ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

robotics Swiss National Centre of Competence in Research

FINDINGS OF THE SURVEYS CONDUCTED ON GIRLS WHO PARTICIPATED TO SCIENTIFIC ACTIVITIES AT EPFL FROM JANUARY 2010 TO JULY 2014 AND ON THEIR PARENTS

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Science Outreach Department, July 1st, 2015

http://sps.epfl.ch

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1. INTRODUCTION

In line with the end of Phase I NCCR Robotics project Advancement of Women, which took place from 2010 to mid-2014, and as planned in the Phase 2 Equal Opportunity Strategy Document, a survey was run to assess the girls-only activities carried out by the Equal Opportunities Office[1] on the EPFL campus from January 2010 to July 2014.

This survey was conducted in collaboration with Professor Pierre Dillenbourg, member of NCCR-Robotics.

The purpose of this investigation is to determine on the one hand the reasons for which young girls and their parents choose these courses, and on the other hand see how these workshops can change the perception of young girls about robotics and technology.

The survey was conducted on all families (1'292 families) whose daughter(s) participated to one or several girls-only activities from January 2010 to July 2014, which include:

- Internet courses *Internet pour les filles*, for girls aged 9 to 13 ;
- Robotics courses *Les robots c'est l'affaire des filles*, for girls aged 11 to 13 ;
- Mathematics courses M*aths en jeu*, for girls aged 7 to 13;
- Science camps *Je m'amuse avec les sciences* for girls aged 7 to 10, *La science c'est … aussi pour les filles*, *Remue-méninges à Robotcity !,* for girls aged 11 to 13.

The survey was sent both by e-mail and mail (c.f. Enclosure 1: Letter addressed to parents

) in September 2014 to 1'292 families and consisted of:

- A questionnaire addressed to the parents (c.f. Enclosure 2)
- A questionnaire addressed to each of the girls who participated to one or several activities (c.f. Enclosure 3).

After two months, 570 answers were collected, one quarter online (141) and the remaining three quarters by post (429). All answers consisted of one parent questionnaire and one or more girl questionnaire. 659 young girls filled in the girl questionnaire.

The total answer rate is 44% (570 answers, sample size 1'292 families).

2. SURVEY RESPONDENTS CHARACTERISTICS

Figure 1 characterizes the type of girls-only activities attended by respondents and compares it to the sample. The former is the answers given by parents related to the activities attended by their daughter(s), who on an average were one third to attend more than one activity, which gives us a cumulated number of 947 participants for the respondents. The

[1]In January 2015 all scientific activities for youngsters were transferred to a new unit called the Science Outreach Department

latter is an estimation considering the maximum number of participants registered over the 2010-2014 period which would amount to 2'850 girls for the sample. Based on these figures, the overall answer rate would be 33%, varying depending on the activity attended: 30% for the mathematics courses; 39% for the Internet course; 43% for the robotics course; 47% for the science camps.

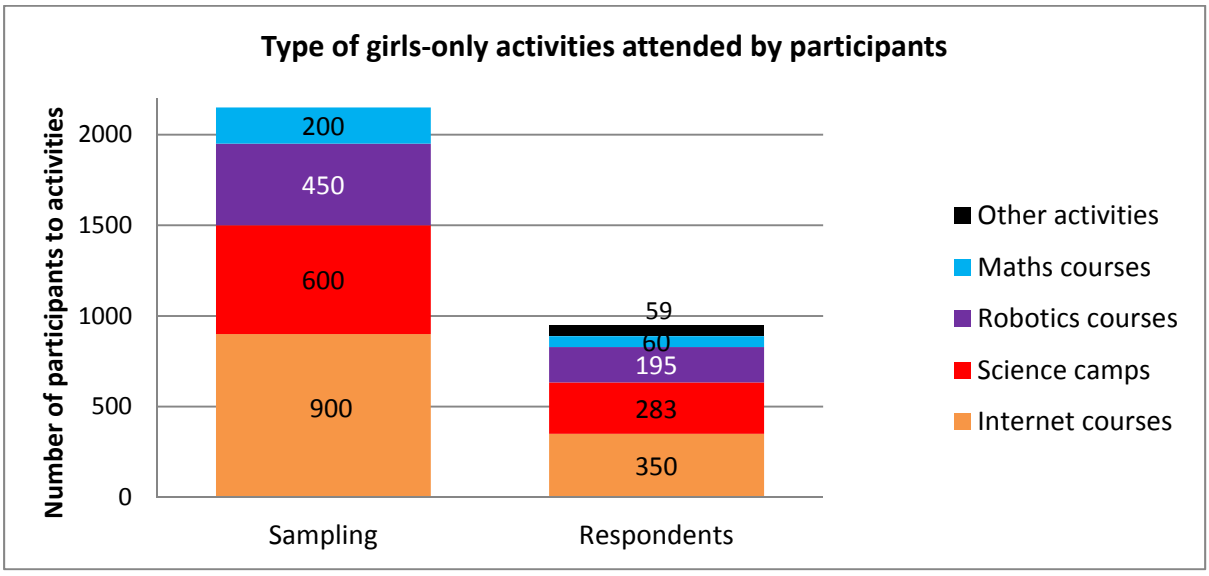

Figure 1 : Number of participants by activity and comparison of answers given by parents to the estimated sample

Figure 2 characterizes the young respondents by age at the time of the survey and at the time of their first activity at EPFL. At the time of the survey, the respondents' ages range from 8 to 18 years old, with over 59% of them being between 10 and 15 years old. At the time of their first science activity at EPFL, most of them were between 8 and 13 years old. This age range corresponds to the targeted public for the girls-only activities listed above.

