PinKamP - Le ragazze contano!

TITLE: PinKamP

Contact information of the Head/Director of the applying Department

Department: DISIM **-** Department of Information Engineering, Computer Science and Mathematics

Director: Prof. Guido Proietti

Email: guido.proietti@univaq.it

Contact information of the responsible for the application:

Prof. Antinisca Di Marco (project coordinator)

Email: antinisca.dimarco@univaq.it

Prof. Laura Tarantino (project coordinator)

Email: laura.tarantino@univaq.it

A brief summary or abstract: PinKamP is an initiative of DISIM Department of University of L'Aquila with the objectives of 1) guiding young girls towards STEM careers and 2) removing possible barriers that prevents girls to choice STEM topics in university studies.

PinKamP is a 2-weeks intensive summer camp. Three technological platforms are chosen (this year, drones, biomath, web site design) and related STEM subjects (problem solving, programming principles, mathematics fundamentals, graph theory) are selected within a hands-on project-based integrated system.

Since its first edition in 2018, PinKamP Involved 145 selected high schools girls ("pinkampers). Thanks to many positive feedbacks, Pinkamp is an annual appointment.

Description of the initiative (max 2 pages)

The growing diffusion of ICT is rapidly changing habits, competences and skills required in daily life in a variety of fields, and the labor market is seeking for more and more professionals and operators in disciplines generally denoted as STEM (Science, Technology, Engineering, Mathematics). ***Official reports emphasize persistent skill shortage*** (particularly pronounced for technological occupations) ***and recruitment difficulties in relation to STEM skill labo***r, and observe that without corrective actions the situation is going to get even worse, due to expected retirements [1,2]. For example, there is a forecast of around 7 million job openings in the European Union (EU) only, by 2025 [2].

Studies singled out two key factors among the causes of this situation: (1) ***a general and gender independent decline of pupils' interest in STEM subject***s, particularly noticeable already at the secondary school level [3], and (2) **a *persisting underrepresentation of women among STEM graduates*** as a result of a mix of social, cultural, economic and educational institutional factors [2]: in EU, in 2012 graduates in STEM disciplines account for 12,6% of female graduates in contrast with a share of 37,5% of male graduates (source: Eurostat [2]). According to official figures related to European Union [2,4], ***employment in STEM is definitely male-dominated***, with women accounting for only 24% of science and engineering professionals and only 15% of science and engineering associate professionals.

Consequences of this general scenario are not only at economic level (e.g., according to [5], the lack of STEM-skill labor will be a significant obstacle to future economic growth), but also at cultural and social level: given the pervasiveness of ICT applications in contemporary society, affecting almost all aspects of daily life, the absence of women in ICT subjects implies that ***modern society is de facto designed and shaped by men***. Actually, the "gender segregation" problem in STEM has a peak in ICT subjects: for example, a recent study shows that, with current trends, gender parity in Computer Science (CS) authorship will be reached in 117 years from now, around 2137, whereas authorship parity in biomedical literature is projected to be reached within two or three decades [6].

The root of this problem is to be found at education level, with families, education system, teachers and peers co-responsible for an early segregation by reinforcing social and cultural stereotypes and giving support to gendered choices with regard to studies and career prospects [7], thus hampering girls' and women's later study and career opportunities. ***Policies and initiatives to invert the trend and encourage and guide girls and young women to pursue STEM studies and career are definitely necessary, starting from curricular and teaching methods.***

PinKamp [8,9,16,17] is an initiative of the DISIM Department of the University of L'Aquila, thought for girls of 3rd and 4th classes of high schools, with the twofold objective of 1) guiding young girls towards STEM careers and 2) removing possible barriers that prevents girls to choice STEM topics in university studies. In particular, PinKamP is structured as a 2-weeks intensive summer camp on CS, Information Engineering and Mathematics conceived for high schools' girls and built around selected example technological platforms (e.g., drones) and related STEM subjects integrated within a hands-on project-based system.

