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Approaching Science at Early Ages Through Steam Activity: School Experience for the Kindergarten Stage in Madrid (Spain)

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Abstract. STEAM education (Science, Technology, Engineering, Arts and Mathematics) is very attractive to bring Science to girls and boys. A STEAM session was developed using the school garden as an outdoor classroom, mainly bringing Science to the CEIP (Patriarca Obispo Eijo Garay School of Early Childhood and Primary Education) in Madrid (Spain) for the girls and boys of Early Childhood Education (4 years old). on the occasion of the celebration of the week of women and girls in Science to try to bridge the existing gender gap in Science professions in our future society.

Keywords: Science, school garden, outdoor classroom, STEAM, gender gap.

General essence of the problem (introduction)

There is a marked gender gap in the Science, Technology, Engineering and Mathematics professions (STEM professions) among women globally. Therefore, developing activities to promote Science among girls at an early age is essential in our time. In these lines I collect the question posed by Fernández (2022): Why does this inequality exist between men and women at all levels and facets of the world of science and technology? That STEAM disciplines are brought closer to girls and boys from an early age generates an approach to disciplines in which girls are distanced professionally, with a gender gap existing in STEM professions. Furthermore, using the school garden as an open-air classroom also offers, among other things, knowledge of the environment and the environment in which the students live. We must emphasize that it is necessary in our time for children from an early age to have a link to the environment and natural space. As stated by Salvador et al. (2023) the school garden brings different benefits both for the academic performance of the students and the lifestyle of their environment. By developing STEAM sessions in the garden, people more linked to nature and sustainable development will be trained, aimed at fulfilling the 2030 Agenda with its 17 objectives for sustainable development. If we also work on bringing girls and boys closer to Science from an early age through STEAM education, using the outdoor educational school garden, we will be training our future society to solve the problems of today and tomorrow.

Analysis of recent research and publications

As Estrella (2020) explains, the school garden is a versatile tool with broad possibilities as a space for promoting education for global citizenship and achieving the different SDGs of the 2030 Agenda, some in a more direct way and others in a transverse shape. SDG 4 (quality education) and SDG 5 (achieving gender equality and empowering all women and girls) aim to end the forms of discrimination suffered by women and girls (Martínez, 2020). According to the UN (2023), women and girls constitute half of the world's population and, therefore, also half of its potential, but gender inequality prevails and stagnates social progress. The fields of science, technology, engineering and mathematics are considered fundamental to national economies, but until now most countries, regardless of their level of development, have not achieved gender equality in this sector (UN, 2024). Girls experience a bias towards STEM subjects, perceiving them as difficult and thinking that their abilities for these subjects are inferior to those of their peers, despite the fact that objectively the grades obtained are higher than those of boys in Spain (BBVA, 2022). In Spain there are differences in mathematics results from Primary Education, in Baccalaureate, the presence of girls in scientific-technical branches is consistently lower (ESADE, 2024). As stated by Lechuga et al. (2018) education plays a leading role in breaking down certain social prejudices, given that it is a powerful lever to support the recognition of women with the same educational, labor, political, social and cultural rights as men. According to ESADE (2024), the rates of women in the total number of people enrolled in STEM university degrees in Spain does not reach 50% in almost no case, and in Mathematics (36%), Physics (27%), Telecommunications (23%), or IT (13%) are especially low. As stated by Andrades et al. (2019) through education equality between

men and women can be achieved. And through education we can change the world, achieve a better world, a more egalitarian world between all people, women and men, a world with greater respect for all people, in which the environment and nature are known and cared for. . We must also emphasize that it is necessary in our time for children from an early age to have a link to the environment and natural space. Carrying out STEAM education outdoors with the aim of improving the world is something very necessary, because as stated by Santillán et al. (2021) the STEAM method favors the realization of predefined ideas full of concepts through inquiry, which is necessary for the development of scientific skills, increasing the level of your STEAM knowledge and applying solutions in your daily life, in your environment in which they live.

Formulation of the purpose of the article

To work on reducing the gender gap in areas of Science on the occasion of the celebration of the week of women and girls in Science, a session was held aimed at girls and boys of the 4-year-old Infant stage at the C.E.I.P. Patriarca Obispo Eijo Garay School in Madrid. The main objective was to bring Science (and other STEAM disciplines) to girls and boys at an early age, using natural resources from the school garden, awakening scientific curiosity, working mainly on SDGs 4 and 5. In addition, the garden was also used as an outdoor classroom so that girls and boys from an early age could learn Science in that natural space, with the existing plants and animals, discovering the environment and nature. The session was, with an adequate methodology and adapted to the group. The materials used were colored plasticine and tree leaves from the School's outdoor space.

Specifically, in this STEAM session the girls and boys collected fallen leaves from the trees to take them to the compost bin and later to the classroom in the school building. It was explained and taught to the students that the earthworms come up to eat the plant material in the vermicomposter and the worms in return “give” a wonderful fertilizer to our garden that they will leave in that gift box. In the building's classroom, the students were able to observe the leaves with magnifying glasses to also awaken scientific curiosity from an early age by playing at being “scientists.” On each leaf they put a ball of plasticine of a color also working on the A of STEAM. Then they began to work on mathematics, as they responded to different mathematical questions posed according to the colors of the balls on the leaves.

