DESIGN AND MANAGEMENT OF SCIENCE ENRICHMENT PROGRAMMES: CONNECTING SCIENTISTS WITH CHILDREN

Joana Maria Bordalo Fernandes

Internship Report
Master's Degree in Science Communication

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This Internship Report is in agreement with the requirements necessary to obtain a Master's degree in Science Communication and was completed under the internal supervision of Professor Dr Carlos Catalão and external supervision of Dr Joana Moscoso (Co-founder and Director of Native Scientist).

For my mom and dad,

Whom I owe everything.

Acknowledgements

Having learnt that quality education is not equally accessible to all, I first would like to thank my parents for all the (educational) opportunities they provided to me and for being, unconsciously, my best role models. Together with my brothers, you all particularly guided my personal and professional growth and development.

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Design and Management of Science Enrichment Programmes: Connecting Scientists with Children

Joana Maria Bordalo Fernandes

Master's degree in Science Communication | April 2022

Abstract

This is a final report on two internships I carried out between September 2020 and November 2021 for the completion of my Master's degree in Science Communication.

The first was completed at Native Scientist, a European-wide non-profit organization registered in the UK, where I was given the responsibility to manage one of their science enrichment and outreach programmes – *Native Schools*. There, I gained a range of soft skills, from programme management to leadership skills. As an outcome of this internship, I co-founded a new, nationwide science enrichment programme in Portugal – *@ Cientista Regressa à Escola,* a programme that tackles social and educational inequities by promoting the return of scientists to their elementary schools to deliver interactive science workshops. This report also includes the design, implementation and management of the programme.

The second internship was hosted by the Communications and Outreach Office of the Carl R. Woese Institute for Genomic Biology of the University of Illinois, United States. There, I gained first-hand experience of working at an office with a different approach to Science Communication and learned about the management of science education programmes in an academic setting. As part of the internship, I conducted a focus group study on the feasibility of setting up a similar programme to *@ Cientista Regressa à Escola* in the United States.

The report ends with my personal contribution to an application for European funds supporting Science Communication and Education projects.

Keywords: Science Communication, Science Education, Science Outreach, Science Enrichment Programmes, Educational and Social Inequities, Inclusion and Diversity.

Resumo

Este é o relatório final sobre dois estágios que desenvolvi entre Setembro de 2020 e Novembro de 2021 para a conclusão do meu Mestrado em Comunicação de Ciência.

O primeiro foi realizado na Native Scientist, uma organização sem fins lucrativos premiada a nível europeu e registada no Reino Unido, onde geri um dos seus programas educativos – *Native Schools*. Aí, adquiri diversas competências, desde gestão de programas a capacidades de liderança. Com efeito, co-fundei um novo programa educativo de enriquecimento curricular em Portugal – *@ Cientista Regressa à Escola,* um programa que colmata desigualdades sociais e educativas promovendo o regresso de cientistas à sua antiga escola primária para desenvolverem oficinas de ciências interativas. Este relatório também aborda o *design*, implementação e gestão do programa.

O segundo estágio decorreu no Gabinete de Comunicação e *Outreach* do Carl R. Woese Institute for Genomic Biology da Universidade de Illinois, Estados Unidos. Lá ganhei experiência direta ao trabalhar num gabinete com uma abordagem diferente face à Comunicação de Ciência e onde aprendi sobre gestão de programas educativos no meio académico. Como parte do estágio, desenvolvi um estudo de *focus group* sobre a viabilidade de implementar um programa educativo semelhante ao *@ Cientista Regressa à Escola* nos Estados Unidos.

O relatório termina com as minhas contribuições pessoais para uma candidatura a financiamentos europeus, que apoiam projetos de Comunicação e Educação de Ciência.

Palavras-chave: Comunicação de Ciência, Educação de Ciência, O*utreach*, Programas de Enriquecimento Curricular de Ciência, Desigualdades Sociais e Educativas, Inclusão e Diversidade.

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List of abbreviations and acronyms

COO	Communications and Outreach Office
CRE	@ Cientista Regressa à Escola
IGB	Carl R. Woese Institute for Genomic Biology
Native	Native Scientist
RI	Research Institutions
SciCom	Science Communication
SRS	Scientists Return to School
STEM	Science, Technology, Engineering and Maths
UIUC	University of Illinois Urbana-Champaign
UK	United Kingdom
US	United States of America

Preface

This report evokes the professional work that I carried out throughout my journey as a master's student in science communication. Over a year-long period I had the opportunity to work both in Europe and in the United States, starting with my first internship at a European-wide organization, Native Scientist, and moving later to a second internship in a research centre in the United States, the Institute for Genomic Biology. Alongside these two internships, I launched a nationwide science enrichment project in Portugal called *@ Cientista Regressa à Escola* (CRE), which I am currently coordinating.

Although diverse in context and nature, with different goals and methods, my work over the last year has always been driven by the same core values and purposes that embody my own life project, beliefs, and sense of citizenship. As an echo of both a professional and personal experience, this report combines an objective presentation of reflexive practice with a subjective narrative of events, people, and places, in an effort to translate my participation in different science communication institutions, different multidisciplinary teams, and different workplace cultures, which ultimately shaped me as a citizen and as a professional.

I invite the reader to travel with me on a journey that starts in Europe, unfolds in Portugal, and ends in the United States (Figure 1). It all began in September 2020, when I joined Native Scientist to manage a European-wide science enrichment programme called *Native Schools*, whose aim is to promote science and language-integrated learning among ethnic minority and migrant children. Five months later, in February 2021, I co-led a small team to develop and implement in Portugal a new similar science enrichment programme called *@ Cientista Regressa à Escola* (CRE), which takes scientists back to their own elementary schools. Would the concept of CRE also work in different geography and culture, on the other side of the Atlantic? The question took me to the next and final stop, Urbana-Champaign, IL, United States, where I carried out a focus group study. Taking advantage of an opportunity for intercultural exchange under a Fulbright Scholarship, from July to November 2021, I experienced working in a science communication office of a university-based research centre in the United States.

This report is therefore a personal and faithful account of this year-long journey and of what I have learned in the process. I hope the reader will enjoy it as much as I enjoyed writing it.