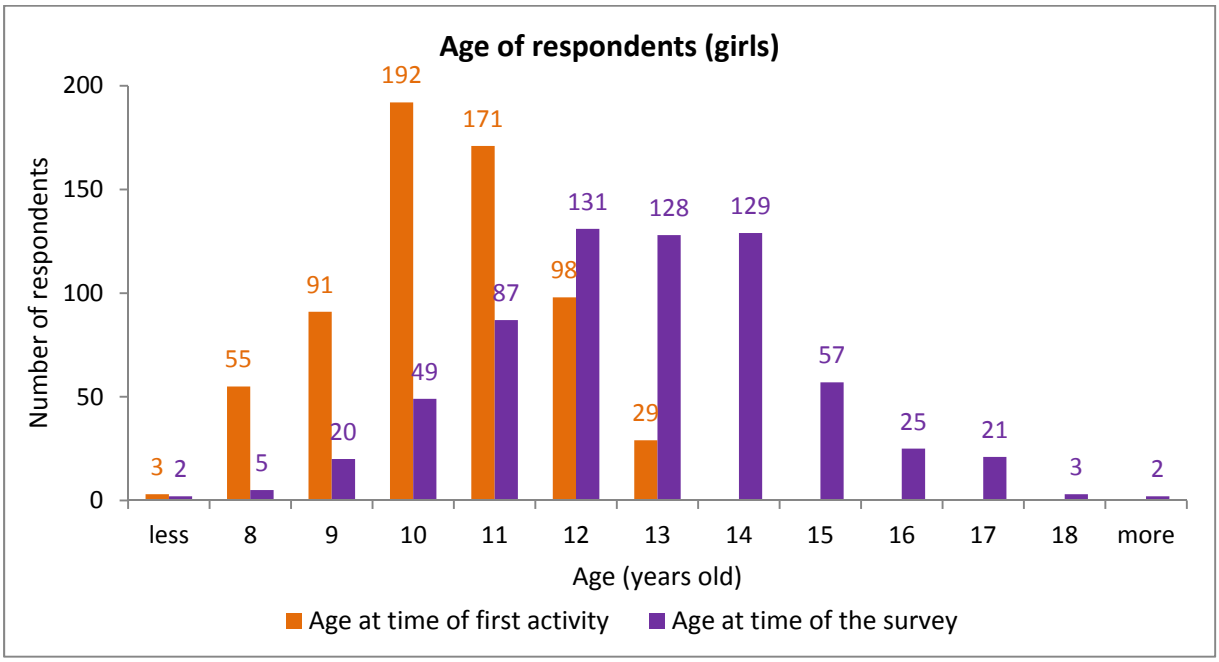

Figure 2: Girls' age at the time of the survey and at the time of the first activity

3. REGISTRATION: MOTIVATIONS AND CONDITIONS

Parents were asked why they choose to register their daughters to these science activities (multiple answers possible). Their answers are shown on Figure 3.

The two most frequent answers - chosen by more than half of the respondents -, are that they "want to encourage their daughter to discover sciences" (334 answers – 59 % of the respondents) and that "the activity is interesting" (327 answers – 57 % of the respondents).

The third most frequent answer is that their daughter chose to register herself, which appears in almost half of the answers (268 answers – 47 % of the respondents).

The reputation of the EPFL also matters noticeably, as it is mentioned by a third of the families (268 answers – 33 % of the respondents).

The last two options were rarely chosen:

- The lack of sciences in school (46 answers – 8 % of the respondents);
- The pragmatic reason "I needed an activity for her in this timeslot" (12 answers – 2 % of the respondents).

