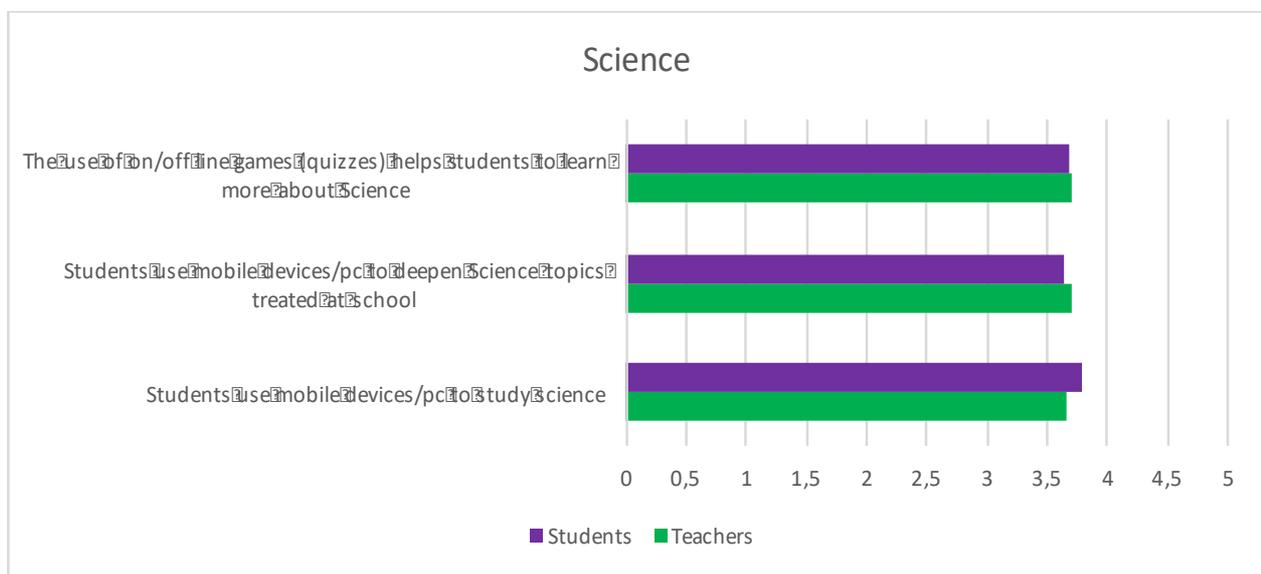


Figure 32 Students and teachers' opinion on Science

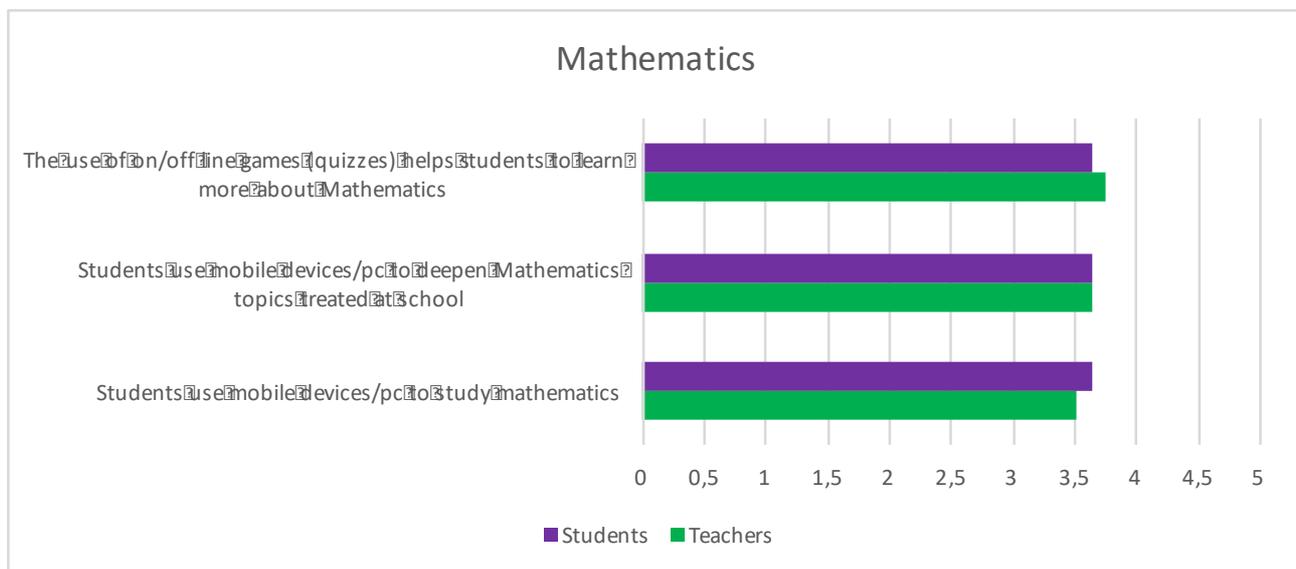
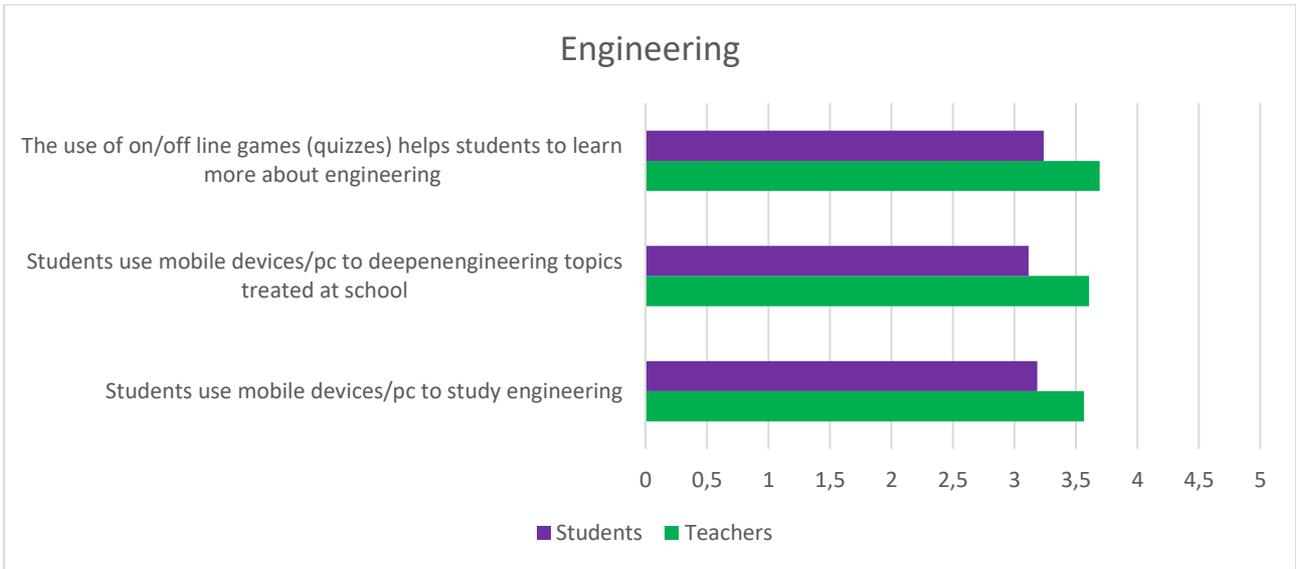
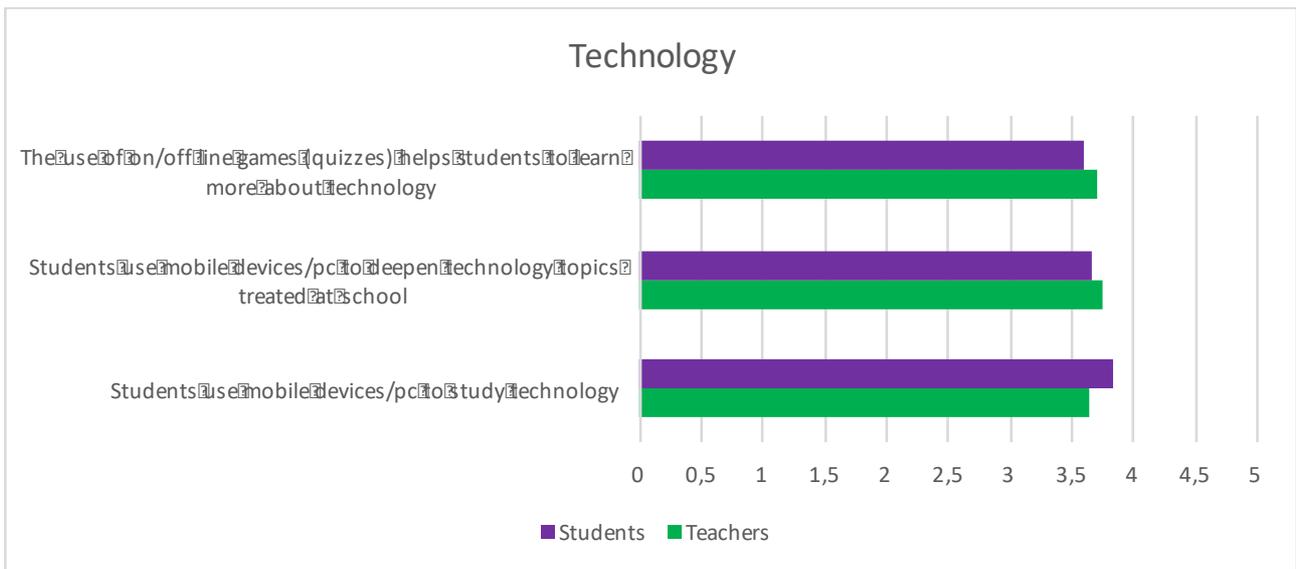


Figure 33 Students and teachers' opinion on Mathematics



*Figure 34 Students and teachers' opinion on Engineering*



*Figure 35 Students and teachers' opinion on 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).