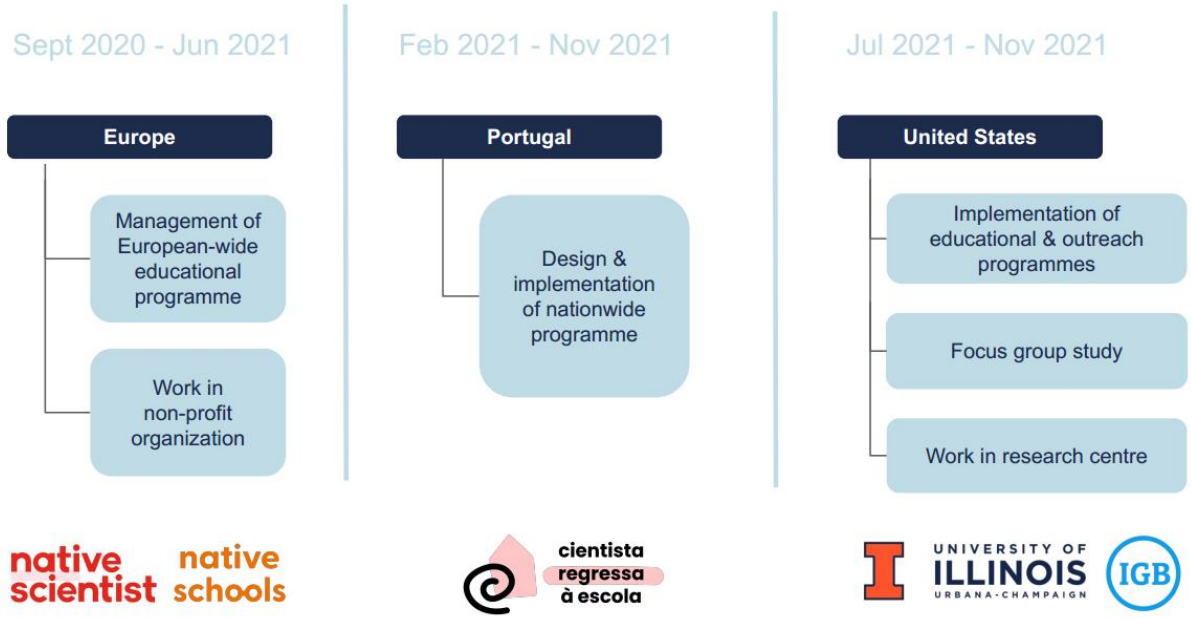

Figure 1. My journey as a science communication master's student, from September 2020 to November 2021.

Introduction

In witnessing the paramount importance of science literacy in our contemporary society, it became more pertinent than ever to deepen my work in science communication and science education, as a contribution to raise public awareness for science and to contribute to quality education.

The present report seeks to interconnect these fields, and was developed as part of my Master's degree in Science Communication, headed by Faculdade de Ciências Sociais e Humanas da Universidade NOVA de Lisboa (FCSH-UNL) and Instituto de Tecnologia Química e Biológica (ITQB).

The report echoes two internships carried out at two different science and education related institutions, namely Native Scientist (United Kingdom) and the Institute for Genomic Biology of the University of Illinois (United States). It is presented in six chapters.

Chapter 1 provides an overview of the conceptual framework underpinning the topics and content relevant to this report.

Chapter 2 elaborates on my first internship at Native Scientist, carried under an Erasmus+ Scholarship. It introduces Native Scientist and gathers the accomplishments that resulted from my experience there, especially that of managing *Native Schools*, a European science enrichment and outreach programme.

Chapter 3 delves into the making of *@ Cientista Regressa à Escola,* a new, nationwide science enrichment programme in Portugal that I have co-founded, and which I am currently coordinating. The chapter focuses on the design, development, and implementation of the programme, which was grounded on my experience at Native Scientist, and which stemmed from my personal aspiration to help tackle social inequities in the access to both science and science education in Portugal.

Chapter 4 explores my internship experience at the Institute for Genomic Biology of the University of Illinois and provides an outline of the institute and the office where I undertook the internship. It also addresses the work I developed as member of their Communications and Outreach Office, under a Fulbright Scholarship.

Chapter 5 delves into a study I have carried out in the United States using a focus group methodological approach, with the intention to elicit and analyse the views, opinions, and ideas of American citizens about the implementation of a science enrichment programme that promotes the return of scientists to their schools in the United States.

Finally, Chapter 6 is my personal contribution to any organization which seeks to raise European funding by presenting the seeds of an application inspired on the Horizon 2020 framework template, and heavily based on my experience in the design and implementation of *@ Cientista Regressa à Escola*.

Chapter 1
Informing the present: a conceptual framework

1.1 Science Communication

Science communication is a diverse, dynamic and transdisciplinary field of expertise (Kalmár & Stenfert, 2020) that has been undergoing rapid evolution, and it is a growing area of practice (Guenther & Joubert, 2017; Mercer-Mapstone & Kuchel, 2017; Burns et al., 2003). It may also be taken as a field of research in its own right, a scholarly activity and a discipline itself (Guenther & Joubert, 2017; Trench & Bucchi, 2010), that has gaining an increasing recognition over more than 50 years (Gascoigne et al., 2010).

In the context of this report, the contemporary terms 'science communication' or 'communicating science' as areas of practice, are applied in line with the broad definition suggested by Bruns et al. (2003, p. 191): "Science Communication may be defined as the use of appropriate skills, media, activities, and dialogue to produce one or more of the following personal responses to science: Awareness, Enjoyment, Interest, Opinions (or attitudes), and Understanding of Science".

Under this umbrella definition, I include 'science outreach' as part of the scope of science communication, framed as a set of activities that allow for such public responses. Specifically, the term 'science outreach' will henceforth be used as referring to the act of delivering scientific content outside of the traditional student-teacher relationship to stakeholders to support and increase the understanding, awareness, and interest in scientific disciplines (Tillinghast et al., 2020).

Durant et al. (1989) stated that science is arguably the greatest achievement of our culture, and thus people deserve to know about it. Concomitantly, Suciu (2021) argues that it is challenging, if not impossible, to distinguish between culture and communication. Based on the definition of culture as a unified set of values, ideas, beliefs and standards of behaviours shared by a group of people and "the means by which we receive, organize, rationalize, and understand our particular experiences in the world" (Saleebey, 1994), we can then perceive communication and science as part of our cultures, both with intrinsic values that cannot be detached from its people, as they are subjects of transmission from generation to generation.

Indeed, there is an agreement that science-literate communities of informed citizens are part of the engine of a prosperous society (e.g., Clark et al., 2016). As Fleming (2009, p.31) pointed out, "today's big issues and the pace of new developments require an unprecedented level of scientific awareness and understanding", which, again, highlights the utmost importance of reaching wide and diverse audiences.