The designed format includes plenary theoretical lectures, team project-based parallel laboratories, soft skills, along with conferences, social debates on women' rights and witnesses held by successful women in the IT scientific/professional fields, and a final contest. PinKamP aims to bring girls closer to STEM disciplines, beyond gender stereotypes, trying to remove barriers and prejudices, showing and demonstrating how women can contribute to the development and improvement of future technologies, thanks to their creativity, sensitivity and attitude to problem solving. It achieves this goal by implementing a novel teaching method based on three dimensions - **Knowledge, Processes and Socialization (KPS)** - having as core real projects to conceive, design and implement using girls' creativity and passions.

The three KPS dimensions (Figure 1) are actually intertwined within a hands-on project-based integrated system, since an approach to learning centered on project work has been linked to greater motivation [12], and studies seem to show that, besides motivating both teachers and students, integrated systems tend to

be more favorable to gender and social equality than more customary approaches based on distinct subject areas [13]. We associated the two dimensions of *Knowledge* and *Processes* with the third dimension of *Socialization*, considering that collaborative skills, in secondary schools, were found to have larger effects on pupils' attitudes than traditional programs [11].

Key roles and impacts have the involved **actors**: organizers, teachers, tutors (young researchers, graduate and under-graduate students, and PhD students), and role models to show than success in STEM field is possible for girls and women.
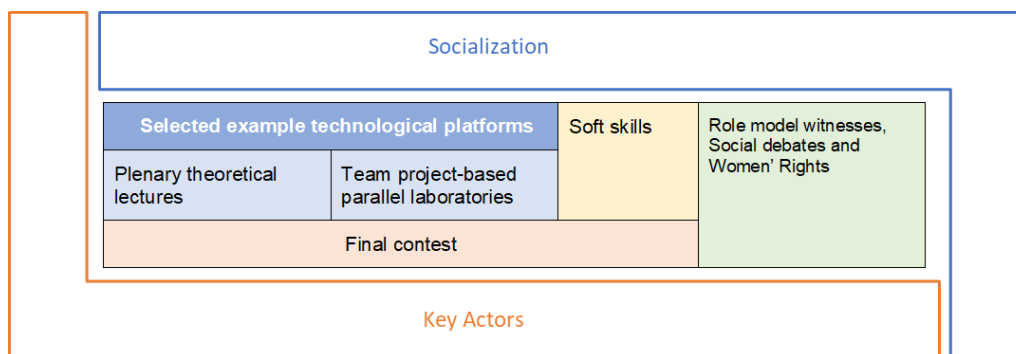

Figure 1. The PinKamP format.

PinKamP format addresses the multi-fold and multi-nature **objective** of supporting young women in (1) *developing personal vocational interests*, and (2) *acquiring a correct and as much as possible comprehensive concept of technology*. As observed in [3], technology education should develop an understanding of the nature of technology, the relationship between technology and society, and technological design, whereas with emphasis on only few specific aspects of technology there is considerable risk that pupils develop a limited concept of technology.

These considerations raised the necessity to harmonize the contrasting **challenges** of *short time* and *ample overview*. Our solution was to single out a number of selected diverse *example technological platforms* representative of the ICT realm and explore them within a multidisciplinary approach touching related subjects and methods.

To work on vocational aspects and personal appropriation of technology, the **activities** of PinKamP participants (the "Pinkampers") are focused on *building and telling a story*. Pinkampers are free to choose one of the proposed technological platforms and use it to invent and enact a "story" that creatively encompasses and interprets the learned technological contents, working in a team. At the end, each team produced and presented a short video, illustrating their story and demonstrating the acquired abilities.

PinKamP2018: It was the first simplified edition attended by 20 girls composed by 9 lessons of 3 hours each on technical topics. No finale events with contest has been organized.

PinKamP2019: In the 2019 edition, the camp selected 50 girls (namely Pinkampers) residing on the national territory and was organized as a two-weeks intensive summer school by engaging the girls in lessons and laboratories for 7 hours a day. The lessons took place from Monday to Friday, from 9:00 A.M. to 6:00 P.M, at the DISIM Department. Finale public contest has been organized.

PinKamP2020 and 2021: In the 2020 and 2021 editions, due to pandemic situation, the camp was organized on-line on the MS TEAMS platform. In 2020, we selected 32 Pinkampers while this year we decide to accept all the applying 43 pinkampers. The camp is organized as a two-weeks intensive summer school by engaging the girls from Monday to Friday from 9:00 A.M. to 1:00 P.M. Pinkampers had several meetings with their tutor to finalize the project. Finale public contest has been organized. To witness the experience of 2020, we realized a book, titled PINKBOOK2020, where we report the experience of PinKamP 2020 [16].