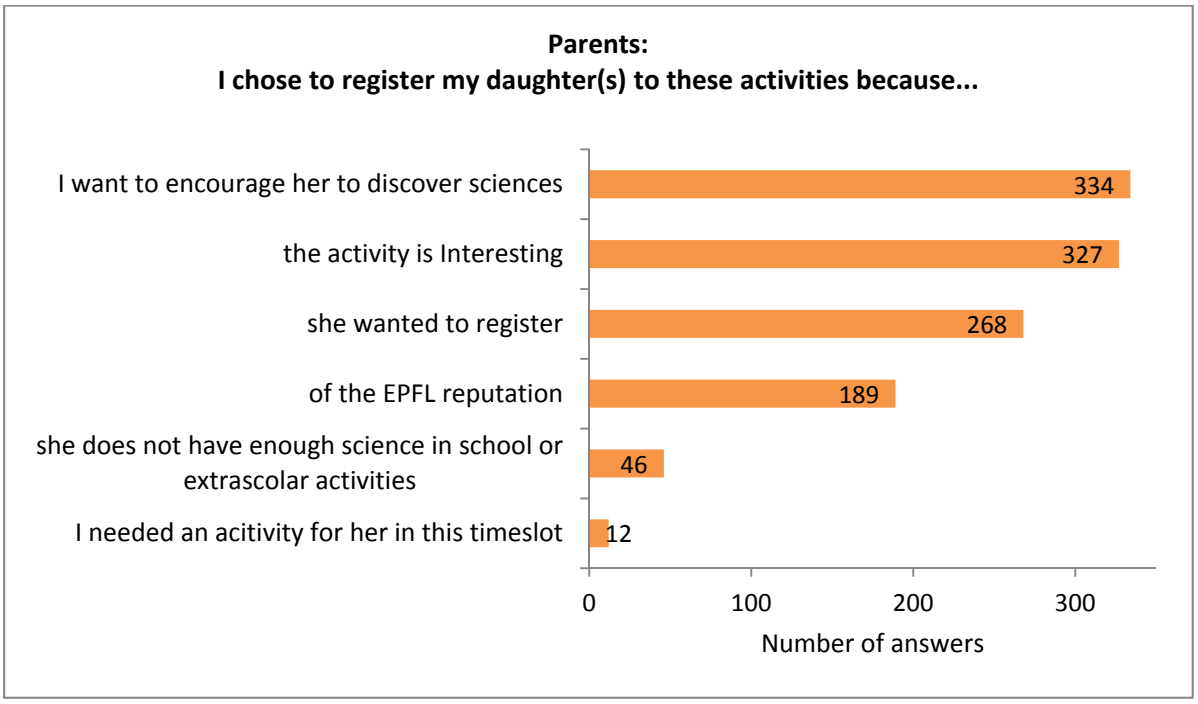

Figure 3: Parents' reasons for registering their daughter(s) to the activities

Parents were also asked whether their daughter(s) registered alone, with a friend or with a relative. More than half of the girls were reported to have registered alone (325 answers – 54%), and the remaining registered either with a friend (231 answers – 38%) or with a sister (47 answers – 8%).

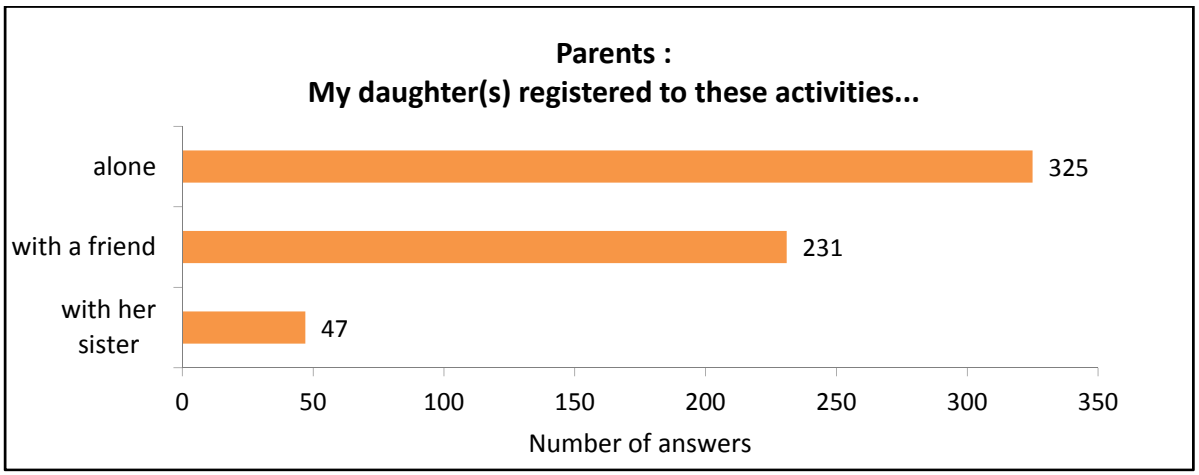

Figure 4: Conditions of Registration

4. OVERALL EVALUATION OF THE ACTIVITIES

4.1 Girls' evaluation

The girls who participated to the activities were asked to evaluate the activities they followed on a 5-level scale (Figure 5): the great majority of them reported having had fun (95%). The global satisfaction index for the girls equals 4.5 - grades 1 being attributed to "not at all" through 5 attributed to "Yes, it was great".

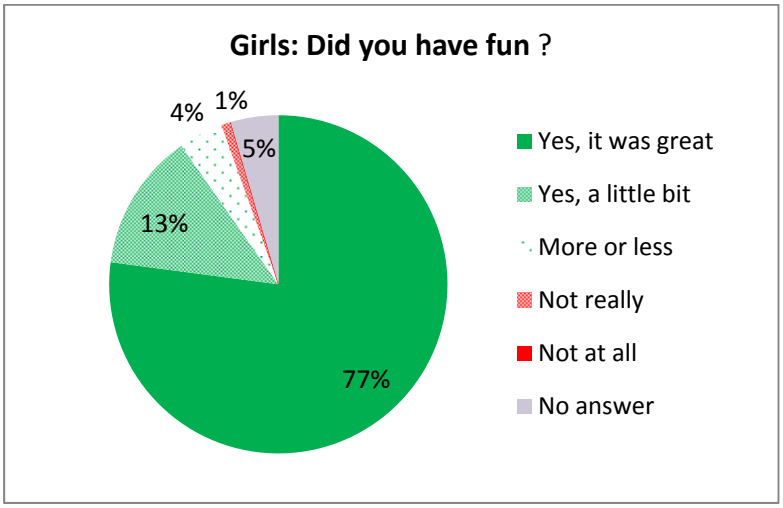

Figure 5: Girls appreciation of the activities followed

Girls were also asked whether they participated (or would like to participate) to other science activities (Figure 6) and whether they had talked about these activities at school: with their friends (Figure 7). 72% and 76% of them answered positively, respectively.