Davies, (2020) gauged perceptions on science communication's role in society from 16 interviewed scholars and teachers of science communication, and recently suggested that public communication is relevant to society for five different reasons: it ensures the accountability and legitimacy of publicly funded science, has practical functions, enhances democracy, serves a cultural role, and (negatively) acts as promotion or marketing of science.

1.2 Scientists as science communicators

It is broadly agreed that scientists should be able to convey their knowledge to non-scientific audiences (Brownell et al., 2013; Clark et al., 2016), which requires attracting scientists to science communication and outreach to promote public engagement in science and make science appealing to wider audiences. Several scholars have studied researchers' participation in public engagement activities (e.g. Poliakoff & Webb, 2007; Bauer & Jensen, 2011). These studies, in particular, show the extent to which increasing scientific literacy demands the involvement and recruitment of scientists to be core agents in science enrichment and outreach programmes. This is, indeed, the core idea behind the actions undertaken in both my internships, as well as a central building block of this report.

Noteworthy, it became self-evident that making contributions and playing a part in such programmes have an impact on both science students and professionals. For the former, participation in science outreach helps students strengthen their applications for internships, graduate programmes, and research fellowships. For the latter, it complements their classroom teaching, refines their ability to communicate with public audiences, and helps form relationships with school teachers (Hendrickson et al., 2020). In the long run, participating in science outreach and communication is perceived as a rewarding experience for both groups. In particular, working closer to school students increase researchers' abilities in teaching, teamwork, communication and facilitating group discussions, and leadership skills (Grant et al., 2015). Furthermore, Woods-Townsend et al. (2016) assert that engaging in

face-to-face interaction with school students raises scientists' awareness of the need to actively engage their audience when communicating their work.

According to Hendrickson et al. (2020) an important step towards increasing the participation of scientists in science outreach and communication is the incorporation of such a component in college students' curricula.

1.3 The scientist-student dialogue

Woods-Townsend et al. (2016) suggest that learning with and from scientists through face-to-face interactions with them allow students to view scientists as approachable, ordinary people and start to understand the range of science. Therefore, scientists' participation is key in delivering science enrichment and outreach programmes that are based on direct interactions between scientists and the audiences. These interactions are promising in promoting positive attitudes towards science and in exposing participants to relatable experienced role models who present useful, relevant, and accessible science content (e.g., Kompella et al., 2020 and Clark et al., 2016).

Nowadays, there are countless science outreach activities and science enrichment programmes around the world that involve the participation of scientists, and which are designed to promote scientists-student dialogue, either in- or outside the school setting. Scientists can, therefore, play an important part in tackling inequities in access to science education, as outreach programmes outside of the school classroom are a critical catalyst for lasting interest and involvement in overall science education.

1.4 Disparities in access to science education

Education is a fundamental human right and indispensable for the exercise of other human rights (Retrieved February the 2nd, 2022, from https://en.unesco.org/news/what-you-need-know-about-right-education). Yet, access to education is not equitable. Inequities in access to education lead to different opportunities in people's lives and variances in students' aspirations. These prevent students from achieving their full potential and, consequently, perpetuates scenarios of socially excluded children and situations of poverty.

Despite increasing efforts in the field of science education, numerous science communication and outreach initiatives keep reaching only certain members of society and numerous underserved and/or underprivileged communities continue to be left out (Humm et al., 2020; Dawson, 2018). So that "access to science and its benefits and opportunities is uneven across the world" (Gascoigne & Schiele, 2021, p. ix), which means science communication is often reaching only certain parts of society. This can be perceived as a system-level failure, as suggested by Bevan and colleagues, and constitutes an urgent need "to recognize, nurture, and channel young people's early interests in science into longer-term pursuits" (Bevan et al., 2018, p. 1), to broaden the diversity of people who participate in, contribute to, and benefit from science and STEM (science, technology, engineering, and math) education.

To reduce inequities, it is important to foster science identity in students. Evidence shows that "beyond factors such as ability and achievement, students who embrace science identity are more likely to maintain their aspirations to become scientists" (Merolla & Serpe, 2013, p. 13).

1.5 Evidence based education

In this report, we will learn about two specific science enrichment and outreach programmes that promote the scientist-student dialogue and establish meaningful connections between children and scientists. They were designed to tackle inequities in access to education and science enrichment programmes. While both programmes use a scientist-student shared background approach (i.e., they promote the interaction of scientists and children that have a common background, e.g., language, cultural heritage, social background,…), they succeed in promoting such interactions differently: the *Native Schools* programme, promotes the interaction of migrant children and migrant scientists that speak the same heritage language, whereas *@ Cientista Regressa à Escola* (CRE) promotes the interactions of children and scientists from the same homeland, therefore sharing the same socio-cultural background and elementary school.

CRE is rooted in the concept of *Circular Education*, borrowed from the notion of Circular Economy, which reflects the idea of high-qualified professionals going back to their *roots* and giving back to their communities, especially to the young generations, to inspire

them to science, as well as, to pursuit of science-related higher education and careers. Moreover, adopting the concept of Circular Education means potentiating virtuous cycles and, more importantly, turning vicious cycles into virtuous cycles, helping youngsters to exit situations of poverty and social exclusion. To the best of my knowledge, this concept has never been implemented as per founding an outreach programme.

Importantly, both *Native Schools* and CRE build on the literature suggestions and are in line with researchers' suggestions on the best practices to promote the participation of young people in STEM. Indeed, CRE aligns with Chapman & Vivian (2017) in the following suggestions: coordinated collaboration between stakeholders across the STEM ecosystem, sustainable inclusive education and engagement for all STEM fields, and sustained professional development. *Native Schools* brings into line Canfield & Menezes (2020, pp. 48-51) in the following recommendations: (i) expand opportunities for multilingual engagement, (ii) create and sustain in-person and virtual networks and resources for community building, and (iii) develop, and test and evaluate inclusive science communication curricula and training.

Moreover, both programmes are based on evidence-based education and training approaches such as:

1. *Science Capital Teaching Approach* – developed by Prof Dr Louise Archer and colleagues (Archer et al., 2013). In this methodology, students are not seen as empty vessels that are filled with scientific information. Instead, science is seen as a vehicle to promote social justice. Therefore, education and outreach programmes need to focus on allowing students to create meaningful connections with science, by making science be perceived as useful and relevant. Providing students with different content is not enough to increase their science capital (interests, attitudes, and resources for science topics), and effective efforts to increase science participation have to be vast, long-standing and continuous.
2. *Inquiry-Based Science Education (IBSE)* – students are at the centre of the learning process, as they are, again, the main drivers and catalysts for their learning (self-directed learning). IBSE provides students to learn through reasoning, asking questions, developing experiments, and considering different hypotheses. This method improves students' critical thinking, cooperative and collaborative

practices, creativity, and reflection. Rather than valuing the amount of information a student can memorize, IBSE values instead the deep understanding of what is being learnt.