Evidence of its impact (max 2 pages):

PinKamP is the first experience of its kind in Abruzzo Region and, up today, it remains the only initiative within the region. On a national level, only a few other initiatives have emerged over time, such as Ragazze Digitali project (https://www.ragazzedigitali.it/). STEM DAYS (https://www.stemdays.it/), a new initiatives of Turin city, has been inspired from PinKamP. In fact, we worked together Fondazione Human+ staff to design STEM DAYS camp.

Added value for the beneficiaries - The beneficiaries of PinKamP are the girls of 3 and 4 classes of high schools who, during the camp, learn theoretical concepts and put them into practice by developing concrete projects they have created. They are exposed to group dynamics and work organization, they have to try their hand at decision making and negotiation. In the final race they test their ability to communicate in a highly competitive context showing all their determination and motivation. During the camp, the girls come into contact with professionals and experts (role models) who tell their experience by providing "pills" of acquired experiences.

Social, economic and cultural dimension of the impact - PinKamP involved 145 high school girls in all four editions. The impact on the territory is to be considered largely higher given that, only for the 2019 edition, the girls came from 23 different schools spread across the country. It received applications from Trento to Genoa, to Barletta to Rome. Indirectly, pinkamp impacted school teachers and girls' families. Specific indicators on the social and cultural dimension of the impact of PinKamP are shown below.

Impacts on DISIM Bachelor and Master Degrees applications – PinKamP is listed as positive action in the University of L'Aquila positive action plan and it is supported by the rector and the Guarantee Act Committee for equal opportunities and promotion of well-being in the workplace, against any form of employee discrimination, carries out proactive, consultative and assessment tasks. PinKamP has big visibility and with it the DISIM department and its bachelor and master degrees. We observe an increment on the application of girls to mathematics, computer science and information engineering bachelor degree and even an increment of applications from women in master degrees. We report in the following some numbers.

KPIs

KPI	Threshold	PinKamP2019 value
KPIs related to PinKamP satisfaction (as whole)		
Number of applications received	> 3/2 of the number of the available places	62
Number of pinkampers that finish the pinkamp	> 90% of the admitted pinkampers	48/50=96%
Followers of social networks per year (as the sum of facebook and Instagram followers)	> 200	503 (facebook) + 182 (Instagram) = 685 followers at June 15th 2021 (per 3 completed editions) 685/3= 226 followers per year
Visits to the pinkamp web site per year	> 1000	6344 at June 15th 2021 (per 3 completed editions) 6344/3= 2114 visits
KPIs related to the impact of the PinKamP on the territory		
Number of involved schools (in each edition)	>10	23
Number of municipalities the Pinkampers come from (in each edition)	>10	15
Number of regions the Pinkampers come from (in each edition)	>2	3

KPIs of Pinkampers' commitment		
Number of attended hours	>60	65
Number of realized projects	>=8	10 (3 on drones, 3 on Lego robots and 4 on virtual reality
Indicators on the commitment and contribution of the proposing structure		
Number of accepted PinKamPers	>32	50
Number of university students involved as tutors	>7	9
Number of developed technologies or application domains	>=3	3
Number of teachers and assistants involved	>10	15
Number of participants in the coordination team	>10	14
Number of Technical Administrative Staff	>2	3
Indicators on external participation to the Pinkamp		
Number of people participating to the final event and contest	>100	>220
Number of role models	>10	14
Number of participating organizations (sponsors, associations, companies)	>5	12
PinKamP impact on University applications from girls		
Increase in the number of female students at two years at DISIM bachelor degrees		a.a. 2019=58 (20 computer science, 23 mathematics, 15 information engineering) a.a. 2020= 60 (16 computer science, 30 mathematics, 14 information engineering) *the numbers are kept in line also in consideration of the economic difficulties of families due to the pandemic* ***among the female students of a.a.2020 there are 3 pinkampers of 2019***
Increase in the number of female students at two years at DISIM master degrees		a.a. 2018=32 for all masters degrees a.a. 2019= 51 for all masters degrees a.a. 2020= 55 for all masters degrees

An optional reference list (which may include URLs of supporting material):