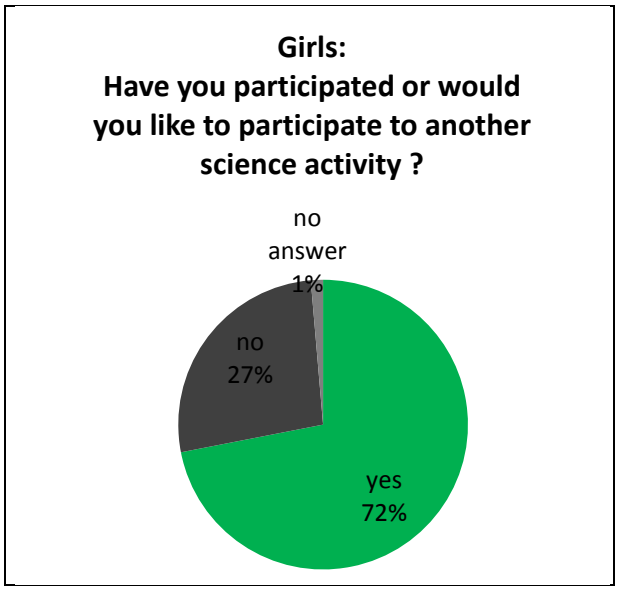

Figure 6: Girls' participation to other science activities

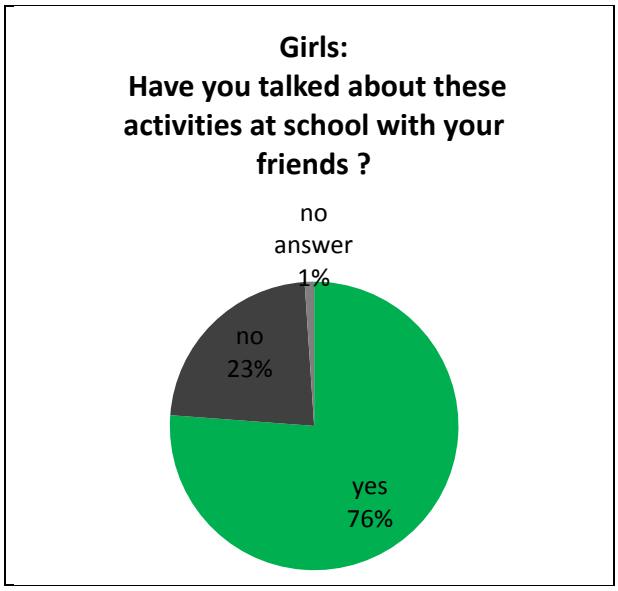

Figure 7: Girls' sharing of experience with friends

4.2 Parents' evaluation

Figure 8 shows the parents' overall evaluation of the activities and their benefits:

- 94% reported their daughter(s) had fun;
- 95% reported their daughter(s) acquired knowledge;
- 92% reported their daughter(s) understood that science is for girls too;
- 78% reported their daughter(s) acquired confidence in her/their scientific abilities;
- 3% reported their daughter(s) did not have fun and/or did not benefit from these activities.

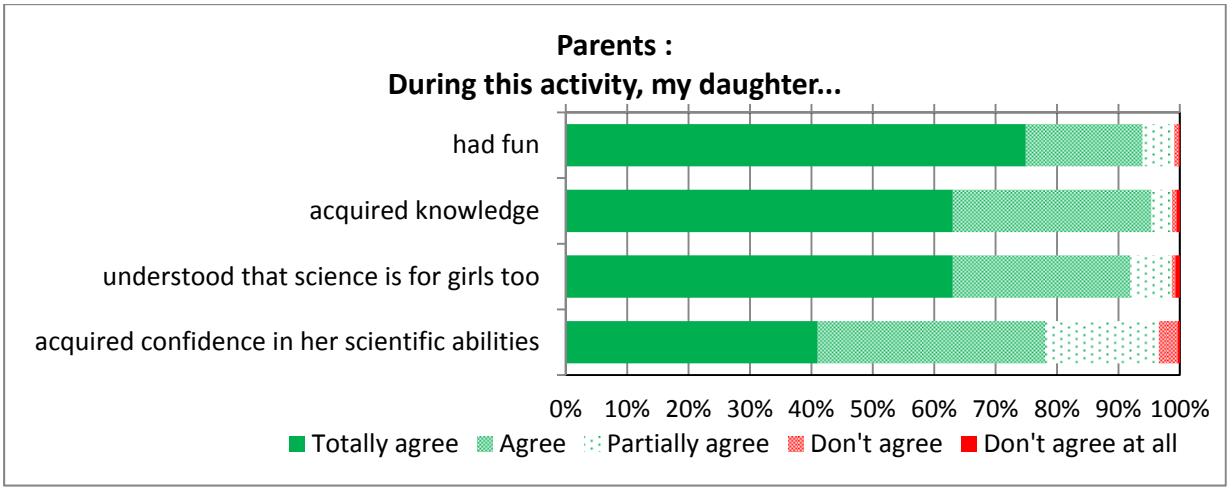

Figure 8: Parents' perception of the benefits of the activities for their daughter(s)

If one extracts a satisfaction index out of the parents' appreciation, the mean satisfaction index equals 4.2 - grades 1 being attributed to "don't agree at all" through 5 attributed to "Totally agree".