3. *Hands-on learning activities* – Literature suggests that students prefer workshops over projects and lectures and that they get actively involved in science activities that include hands-on activities as a teaching method (Vennix et al., 2018).

Chapter 2
Europe: Managing “Native Schools”, a science enrichment programme

This chapter delves into my first science communication experience: the internship I completed at Native Scientist, a European-wide non-profit organisation that develops, implements, and evaluates science education and outreach programmes for children, particularly underserved and/or underprivileged children.

My internship experience as a Programmes Manager of the *Native Schools,* a science enrichment programme of Native Scientist, was carried out from September 2020 to June 2021. Firstly, I provide in Section 1.1 a holistic subjective overview of Native Scientist as it was captured through my lens. Secondly, I elaborate on the work I developed, gathering in Section 1.2 the main deliverables, achievements, and lessons learnt from this personal learning path and explaining how this experience provided me with the appropriate know-how to further design and implement a new science enrichment programme, which will be addressed in Chapter 2.

2.1 Native Scientist

2.1.1 A socially driven enterprise for science education and communication

Native Scientist (*Native*) is a non-profit organization founded in London in 2013 by two Portuguese scientists, Dr Joana Moscoso and Dr Tatiana Correia, who wanted children worldwide to have equal and increased access to science and higher education. Joana Moscoso holds a PhD in Biology from Imperial College London and has a long-standing experience in science outreach and entrepreneurship. Moscoso's outreach work has been distinguished multiple times, including the titles Top 100 Women in Social Enterprise (2021) and MIT Innovator Under 35 (2017). Tatiana Correia holds a PhD in Physics and an MBA. Correia works as the Knowledge Transfer Manager at Innovate UK and has over 14 years of proven project delivery in the public and private sectors.

Working across two different sectors, science communication and education, Native Scientist's mission was, until the end of 2020, to broaden the horizons of ethnic minority and migrant children by connecting them with scientists and promoting science education (Native Scientist, 2020). *Native* provided science and language workshops for students, as well as, science communication training for scientists. With this, *Native* was tackling three main challenges: the educational disadvantage of migrant students, the low language and science literacy in society and the poor scientists' participation in outreach. In 2021, a revision of *Native'*s mission to better reflect the core goals and growth of the organization resulted in a mission with a broader scope, the one of broadening the horizons of underserved children by connecting them with scientists to promote science careers and higher education.

Importantly, *Native* is committed to reducing inequalities in education and bridging the gap between science and society (Native Scientist, 2020). Throughout eight years of experience promoting scientific volunteering, innovation, and social responsibility, and of teaching science at school and mitigating inequities, *Native* was awarded and received recognition by entities that include, but are not limited to, the Imperial College London, the Royal Society of Biology, or the Euclid Network. Nature Careers also counts with the testimonials of two Native Scientist volunteers in an article released in February 2021 (Teles & Viana, 2021).

Every year, Native Scientist reaches 1,200 school students across 20+ European cities, effectively training and helping 200+ scientists disseminate their work.

Finally, *Native* is aligned with the Sustainable Development Goals (Retrieved March the 7th, 2022, from https://sdgs.un.org) established by the United Nations General Assembly in 2015, including: Quality Education (Goal 4), Gender Equality (Goal 5), Decent Work and Economic Growth (Goal 8), Reduced Inequalities (Goal 10) and, finally, Partnerships for the goals (Goal 17). *Native* is not limited to the goals mentioned above, since all the work it develops leads to many relevant outcomes which contribute to other goals (Bordalo, 2021).

2.1.2 Organizational structure and internal communication

Native Scientist is a vibrant and growing organization whose operational capacity is grounded in a diverse group of 18 people in the core team, working remotely from all over Europe on a part-time and/or volunteering basis.

Native is organized in a functional structure within seven working units, namely: (i) the Director Board, (ii) the Advisory Board, (iii) the Sustainability and Development Unit, (iv) the Strategy, Data and Talent Management Unit, (v) the Financial and Legal Management Unit, (vi) the Communications and Marketing Unit, and (vii) the Programmes and Projects Unit.

Among these, the Programmes and Projects Unit is the largest unit, involving around 12 people, who are currently divided into 7 working groups: Native Schools Management, Native Explorers Management, Native Training Management, Native Awards Management, Native Certificates Management, Native Translations Management, and Native Research and Impact Management.

For internal communication purposes, every three months Native Scientist organizes so-called Quarterly Meetings, where people working in the different units have the opportunity to share progress and achievements, problems faced, and plans and goals for the next three months. An annual meeting also takes place every year, with the goal of providing a year review of the organization, not only for its core team, but also for all of the coordinators and volunteer scientists who actively engage with Native Scientist in the implementation of its programmes.

Moreover, there is also an internal newsletter called “5 Bullet Points of the Month”, which includes a digest of five key aspects of the organization. This newsletter targets the core team members, *Native Schools* coordinators, and the advisory board members, and is written by the director every month. There is also an external newsletter that is issued three times a month before the Winter holidays in December, before the Spring holidays in March or April, and before the Summer holidays in June or July.

2.1.3 Educational programmes

Currently, *Native* develops and implements three educational programmes (Table 1): the *Native Schools* programme for children aged 6 to 12 years, the *Native Explorers* programme for teenagers aged 13 to 17 years old, and the *Native Training* programme that targets international scientists worldwide. Additionally, *Native* develops bespoke programmes for given institutions, and incubates a programme of letter exchanges between scientists and students in Portuguese-speaking countries, called *Cartas com Ciência* (Retrieved February the 2nd, 2022, from https://cartascomciencia.org). For the purpose of this report, I will focus only on the description in detail of *Native Schools*.

The *Native Schools* programme, implemented European-wide, is the most popular programme of Native Scientist and targets ethnic minority and migrant children. The programme brings international science university students and professionals from their labs into the schools to deliver science workshops in their native language. This aligns with research suggestions to encourage and support science students and professionals to seek out opportunities to talk about their work in their native tongue (Márquez & Porras, 2020, p. 4).

Initially, the programme was operating only for the Portuguese-speaking community in the United Kingdom (UK), but as it rapidly inspired other international communities across Europe, *Native Schools* expanded to other migrant communities in the UK and in other European countries. Nowadays, it is present in 9 countries all over Europe (France, Germany, Ireland, the Netherlands, Norway, Portugal, Sweden, Switzerland, and the UK), and works with pupils in 10 different languages (Arabic, Estonian, French, German, Greek, Italian, Polish, Portuguese, Spanish and Turkish). Throughout this programme, communities where science

professionals can interact with each other in different languages are created (Márquez & Porras, 2020).

