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Summary report

LESSONS LEARNED FROM MY FIRST SOLO RESEARCH EXPERIENCE

As an Ecuadorian woman studying in a first-tier research university, I have experienced some of the typical psychological challenges related to my scientific and engineering identity that have shaped my academic behavior, and possibly hindered my academic performance. Although in my country there are no explicit messages conveyed about a "national ineptitude" to do science and engineering, it seems that this conception might have surreptitiously pervaded our identities, and thus, the ethos of our culture. Maybe youth's identity regarding science and engineering is connected to the fact that we grow up in an environment where STEM knowledge always come from scientific authorities from abroad, and cool, cutting edge technology is created anywhere but home. In most school settings students have no other option than to follow the rigid instructions of an authoritative figure (i.e., teacher), who in turn follows the "undisputable" knowledge provided by other authoritative figures (i.e., world renown scientists.) Without even noticing it, we start to acknowledge ourselves as passive receivers of knowledge, incapable to produce it by ourselves. However, identity formation is known to be a dynamic process[1], and I hypothesize that interventions such as the project I led in Ecuador prior to my acceptance to the Ph.D. program in the US (Pequeñ@s Cientific@s), can have a positive effect on children's scientific and engineering identities.

The study of scientific identity, and more recently engineering identity, are prominent topics among educational researchers around the world. They have a strong correspondence with other relevant constructs for learning, such as agency, motivation, attitude, and self-confidence[2]. The OECD recognizes all these concepts as important, stating that in their absence, learners' raw potential will not be transformed into high-level skills, independently of other variables such as students' cognitive proficiency, teachers' dedication, or the resources allocated to education[3]. This statement substantiates the importance of studying and reinforcing scientific and engineering identity in children, given that their presence or absence will not only affect their academic performance but also their life-long attitudes towards the learning and understanding of science and engineering[4]. Based on this argument, the OECD, through its Program for International Student Assessment (PISA), has included on their tests questions whose aim is to reveal learners' attitude towards science and mathematics. Results show that although students express an interest in science, only a minority see themselves using science in the future. Although Ecuador has not been part of these studies (in general, data related to the topic at hand is nonexistent for my country), it is reasonable to assume that this Andean Nation will follow the global trend.

The program Pequeñ@s Cientific@s was launched in 2010, and, to date, it has served more than 600 children. Its main goal is to motivate children aged 10-11 to learn science and engineering through hands-

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[1] Gee, J. P. (2000). Identity as an Analytic Lens for Research in Education. Review of Research in Education, 25(1), 99–125. doi:10.3102/0091732X025001099

[2] Sfard, A., & Prusak, A. (2005). Telling identities: In Search of an Analytic Tool for Investigating Learning as a Culturally Shaped Activity. Educational Researcher, 34(4), 14–22. doi:10.3102/0013189X034004014

[3] OECD. (2013). PISA 2012 Results: Ready to Learn. (PISA, Ed.)Pisa (Vol. III). OECD Publishing. doi:10.1787/9789264201170-en

[4] OECD. (2007). PISA 2006 - Science Competencies for Tomorrow's World. (PISA, Ed.) (Vol. 1). OECD Publishing. doi:10.1787/9789264040014-en

on activities. The program is run by a local university, and the workshops are free in order to serve the low income spectrum of the population. The program is advertised in local schools, and enrollment is voluntary. Children attend the workshops for 2 hours daily for 2 weeks (20 hours in total). The workshops provide a personalized experience by keeping a low student–teacher ratio of 12:1, with a maximum classroom capacity of 12 students.

Through my research project I wanted to discover whether Pequeñ@s Cientific@s have any effect on children's scientific and engineering identities. I selected this program for two reasons: First, the workshops are already well established and have the support of the community; and second, since I am one of its co-founders, I mistakenly thought I would not face any inconvenience working with the children attending the program.

According to my original plan, my study would last 4 weeks, and given that I would be in Ecuador for 30 days, I had just enough time to make everything work. The first week would be devoted to the pre-surveys and pre-interviews, during the following two weeks I would video record the workshops, and throughout the last week I would carry out the post-surveys and post-interviews. Then, I would happily come back to the U.S. to analyze the data. Well, as you might imagine, things did not happened exactly as I expected.

Now that I have shared my motivation for conducting the study, and I have provided some background about Pequeñ@s Cientific@s and the plans for the study, I would like to share 3 + 1 lessons I have learned from this trip. You will soon realize that these lessons are not related to my original research pursuits–maybe some people might consider them to be irrelevant or even obvious–but they are the most valuable thing I have obtained from carrying out this research project.

Lesson 1: Communication at all levels

In Ecuador, institutional hierarchies are very important. Being fully aware of the importance of respecting the hierarchical system, back in April I emailed the chancellor of the local university asking him for permission to carry out my research project. As expected, he replied granting the requested authorization. Once I got to Ecuador in July, and after conducting the first meeting with the parents, I was suddenly informed that my project has not been approved, and I was asked not to improvise activities that could interfere with the normal development of the workshops. I was befuddled! I did not understand what was happening. What I learned after carefully looking at all my emails was that the chancellor replied to my email by clicking on the button "reply" instead of "reply to all". Additionally, during all the months of preparation, I coordinated all the activities directly with the instructors of the workshops, who are in the lowest position in the overall hierarchy. Therefore, I unknowingly failed to recognize the authority of the person who supervises the afterschool program, and as a consequence, the power dynamics became unbalanced. As a consequence of this unexpected situation, my whole study was delayed, preventing me from collecting data from the pre-surveys and conducting the pre-interviews. The first lesson I learned from this experience is that *communication at all levels* must be maintained from the very beginning to the very end of the research process. CC'ing all the people involved in the project, and checking if the replies have been CC'ed properly, is a very simple and quick practice that could save you a lot of precious time.

Lesson 2: It is probably going to take longer than expected

Another lesson related to communication is the importance of *keeping a written record of the verbal interchanges* (e.g., phone calls, skype, or google hangout meetings) with the organization where you are going to conduct your study. It is not a secret that communicating properly with other people is challenging, and this is exactly why you need to summarize and write down the main points of any conversation you have with the people who are going to work with you. Please do not forget about lesson 1, you should also share these notes with all the stakeholders (unless otherwise stated by the organization itself) and ask them to add or modify the information as they consider appropriate. In this way you will be aware of whether you all are on the same page. This practice can take some time, but having these records can help you in the future to avoid or clarify any misunderstanding.

Lesson 3: Keep and share a written record of your verbal communications

After one week of waiting, the project was officially approved, but before starting with the activities I needed to collect the consent, permission, and assent forms from parents, children, and instructors. I also asked the parents who agreed to participate in the study to fill out a survey. This process that I thought would take one or two days ended up lasting one more week. The most frequent problems were parents forgetting about the forms, parents forgetting to sign in one or two places, children forgetting to give the forms to their parents, and parents just being too busy to read and fill out the forms. Now that I think about my planning process, I realize how naïve it was not to have considered these factors. In the future, I will remember that getting properly filled out forms from the participants might take longer than expected. Additionally, I think it is a good practice to check the forms just when the participants are giving them to you; in this way you can look for missing signatures on the spot and ask the participants to help you.

And finally,

Lesson 4: No matter how much you plan, something unexpected will happen.

I am aware that these lessons might be obvious for some, but it was because I took them for granted that I overlooked them. During my first days in Ecuador, I felt that my whole project was doomed to failure; however, once I was able to change my mindset, I decided to do what was in my power. After all, I am only a human being. I might not be able to control everything, but I am able to learn from my mistakes. There will be other trips, other projects, and many more lessons to be learned.