5. GIRLS ATTITUDE TOWARDS SCIENCE

5.1 Girls attitude towards science

Almost all girls surveyed (98%) reported being convinced about the usefulness of sciences for society. They were invited to give an example in an open-ended question. Figure 9 shows a graphical representation of the 50 most frequently used words. Table 1 gives the counting of the words occurrences. They mentioned a wide range of sciences applications, with a significant emphasis on life sciences and more particularly on medicine.

Figure 9: Keywords of girls' comments on science usefulness

Keywords		Occurrences	Keywords		Occurrences
InFrench	In English		In French	In English	
médicaments	drugs	110	ordinateurs	computers	11
médecine	medicine	74	humain	human	11
nouveau	new	72	avancer	advance	11
recherche	research	57	voitures	cars	10
maladies	diseases	45	savoir	know	10
nous	us	40	produits	products	10
vie	life	39	développement	development	10
trouver	find	33	santé	health	9
découvrir	discover	30	robotique	robotics	9
technologie	technology	27	progresser	progress	9
comprendre	understand	21	progrès	progress	9
monde	world	19	inventer	invent	9
informatique	IT	19	électricité	electricity	8
guérir	cure	19	physique	physics	7
créer	create	19	nature	nature	7
société	society	17	internet	internet	7
médical	medical	17	aide	help	7
aider	help	17	technologique	technological	6
soigner	treat	16	sauver	save	6
corps	body	15	remèdes	remedies	6
améliorer	improve	15	fabriquer	medical	6
vaccins	vaccines	13	environnement	health	6
robots	robots	13	écologie	ecology	6
chimie	chemistry	13	découvertes	discoveries	6
biologie	biology	12	comment	how	6

Table 1: Keywords occurrences of girls' comments on science usefulness

5.2 Parents observation of attitude changes

Parents were asked to write a comment or an anecdote if they had noticed a change in their daughters' attitude after participating to the activities. Figure 10 shows that 41% of the parents wrote a comment illustrating a change. The remaining percentage shows that 28% of the parents reported not having noticed any change, and 31% did not answer the question.

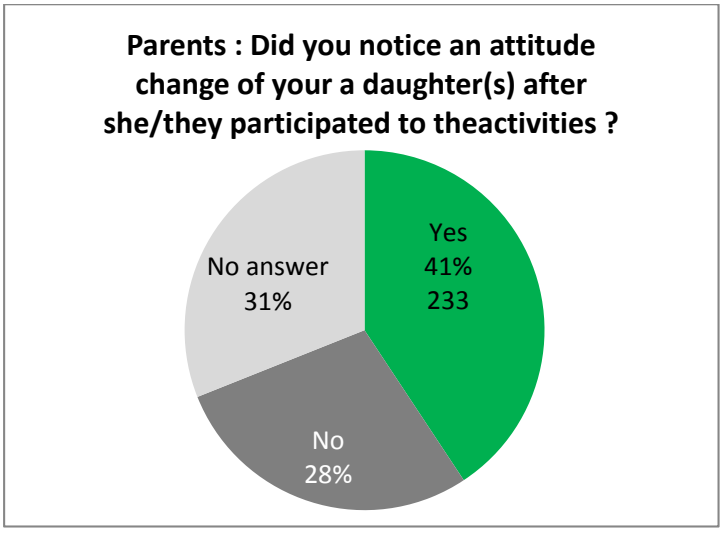

Figure 10: Parents' observation of an attitude change of the daughter(s)

Among the 233 parents' comments given about any attitude change (Figure 9), following keywords were outlined to describe the benefits observed on their daughter(s):

- **Interest (46 occurrences)**

" All three of them have very fond memories and especially a much higher **interest** regarding all the professions touching chemistry, physics, biology… Their elder cousin studies at EPFL, they question him a lot."

"She developed an **interest** for more scientific topics and to understand the world around her".

- **Pride (17 occurrences)**

« She was extremely **proud** of her website; she showed us the different steps and talked about it to her cousins ».
"She talked a lot about it after the first camp, telling, giving explanations, **proud** of what she had learnt."

- **Confidence (17 occurrences)**

«Having gained knowledge in computer science, she is more **confident** in this area. She has acquired a logic of the computer and has become the reference person when someone in the family has a question on the subject" .

"I think the courses, especially the internet course and *Je m'amuse avec les sciences* camp boosted her confidence in these areas. Science is one of her favorite subjects at school."

- **Ease (16 occurrences)**

« Since she attended the Internet course, she acquired much **ease** with the computer and from now on she is teaching me tips and tricks ».
« She improved significantly her self-confidence and she is now entirely at **ease** while interacting with boys in her classroom».