All *Native*'s educational programmes are designed with three key outcomes in mind, namely: (i) promoting science learning; (ii) promoting language learning; and (iii) promoting the interaction of children with role models. The programmes that target school students are all based on the following propositions:

1. "No child should leave school without ever meeting a scientist";
2. "No child should ever feel ashamed of speaking more than one language";
3. "School performance and career prospect should not be determined by whether a child is a migrant or not".

Table 1
Native Scientist Educational Programmes

Name	Geographical reach	Main beneficiary
Native Schools	Europe	Ethnic minority and migrant children (6-12 years old)
Native Explorers	Europe	Ethnic minority and migrant children (6-12 years old)
Native Training	Worldwide	Scientists

2.1.4 Supporting programmes

By fostering the generation and maximization of social impact through its educational programmes, Native Scientist also holds four supporting programmes: the Native Research & Impact, the Native Certificates, the Native Awards, and the Native Translations. At their core, they support and complement the educational programmes and target all stakeholders involved (Table 2).

Table 2
Native Scientist Supporting Programmes

Name	Goal	Main beneficiary
Native Research & Impact	To disseminate the work developed and evaluate the impact of the educational programmes	Research community; *Native's* partners and followers
Native Certificates	To produce and deliver the certificates of the educational programmes	Children; Scientists; Teachers
Native Awards	To select and award the annual contest winner for "Best Drawing" and "Best Sentence"	Children
Native Translations	To support the translation of materials, forms, consents, and others	*Native* community

2.2 The Internship

2.2.1 Role and onboarding

I joined the Programmes and Projects Unit, with the purpose of undertaking an internship as the Programmes Manager (PM) of Native Scientist. The job profile specified "the collaboration in the management, implementation, evaluation, improvement, and communication of Native Scientist programmes, as well as providing specific contributions beyond *Native* programmes by supporting other members of the core team".

My internship was supervised by Dr Joana Moscoso, the co-founder and director of Native Scientist, who provided me with guidance and mentoring throughout the internship. As the internship was conducted remotely, our relationship was nurtured via one-on-one weekly meetings held on the Zoom Platform, email exchange, usage of the Basecamp Management and Communication Platform, and also WhatsApp (for some urgent matters).

The onboarding process took place during the first week of the internship, in September 2021, and consisted of three online meetings that introduced the organization. Subject matter in these meetings included:

- Expectations alignment;
- General presentation of Native Scientist;

- Strategic plan and implementation;
- Communications and branding;
- Team structure;
- Google Drive tour and workplan.

Dr Joana Moscoso and I kept a continuous and systematic communication throughout the internship which contributed significantly to my sense of belonging at *Native*. Additionally, Moscoso's support and guidance allowed me to overcome any barriers caused by the vicissitudes of remote work, and contributed to the accomplishment of several deliverables, helping me to perfect them towards higher standards.

2.2.2 Hands-on, key responsibilities

In addition to contributing to an assortment of specific tasks and deliverables during my internship, and to supporting various programmes, management and delivery of the *Native Schools* educational programme was a key responsibility of mine. I also supported other programmes and contributed to specific tasks and deliverables. In response to the presence of pandemic restrictions making necessary the transition of the programme to a virtual format, I oversaw the development and delivery of a new synchronous, online version of the *Native Schools* programme.

For the implementation of the *Native Schools* I performed several tasks, including:

- Meeting and communicating with the different stakeholders, namely the local coordinators and the hosts of the workshops;
- Organizing mock/training workshops that provide scientists with feedback on their content, and allow the local coordinators to practice logistics for the day of the workshop;
- Creating registration forms via Google Forms and Eventbrite;
- Evaluating the impact of the workshop through data collection and analysis;
- Writing and delivering workshop reports.

Outside the direct scope of the *Native Schools*, other key responsibilities and tasks of my internship included:

- Introducing the organization and its programmes at online events and conferences;

- Conduct a literature search and write the outline of my first journal article;
- Writing internal reports and blog articles;
- Creating protocols to ensure consistency and to move improvements forward;
- Co-producing content for the website;
- Supporting the development and delivery of the coordinators and scientists' training;
- Upholding the Native Scientist commitment to diversity, equality, and inclusion.

2.2.3 Minds-on, lessons learnt, key achievements and tasks

Most of the accomplishments of my experience at *Native* are the result of working within inclusive and diverse workplace culture, jumping outside my comfort zone to acquire newfound knowledge, and overcoming unprecedented challenges.

In the next pages, I will present a full account of my *Native Scientist* internship tasks, including the skills I acquired by accomplishing them. These spanned five different domains: (i) Programme management; (ii) Creating, developing, and implementing the *Native Schools Oline*; (iii) Oral presentations for external communications and training; (iv) Writing; and (v) General accomplishments.

Programme management

As a manager of the *Native Schools* programme, I developed problem-solving skills leadership, and interpersonal and communication skills - particularly those related to planning, coordination, and monitoring of processes. Tasks included:

a. **Managing, improving, and updating dashboards, forms, and folders** – Organizing and implementing educational programmes posed several challenges, all requiring commitment, organization, and attention to detail. My general organization skills were improved, and I acquired and developed technical skills regarding the management and improvement of excel dashboards, learned how to master new platforms (e.g., Google Forms, Drive, Eventbrite and Basecamp), and developed data collection skills by building different mechanisms of organizing data (e.g., Excel).
b. **Creating and updating protocols** – To sustain efforts to boost internal organization with the team, it is of utmost importance to keep processes clear

and effective. My contributions to that purpose included but were not limited to the creation of new protocols, and updating existing ones to enable good guiding practices.

c. **Schematize the workflow for the next Programmes Manager** – As stated before, a clear lesson learned from managing an educational programme is the ability to rely on good processes, in which everyone clearly understands the role they play and the key tasks to be performed. These are crucial for the successful implementation of an educational programme that is conducted by a multi-person team. Consequently, one of the final tasks I handled during the internship was building a scheme to help and guide the next Programmes Manager through the organization of the *Native Schools* workshops: the Programme Manager workflow (Figure 2).