Presentation of the main material (research results)

The girls and boys were asked if they had liked the session at the end, to which they responded yes, this already indicated to us that they had liked what they had seen in this session. In this session many aspects were seen since we worked with the colors of the plasticines (Art), we worked on Science (with magnifying glasses, observing leaves and the plants, animals and rocks that they saw in the outdoor classroom and the vermicomposter like worms) and Mathematics was worked on with questions such as: how many leaves with red balls are there? and yellow? and in total?

The momentary result of this session to promote Science at an early age was seeing that the students had liked the session. This is important because, as stated by Madrigal et al. (2013) a child's learning is more meaningful and lasting when it is taught through playful activities through which they have the opportunity to explore and discover the world through their interaction with it. It is true that the results of this type of sessions carried out with children are expected in the students later, having tried to awaken scientific, mathematical, and art curiosity in them, using the outdoor classroom and its invaluable resources. It is expected and desired to bring students closer to different disciplines, teachings and learning that contribute to awakening in girls and boys a closeness to Science, Mathematics and Art early so that at later ages they continue to be attracted to these disciplines and thus subsequently, so that upon reaching the University there is no gender gap in STEM careers and that it contributes to forming a better and fairer world in various social and environmental aspects.

Conclusions

In general, countries around the world seek to reduce inequalities by guaranteeing, at least, a minimum level of education, being a form of development, since it means greater job opportunities, competitiveness, equity, equality and flexibility of the economy (Ruíz , 2021). Interdisciplinary STEAM education is necessary nowadays because it prepares our girls and boys for the professional world, which is also interdisciplinary; in short, it prepares them to create a better world in all possible aspects, better prepared and more equal. As stated by the UN (2024), gender equality and the empowerment of women and girls will contribute decisively not only to the economic development of the world, but also to progress towards all the goals and targets of the 2030 Agenda for Sustainable Development. . And working on all these objectives outdoors, using educational gardens or open spaces in schools, offers a range of didactic possibilities that teachers must consider and take into account when training students.

List of references

Andrades Marulanda, N. L., Palacio Flórez, A. K., & Blanco-Ariza, A. B. (2019). Female empowerment and gender equality in organizations. *Strategic Leadership*, 9(1), 140–148. Simón Bolívar University, Barranquilla. Retrieved from <http://revistas.unisimon.edu.co/index.php/liderazgo>.

BBVA. (2022). This is the gender gap in the STEM world. Available online: <https://www.bbva.com/es/asi-es-la-brecha-de-genero-en-el-mundo-stem/> (accessed on 15 July 2024).

Estrella Torres, A. (2020). Education for global citizenship: School gardens and the SDGs. *Comillas Journal of International Relations*, 19, 091–099. Germinando S. Coop. [ISSN 2386-5776].

Fernández, R. (2022). The gender gap in the STEAM field, a social challenge. *Mosaic, Open University of Catanunya*. Available online: <https://mosaic.uoc.edu/2022/11/17/la-brecha-de-genero-en-el-ambito-steam-un-reto-social/> (accessed on 15 July 2024).

Lechuga Montenegro, J., Ramírez Argumosa, G., & Guerrero Tostado, M. (2018). Education and gender: The long journey of women towards modernity in Mexico. *UNAM Economy*, 15(43), 110–139. <https://doi.org/10.22201/fe.24488143e.2018.43.387>

Madrigal Barajas, T. F., Valle Rubio, B. T., & Mayoral Valdivia, M. C. P. J. (2013). Creating environments that facilitate learning: An experience with children, recreational activities and English. *University of Colima*. Retrieved from https://cenedic.ucol.mx/fieel/2013/ponencias_pdf/23.pdf

Martínez Lirola, M. (2020). Towards inclusive education: Primary teacher training framed in the SDGs that promote gender equality. *Ibero-American Journal of Education*, 82(2), 27–45. <https://doi.org/10.35362/rie8223596>

UN. (2023). Goal 5: Achieve gender equality and empower all women and girls. Available online: <https://www.un.org/sustainabledevelopment/es/gender-equality/> (accessed on 16 July 2024).

UN. (2024). International Day of Women and Girls in Science February 11th. Women in science leadership: A new era for sustainability. Available online: <https://www.un.org/es/observances/women-and-girls-in-science-day> (accessed on 13 July 2024).

Ruíz, C. (2021). Women in education: Social inequalities beyond gender. *Analysis*, 53(98). <https://doi.org/10.15332/21459169.6237>

Salvador Beltri, A., Lorenzo Valentín, G., Santágueda Villanueva, M., & Monferrer Sales, L. (2023). Situations for learning science in 3 and 4 year old children in the school garden. *Edma 0-6: Mathematics Education in Childhood*, 12(2), 31–64. <https://doi.org/10.24197/edmain.2.2023.31-64>

Santillan Aguirre, J. P., Santos Poveda, R. D., & Jaramillo Moyano, E. M. (2021). STEAM "Education for the 21st century subject." *Dom. Cien.*, 7(4), 1461–1478. <https://doi.org/10.23857/dc.v7i4.2181>