- **Discovery (16 occurrences)**

« It made her discover EPFL and the possibilities it opens ».
« My daughter who did not like science enjoyed doing experiments and making **discoveries** during the week ».

- **Curiosity (13 occurrences)**

« The fact that she followed these two courses made her more keen on science and more **curious** in general about technique ».

- **Openness (7 occurrences)**

"She **opens** up, looking for larger explanations on the world around her… "

- **Enthusiasm (6 occurrences)**

« She has been very e**nthusiastic** about all these discoveries… On Thursday mornings, a exchange session in the classroom allowed her to explain what she had seen and done… As a result several girls from her class registered to the next sessions of the course ».

- **School and Class (40 occurrences) and Career (23 occurrences)**

Last but not least, Changes in school results or interest were mentioned frequently (40 occurrences for « school » and « class » combined), as well as thoughts relating to career choices (23 occurrences as a whole): Job, orientation, career.

"My two daughters finally took the Mathematics/Physics option for their following studies. The eldest one will start this option already next year at high school. I would like to take this opportunity to thank you for having supported my daughters in their school orientation."

« I think some barriers have fallen down, she feels more at ease with some activities in which she feels more at ease and when we discuss, she could project herself in a scientific career, what she would maybe not have done before ».

6. PERCEPTION ON THE GIRLS-ONLY ACTIVITIES

6.1 Girls' perception

Figure 11 shows the girls perception of the girls-only activities. A majority of them (87%) liked the fact that activities were limited to girls, regardless of the age range of the respondents, even in the teenager category.

Girls appeared to be very confident about the possibility for women to embrace a scientific or technology career (Figure 12): none of them consider they cannot choose these kinds of careers, though 7% say it is difficult for women.

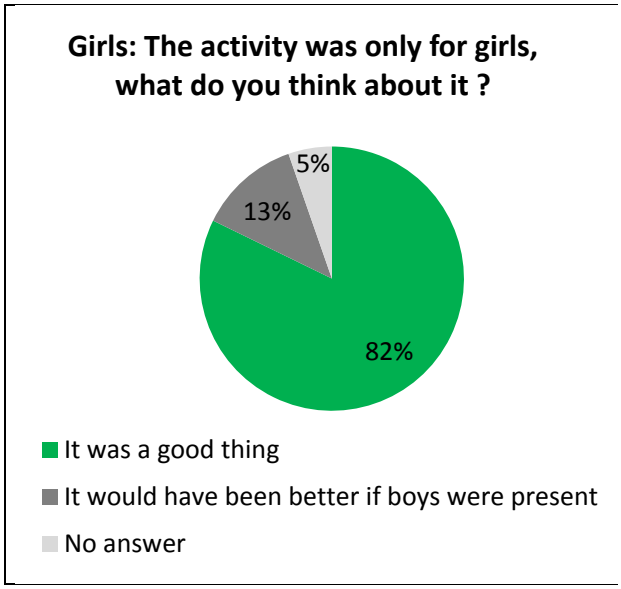

Figure 11: Participants' perception of the "girl-only" activities

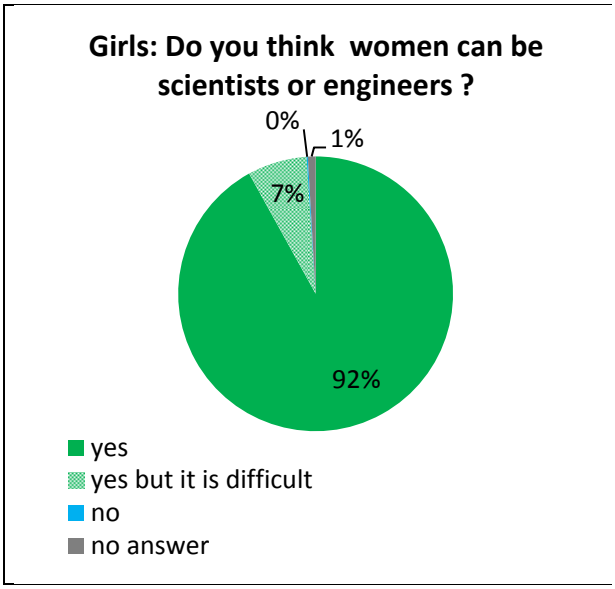

Figure 12: Participants' opinion of scientific careers for women

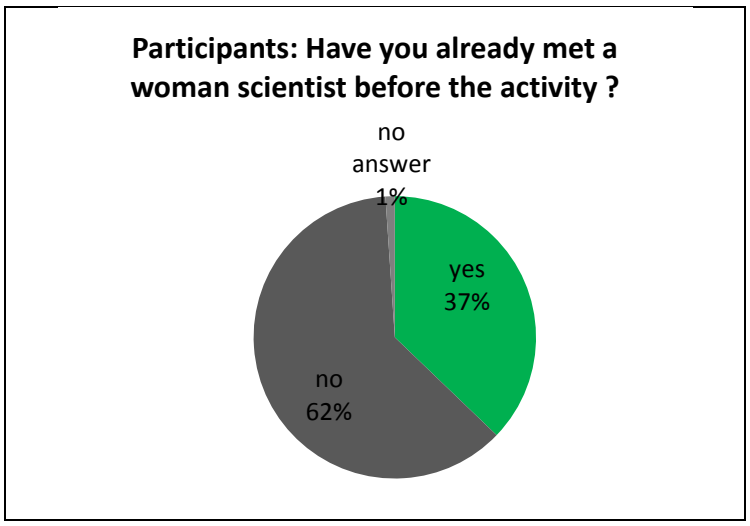

Figure 13: Participants – women in science

It is to be noticed that 62% of the girls reported having never met a woman scientist before participating to these science activities (figure 13).