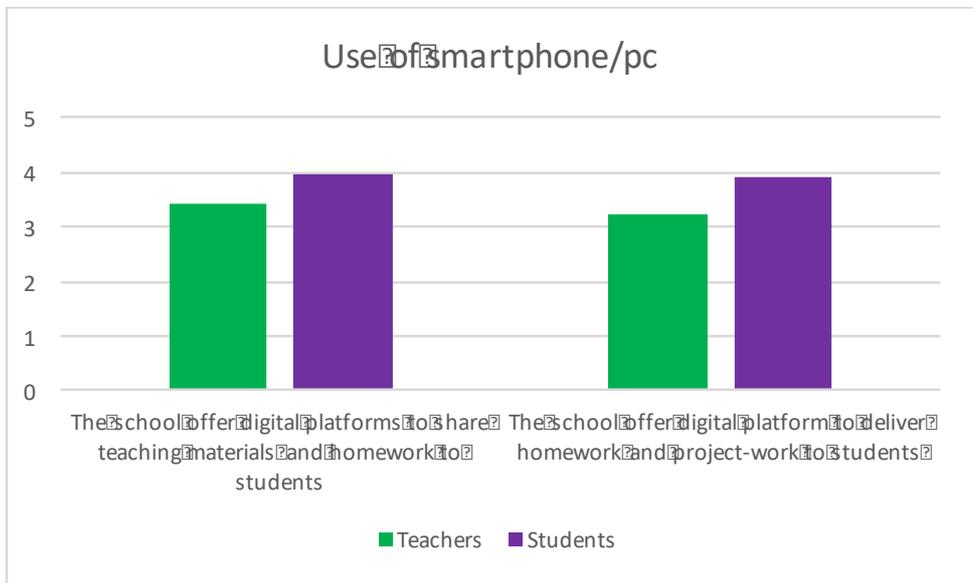


Figure 36 Students and teachers' opinion on use of smartphone/pc

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).

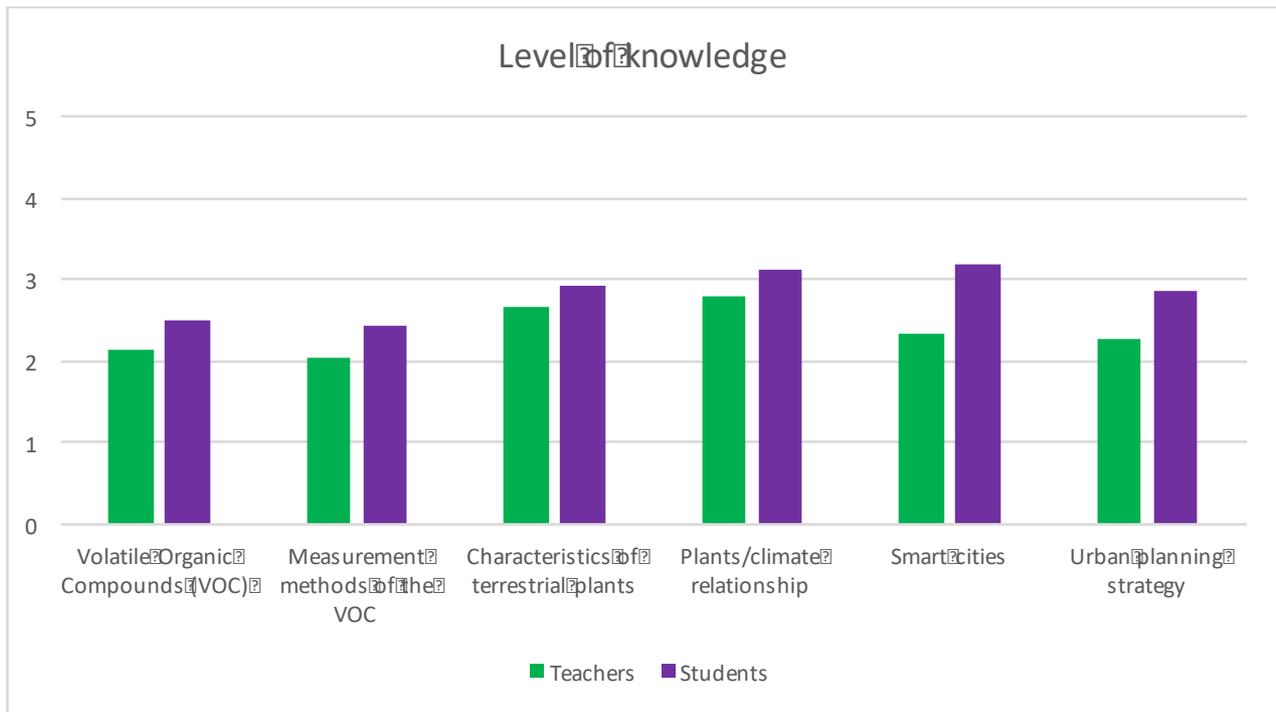


Figure 37 Students and teachers' opinion on level of knowledge