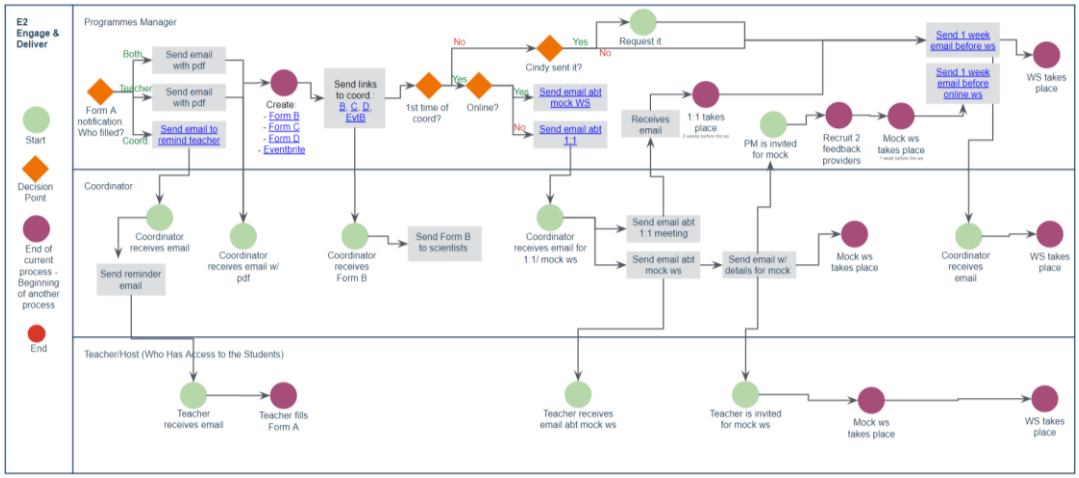

Figure 2. The Programmes Manager workflow for managing the Native Schools programme.

d. **Comparison of *Native Schools* with other projects** – After performing a literature search into science enrichment and outreach programmes, I selected paper journals addressing and describing scientist-implemented science enrichment programmes and outreach activities and further compared these with *Native Schools*. The results of this task are summarised in Table 3.

Table 3
Comparison of *Native Schools* with other science outreach programmes

	Native Schools	Hands-on at Otago (Mackay, 2020)	Present your PhD to a 12-year-old (Clarke, 2016)	The Science Squad (Lauresen, 2007)	Owen, 2019	Oh-Kids (Pedrozo-Acuña, 2019)
Long-term programme	✔	✔	✔	✔	✘	✘
One-off experience	✔	✘	✘	✘	✘	✔
Goal is meeting role models	✔	✘	✘	✔	✘	✘
Conversational, ping-pong style	✔	✔	✘	✘	✔	✔
Scientists training	✔	✘	✘	✘	✘	✘
Usually low science capital children	✔	✔	✔	✔	✘	✘
***Science tapas* 4 scientists 4 topics**	✔	✘	✘	✘	✘	✘
Heritage language	✔	✘	✘	✘	✘	✘
Evaluation	✔	✘	✔	✔	✘	✔

Creating, developing, and implementing the Native Schools Online

In the wake of the pandemic, there was a need to transition our programmes to an online format. Therefore, we united operational efforts to develop and pilot an online live version of the *Native Schools* programme, where a lot of desk-based work had to be done from scratch. I was responsible for creating new processes, protocols, and registration and feedback forms to suit the emerging needs. These efforts contributed to developing creativity, adaptability and problem-solving skills.

Oral presentations for external communications and training

My internship provided several opportunities to perfect verbal communication skills, particularly in the delivery of public presentations. Some key achievements on this topic

include the creation of presentations that suit different purposes and target different types of audiences, and the usage of appropriate and confident speech and clear engagement with the audience. In these presentations, the speech, the slides, and the messages conveyed varied widely according to both the topic and the target audience.

a. **PARSUK (Portuguese Association of Researchers and Students in the UK) Promotional Event** (September 2020) – I introduced Native Scientist to an audience of Portuguese-science students and professionals living in the UK.
b. **Coordinator Induction Training** (November 2020) – I introduced the *Native Schools* programme to the new *Native Schools* coordinators for that upcoming year by providing a framework on the key steps of organizing the *Native* workshops. The framework mainly addressed what it means and what it takes to be a coordinator of the *Native Schools*.
c. **Learning for Citizenship Conference** (May 2021) – This conference brought together "academics, practitioners, NGOs and policy-makers from across Europe, to exchange and discuss best practices of inclusion, engagement, practical and emotional support for migrant and refugee students from different backgrounds, educational levels and local contexts" (Retrieved November the 12th 2022, from https://learningforcitizenship.wordpress.com/2021/04/07/online-conference-supporting-migration-students-through-the-pandemic/).

   I was in charge of presenting the *Native Schools p*rogramme, its rationale, impact and evaluation, including the need to effectively adapt *Native Schools* to an online format by developing a virtual programme, and the 8 key learnings taken from that experience. The target audience was social science students and professionals, mainly working in the education field. This was my first experience at a scientific conference.
d. **Other –** I also conducted an interview for a project called Success Stories. Its goal was to publish a blog article on how Native Scientist impacted and inspired a student in 2014 who went to pursue a scientific career in 2021. Additionally, I held several meetings with external partners and key stakeholders within the broader science education and communication

communities to instigate improvements and innovations throughout the internship.

Writing

Mastering the process of writing takes time and extensive practice. It is therefore a time-consuming journey where trial and error are key parts of the process, and where feedback is crucial. Writing is an important skill to develop in science communication, and while not the focus of my internship, it is a skill I was able to improve because of it.

a. **Journal article** – After conducting a literature search on science enrichment programmes, I contributed to the writing of a manuscript. This article was my first experience as co-author of a publication in a peer-reviewed journal. The manuscript, entitled "How science outreach with children can promote equity and diversity", was accepted for publication in the Journal Trends in Cell Biology, section Trends Voices, in April 2022.
b. **Blog articles** – Focused and useful feedback creates fertile ground for improving blog writing and written communication, which does not come easily. Receiving consistent feedback and working alongside the Blog & News Manager of *Native* allowed me to improve my science writing skills and to work on efficient and effective written communication. The three blog pieces I have written include:
    i. The Native Scientist alignment with the Social Development Goals (Bordalo, 2021);
    ii. The Educational Challenges of Migrant Children (unpublished);
    iii. The Success Story of Tiago Alves, once a student at a *Native Schools* workshop, now a physical-scientist in the making (Retrieved February the 15th, 2022, from www.nativescientist.com/single-post/success-stories-tiago-alves).
c. **Internal reports and evaluation reports** – In the production of internal reports, I developed the ability to deal effectively with multiple and diverse types of information based on given key metrics. The goal here was to summarise and extract relevant data for different purposes, such as retrieving relevant

information to be included in the annual report. After each *Native Schools* workshop, I was responsible for writing and delivering workshop reports, according to data collected in the feedback forms.

d. **Writing emails** – Perfecting the writing of formal emails in reaching out on the behalf of an organization paved the way for nurturing meaningful connections with the different stakeholders.