6.2 Parents' perception

Parents were also asked a set of questions investigating their opinion on gender issues.

Figure 14 shows that for the great majority of parents (73%, 418 answers), it was not important that activities where targeting only girls. However, almost one family out of 6 (16% of the parents) reported they would not have registered their daughter(s) to these activities if it had not been explicitly mentioned "for girls".

Parents were also asked if these activities made them realize the lack of women in scientific and technology careers: 62% of them answer positively (Figure 15).

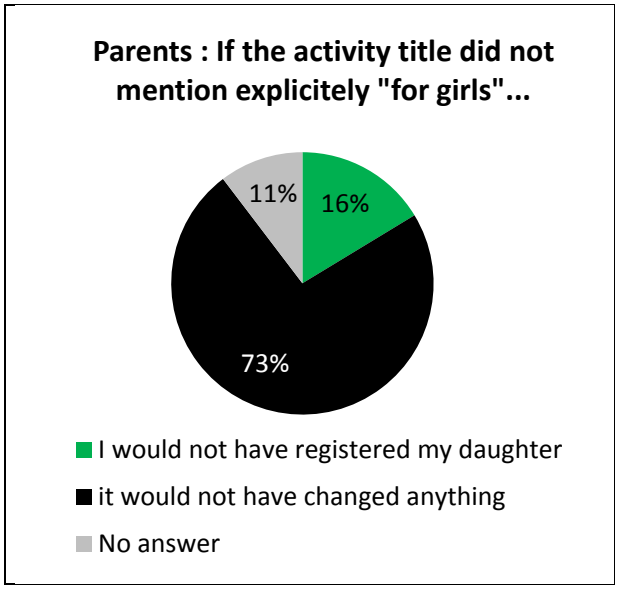

Figure 14: Parents - mention "for girls"

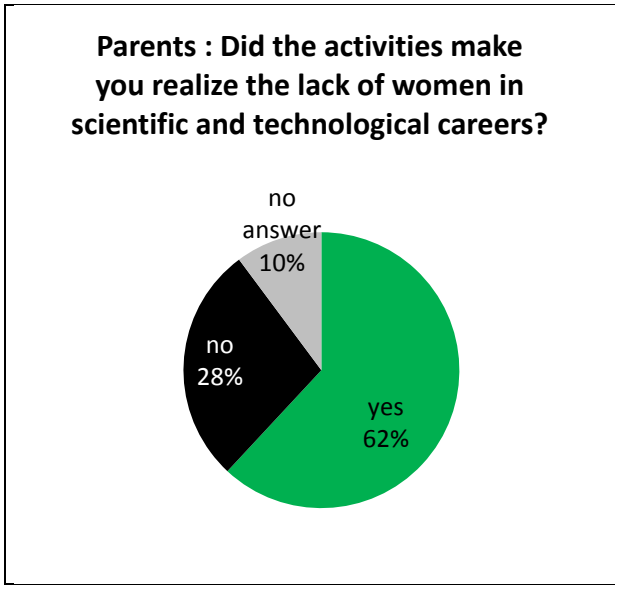

Figure 15: Parents – Lack of women

Based on our experience, we can confirm that mixed science activities attract fewer girls than "girls-only" science activities. As a matter of fact, for mixed activities enabling 50% girls and 50% boys to register, it takes much more time to fill in registrations of girls as compared to that of boys. Parents were asked whether they had an explanation for it and 63% of them made a comment. Out of these answers, 72% refer to children's preferences. Most of them mention it is an age-dependent situation. The answers highlighted the positive aspects of a girls-only activity: the context of the course is comforting, making girls feel at ease. Positive working attitudes are mentioned: cooperation, listening, sharing of the same interests.

Parents also pointed out the obstacles girls face in mixed activities: they would feel less concerned by the contents and get less attention from the teachers. Many parents explain the situation by differences in boys and girls attitude in the classroom and towards sciences: boys are described as more confident in their abilities and more competitive, some comments even state they are "better in sciences". They are also mentioned as troublemakers, judgmental or even teasing, creating a negative study environment.

Only 10% of the answers refer to the influence of parents, friends, culture (social environment).

7. CONCLUSION

They survey answer rate of 44% is quite high. Moreover, a large proportion of respondents, both parents and girls, made the effort to write developed comments to the open-ended questions. The fact that children and parents chose to answer to the questionnaire even some years after the activity was done is also positive. To the best of our knowledge we don't have a similar survey with the girls-only activities to which we can compare this survey. However one has to keep in mind that in a survey, .those who are satisfied tend to answer more than those who aren't.

The activities are evaluated very positively by both parents (satisfaction index : 4.2 out of 5) and girls (satisfaction index : 4.5 out of 5). Considering these evaluations and the comments, the key objectives of the activities seem to be met:

- To propose programs where girls can learn while having fun;
- To give confidence to young girls in their scientific abilities;
- To help them consider career options in scientific and technological fields.