[1]   K. Attström, S. Niedlich, K. Sandvliet, H-M. Kuhn, and E. Beavor, "Mapping and analyzing bottleneck vacancies in EU", 19 September, 2014. Retrieved from https://ec.europa.eu/eures/downloadSectionFile.do?fileId=8010

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[3]   E. Rohaan, R. Taconis, and W. Jochems, "Reviewing the relations between teachers' knowledge and pupils' attitude in the field of primary technology education", *International Journal of Technology and Design Education*, no. 20, 15–26, 2010. doi:10.1007/s10798-008-9055-7

[4]   B. Burchell, V. Hardy, J. Rubery, and M. Smith, M., "A New Method to Understand Occupational Gender Segregation in European Labour Markets". Publications Office of the European Union, Luxembourg, 2014.

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[6]   L. L. Wang, G. Stanovsky, L. Weihs, and O. Etzioni, "Gender trends in computer science authorship", arXiv:1906.07883, 2019.

[7]   M. Sáinz, R. Palmén, and S. Garcia, S. "Parental and Secondary School Teachers' Perceptions of ICT and their Role in the Choice of Studies". *Sex Roles*. Vol. 66, no. 3-4, 235-249, 2012.

[8]   Pinkamp – Le ragazze contano!, web site. Retrieved from www.pinkamp.disim.univaq.it

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[15] European Institute for Gender Equality, "Economic benefits of gender equality in the EU – How gender equality in STEM education leads to economic growth", 2020. Retrieved from https://eige.europa.eu/gender-mainstreaming/policy-areas/economic-and-financial-affairs/economic-benefits-gender-equality/stem

[16] PINKBOOK 2020. Antinisca Di Marco and Laura Tarantino. Arkhè Editor. 2020 https://arkhe.it/libri/prodotto/pinkbook/

[17] Di Marco, A., Tarantino L., PinKamP: a novel educational format for the recruitment of high school girls in stem subjects, Proceedings of EDULEARN2020

Optionally, one or two letters of support. The letters of support may come, for example, from female students who have benefited from the scheme:

Unfortunately, for sake of deadline (we discover late the call), we are able to ask and receive support letters from previous pinkampers. However, if it can help, we can send to the Award Committee a copy of the pinkbook that, at the end, reports comments and appreciations of the pinkampers. Moreover, PinKamP has received the support of Ministero dell'Istruzione and the final event that is organized on September 24th 2021has received the "alto patrocinio del Parlamento europeo".

An indication of whether the submission can be considered as a runner up (if it does not win the award) and be included as an exemplar of best practice in future Informatics Europe publications: If PinKamP does not win the award, it can be considered as a runner up and be included as an exemplar of best practice in future Informatics Europe publications

PinKamP contacts

Web Site: http://pinkamp.disim.univaq.it

Facebook: https://www.facebook.com/pinkamp

Instagram: https://www.instagram.com/pinkamp

email: pinkamp@univaq.it

Press

All'Aquila riparte PinkamP, per far innamorare le ragazze della scienza
https://www.avvenire.it/attualita/pagine/all-aquila-torna-pinkamp

L'Università dell'Aquila si tinge di rosa per sfidare il gender gap tecnologico
https://www.ilmessaggero.it/abruzzo/l_universita_si_tinge_di_rosa_sfidare_gender_gup_tecnologico-5476286.html?fbclid=IwAR25s5k5HO988Mri8B866qZ43IgiVWEKxjBTKykkQrOfjA2L-3LRU6ifvVA

PinKamp, le ragazze nel futuro
https://www.collettiva.it/copertine/diritti/2020/10/05/video/pinkamp_le_ragazze_nel_futuro-296495/?fbclid=IwAR0847Q3uX5LvXqh1o7wja_AXtFm2ER0U1KCTWT9SCAyQcm3jDF8Pfo-4T8

PinKamp, a L'Aquila la summerschool per promuovere le materie STEM
https://alleyoop.ilsole24ore.com/2020/10/07/pinkamp-laquila-la-summerschool-promuovere-le-materie-stem/?fbclid=IwAR0UeqWD9Izg5yGH5sIBz0GPAz4no8dxJLtoBhOmOJnM0WKAlxa5hk-uXjA&refresh_ce=1