General accomplishments

By far, all my initial expectations for an internship have been surpassed. Indeed, beyond the technical improvements already mentioned, I have also:

a. Improved entrepreneurial skills;
b. Gained experience working in a growing social organization;
c. Deepened project and people management skills;
d. Networked with scientists and science communicators European-wide.
e. Perfected the usage of the English language in a professional setting;
f. Increased computer literacy and remote-based skills;

2.2.4 Performance reviews

Undoubtedly, a vital part of improving learning, motivation and personal and professional growth is the quality of the feedback provided. As such, Moscoso and I held two performance reviews. These consisted of online sessions that at their core provided two-way constructive feedback. The performance reviews took place in the middle and at the end of the internship and allowed us to exchange insights both on the performance of my work as an intern, as well as, on the director's support and advice. The performance reviews contributed to the creation of a friendly working environment, helped me to sharpen my focus, boosted engagement and contributed to achieving better results. Ultimately, they increased transparency in the workplace. The final session, in particular, was of utmost importance to summarize my work throughout the internship, assess the quality and quantity of the deliverables, reflect on achievements, and recount the lessons learnt throughout this period.

2.3 Key points

This chapter addressed the internship I completed at Native Scientist, my first working experience as a science communication professional.

Firstly, we have learnt about *Native's* foundation, its organizational structure, and the programmes *Native* implements.

Secondly, we have learnt about the work I developed there, including the main deliverables, achievements, and lessons learnt from that experience. With first-hand insights into the work of a European-wide organization, I learned what it takes to manage a science enrichment programme that targets migrant children, and also how diverse people around Europe work together sharing common values and goals. The knowledge and experience I acquired throughout six months paved the way for the further design and implementation of a new science enrichment programme that will be addressed in the next chapter.

Lastly, it is relevant to acknowledge that Native Scientist received me with open arms, provided me with the right environment to share my insights, views and ideas, and welcomed me in an extremely friendly environment. I appreciate the fact there was always room for professional and personal growth as a result of being constantly challenged and mentored. I will forever remember how it felt to work as a professional for the first time and will always be grateful to Dr Joana Moscoso whose support I relied upon.

Chapter 3
Portugal: The making of "@ Cientista Regressa à Escola", a new science enrichment programme

The previous chapter described my experience at Native Scientist as Programmes Manager of a science enrichment programme clarifying how it provided the experience that is required to further design and implement similar initiatives. This learning process was key in my next endeavour: that of creating from scratch a similar initiative, only this time to be implemented at a nationwide scale in my own country.

This endeavour is precisely the subject of the present chapter, which starts by presenting my experience in Portugal working locally to address the same goal of improving science education and scientific literacy, through the design and implementation of *@ Cientista Regressa à Escola* (CRE). Building on the acquired knowledge at my first internship, we will see how a team was assembled, how goals were set, how stakeholders were reached, how partnerships were established and, ultimately, how we ended up creating, launching, and implementing an ongoing nationwide initiative, under the mentorship of Native Scientist.

Both the *Native Schools* and CRE seek to improve science education and students' aspirations toward science by connecting them with scientists in meaningful ways. While for the first this is achieved through sharing a common heritage culture and language, for the latter this is achieved through a common birthplace and elementary school experience. With this, students can relate to the scientists and realise "I can be a scientist if I want to".

In both programmes, scientists eligible to participate are any person at any stage of their careers who conducts and/or contributes to research in any field of expertise, carried out at public or private research centres.

3.1 The first stone of the trail

@ Cientista Regressa à Escola, referred to as CRE in this report, started its pre-launch phase in January 2021, when the director of Native Scientist Dr Joana Moscoso and I discussed the possibility of "giving back to our country" by implementing a science enrichment programme that would work in the social sector and that would contribute to improving educational opportunities nationwide, whilst tackling inequities in access to science education.

To aid in the fulfilment of this goal, we decided to apply for an acceleration programme called "Prémio Melhor Ideia de Negócio", from Faculdade de Ciências Sociais e Humanas/ Santander Universidades. Our participation in the acceleration programme took place in February and March 2021. During this period, we had access to workshops that helped us consider all the variables and implications that a challenge like this would imply. This was key to initiating the design and conceptualization of this new programme.

3.2 Bringing together a motivated team

The very first step we had to take was to bring together a motivated and multidisciplinary team, as well as, establish the programme coordinator (myself). We recruited four people and are now a team of six people willing to improve educational opportunities for students. Each member of the team has a different background, different levels of higher education, and different participation in society, which enriches the diversity of the team. This wide range of personal and professional journeys provides us with multiple insights into Portugal's educational gaps, enables us to connect with different educational communities, in Portugal and abroad, and empowers us to meet their needs and give rise to a new educational programme. Therefore, creating a team was the first milestone of the programme.

3.3 Defining the programme's concept and social mission

During the aforementioned acceleration programme, we defined CRE's concept and social mission.

CRE was thought of as an entirely new science enrichment programme, inspired partially by *Native Schools*, but with a new set of goals and operations. It was thought of as a local initiative with a nationwide ambition. It was conceived to empower children to pursue higher education and scientific careers while tackling educational inequities among children. Overall, the programme seeks to narrow the gap between the scientific and the educational communities, promoting positive change in student attitudes towards science. To accomplish this, scientists and students from the same homeland are brought together within the school environment to have meaningful dialogues as a kind of formal-informal cooperation. The merging of the most relevant features in both approaches – that of formal education represented by the school, and that of informal learning environments represented here by the CRE contribution – is key to promoting and popularizing a concept of Circular Education, and to maximizing the establishment of possibilities from meaningful connections.

The overarching premise of CRE is to provide students (especially those from underprivileged backgrounds and/or underserved communities) with opportunities to engage in personally relevant and scientifically authentic workshops implemented by STEM (science, technology, engineering and maths) practitioners. Noteworthy, for students, participating in the project will be a once-in-a-lifetime experience, while for the scientist, it can be an annual or biannual experience (each scientist can dedicate one day per year or one day every two years to this project).

Working at a national level, this programme helps students, particularly those who feel detached from science, to:

(i) break down stereotypes about scientists by interacting with role models;
(ii) develop their identities as people who can enrol in science if they want to;
(iii) broaden their horizons and increase their interest in pursuing higher education and science-related careers;
(iv) improve scientific literacy and critical thinking by raising their awareness of scientific topics.