The results also indicate that the activities program is attractive to both parents and girls. On the parents' side, we can notice their willingness to encourage their daughters in scientific fields. Their answers show that the EPFL is considered by many of them as a guarantee of quality. On the young girls' side, the results underline that they are active in the choice and registration process, and that they enjoy participating to girls-only activities.

This survey has a global aspect and don't focus I on a specific activity. In our opinion indeed, a change in mentalities and attitudes can appear following several concrete and concerted actions.

ENCLOSURE 1: Letter addressed to parents

ENCLOSURE 2: Questionnaire addressed to parents

QUESTIONNAIRE PARENT

(Plusieurs réponses possibles pour chaque question)

Dans le cas où plusieurs de vos filles ont participé à nos activités, considérez les questions de ce questionnaire comme étant au pluriel.

Ma fille a participé aux activités suivantes :

- ☐ Camp scientifique « Je m'amuse avec les sciences »
- ☐ Camp scientifique « La science c'est ... aussi pour les filles »
- ☐ Cours « Internet pour les filles »
- ☐ Cours « Les robots, c'est l'affaire des filles »
- ☐ Camp scientifique « Remue-méninges à Robotcity ! »
- ☐ Cours « Maths en jeu »
- ☐ D'autres activités scientifiques du bureau de l'égalité des chances

Quel âge avait votre enfant lors de la 1ère activité ? _____
Quel âge a votre enfant maintenant ? _____
Combien de vos enfants ont participé à des activités ? _____

Votre fille est-elle venue

- ☐ Seule
- ☐ Avec une sœur
- ☐ Avec des amies

J'ai choisi d'inscrire ma fille à ces activités:

- ☐ Pour la réputation de l'EPFL
- ☐ Parce que ma fille n'a pas assez de cours de sciences à l'école ou dans ses activités extrascolaires
- ☐ C'est ma fille qui a voulu s'inscrire
- ☐ Parce que je voulais encourager ma fille à découvrir les sciences
- ☐ Parce que l'activité me semblait intéressante
- ☐ J'avais besoin d'une activité pour ma fille à cet horaire

Lors de cette activité scientifique, ma fille a :

	Tout à fait d'accord	D'accord	Moyennement d'accord	Pas très d'accord	Pas du tout d'accord
Pris du plaisir	☐	☐	☐	☐	☐
Acquis des connaissances	☐	☐	☐	☐	☐
Compris que les sciences sont aussi pour les filles	☐	☐	☐	☐	☐
Pris confiance dans ses capacités dans les matières scientifiques	☐	☐	☐	☐	☐

A la suite du premier atelier suivi, ma fille a voulu s'inscrire à une autre activité scientifique.

- ☐ Oui
- ☐ Non

Si le titre du cours ne mentionnait pas explicitement « pour les filles »,

- ☐ Je n'aurai pas pensé à y inscrire ma fille, mais plutôt mon fils
- ☐ Ça n'aurait rien changé

Ces activités vous ont-elles fait prendre conscience du manque de femmes dans les métiers scientifiques et technologiques ?

- ☐ Oui
- ☐ Non

Avez-vous observé un changement de l'attitude de votre fille concernant les sciences suite à ces activités ? Auriez-vous une anecdote à nous faire partager ?

Nous avons constaté que les filles s'inscrivent moins dans les activités non mixtes que dans les activités organisées spécialement pour les filles. Quelle est votre explication ?

Donnez-nous votre avis sur ces activités. Qu'est-ce qui est bien et qu'est-ce qui pourrait être amélioré ?

ENCLOSURE 3: Questionnaire addressed to girls

QUESTIONNAIRE PARTICIPANTE

Quel âge as-tu ? _____

Quel âge avais-tu lors de la 1ère activité suivie à l'EPFL ? _____

Penses-tu que les femmes peuvent aussi être scientifiques ou ingénieures (chimistes, informaticiennes, etc.) ?

- ☐ Oui, autant que les hommes
- ☐ Oui, mais c'est plus difficile pour les femmes que pour les hommes
- ☐ Non, c'est trop difficile pour les femmes

As-tu pris du plaisir à participer aux activités scientifiques pour les filles auxquelles tu as participé ?

Oui c'était super	Oui un peu	Moyennement	Pas trop	Pas du tout
☐	☐	☐	☐	☐

En as-tu parlé avec tes ami-e-s à l'école ?

- ☐ Oui
- ☐ Non

As-tu participé ou aurais-tu envie de participer à d'autres activités scientifiques pour les filles ?

- ☐ Oui
- ☐ Non

Avais-tu rencontré des femmes qui travaillent dans les domaines scientifique et technologique (chimiste, physicienne, informaticienne, etc.) avant de participer à ces activités ?

- ☐ Oui
- ☐ Non

Est-ce que tu penses que les sciences sont utiles à la société ?

- ☐ Oui
- ☐ Non

Donne un exemple :

Le cours était réservé aux filles. Qu'en as-tu pensé ?

- ☐ C'était une bonne chose
- ☐ J'aurais préféré qu'il y ait des garçons

Qu'est-ce qui était bien ou pas bien dans l'activité ou les activités que tu as suivie-s ?