The more far-reaching goal of the programme is to contribute to excellence in science education across Portugal, as well as, to promote young people's interest in science by showcasing what it means to be a real scientist. In the long term, the programme's most prominent promise is to increase people's science literacy and soothe educational inequities.

To aid in the fulfilment of this goal, this year-long programme is intended to be implemented and replicated every school year in an increasing number of schools throughout Portugal.

CRE is uniquely positioned in terms of geography. It contributes to quality education nationwide, especially in under-resourced areas, and participating scientists, who return to their homelands, are emotionally involved through giving back to their own communities, giving the programme traction.

Finally, considering that at the core of the programme is an authentic interest in transforming knowledge into positive societal changes by encouraging more young people to pursue careers in science, CRE initiatives at schools encompass evidence-based education, such as the *Science Capital Teaching Approach, Inquiry-Based Science Education*, and *Circular Education* (see section 1.6).

3.4 Understanding educational needs

It became clear, right from the start, that before launching the programme it is key to understand the needs of the target population. Thus, in February 2021, our team launched a survey for teachers and schools aiming at gauging their interest in a programme with CRE's characteristics. Results (Annexe 1) indicated that there is an appetite in Portugal for the programme, as more than 40% of the respondents (n=69) said there are no science enrichment activities in their school. The majority (93%) stated interest in welcoming scientists into their classes and considered this proposal to be a viable option (88%). Worthy of note, 49% of the responses were from schools in what we considered a rural area (less than 50,000 inhabitants).

Following this survey, we began meeting with scientists and teachers online, in a deliberate effort to co-create and improve the programme. The outcomes of these meetings include:

(i) a well-defined structure for the days of the interventions at schools;

(ii) the development of lesson plans for teachers to help them in the organization of a pre-workshop session designed to prepare the students for the CRE intervention;

(iii) the development of a post-workshop session to consolidate learnings and guide students in the preparation of a science communication output.

3.5 Creating a visual identity

In a world where visual communication thrives, it is crucial to have a *brand* that enables people to understand one's offer from clear visual signs. Hence, priority was given to the development of a visual identity kit for CRE (Annexe 2), together with a logo (Figure 3) that would operate as the programme fingerprint and would help make an emotional impression on the viewers.

Figure 3. CRE logo.

A selection of keywords underpins the logo's foundation. These words include *school,* house, *return*, *circular*, and *gender equality*. The CRE logo brings up a combination of these keywords with the programme values. The pink symbol represents both a house and a school; the "@" stands for both *circular* and *giving back,* as well as, for the "*A*" (female "the" in the Portuguese language) or the "*O*" (male "the" in the Portuguese language). Pink was chosen as the central colour of the programme to highlight our commitment to gender equality in the scientific and education communities and society as a whole. Moreover, this choice relates to the Native Scientist's logo, which includes tonalities of red and pink. Since CRE is a Native Scientist programme, it seemed just right to use colour as a unifying aspect between the programme and the organization that implements it. The same applies to the font used, which is similar to *Native's*.

3.6 Internal communication within the team

Communication within the CRE team is of utmost importance as it ensures a smooth development of the programme and contributes to providing a comprehensive *status quo* on the programme to all members of the team. Communication helps monitor the extent to which we define how objectives are being accomplished and guarantees the creation of synergies within the team, which is key to achieving a commonly shared view of the programmes' best success.

Our internal communication takes place via constant email exchanges, usage of the Basecamp platform, and online group meetings that run on an as-needed basis. Bi-weekly decision-making meetings between the co-founders of the programme (Dr Joana Moscoso, Dr Matilde Gonçalves and myself) have taken place since February 2021, as well as monthly team meetings to report on progress made and future plans.

3.7 Stakeholders' mapping

To successfully implement CRE, it is crucial to bring on board a wide range of stakeholders from the start. With this in mind, we identified the key stakeholders that are expected to engage with the programme. Then, for each stakeholder, we defined its main expected inputs and impacts from the programme, its specific interests in CRE, and, ultimately, its key messages for and contributions to the programme. These are, broadly:

- *School students*, and especially the ones from underserved/underprivileged areas, learn new scientific concepts, learn new vocabulary, meet role models, see scientists as normal accessible people, find the motivation to proceed to higher education at a later stage, and are empowered with the belief that "I can be a scientist if I want to".
- *Elementary school teachers* are the mediators of the interventions at schools. They improve self-esteem and confidence, deepen students' understanding of the scientific method, and develop more diverse and inclusive representations of scientists. For teachers with a science-related background, in particular, CRE provides the opportunity to learn about state-of-the-art research and find ways of integrating it into the class curricula.

- *Scientists* act as role models and instructors for the students. In that role, they are expected to benefit from training opportunities in science communication with children that are delivered by the programme itself. These improved communication skills, with this particular kind of audience, are paramount to increasing the impact of scientists' interventions, but also to nurturing positive feelings associated with giving back to society for the scientists themselves.
- *Parents and family members* also benefit from the programme through the opportunity to deepen their understanding of what enthuses their child/family member, and through increased proximity to scientific concepts and lexis themselves.
- *Municipalities* that seek to provide better education for future generations can create opportunities for science dissemination and innovation in their region through CRE, benefiting from closer proximity with researchers who participate in the programme.
- *Research centres* nationwide expand and enrich their outreach/educational offer, promote their names and brands, and motivate their researchers through engagement in the programme initiatives.
- *Ministry of Education*, as well as local education authorities, find in CRE new channels to widen their offer of non-formal science education, especially in underserved and/or underprivileged schools.

3.8 Establishing partnerships

Establishing partnerships in a project like ours is crucial for sustainability and longstanding collaborations. The goal here is to bridge the existing gap between different sectors: the scientific community and the education sector.

From the beginning of the programme up until February 2022, we have partnered with:

(i) universities and research institutes to recruit science students (MSc or PhD students) and professionals;

(ii) municipalities nationwide that connect us to their schools, students and teachers;

(iii) governmental bodies, like the Ministry of Education and the Regional Direction for Science and Technology of the Azores, support both the dissemination of and fundraising for the programme;

(iv) civil society organizations and other partners, like Ciência Viva (the national foundation for the promotion of scientific culture in Portugal), Fulbright Portugal and FLAD (Fundação Luso-Americana para o Desenvolvimento), provide us with enhanced visibility and resources.

3.9 Registration forms and pairing mechanism

CRE designed registration forms for scientists and for teachers to show their interest in participating in and in hosting the programme, respectively. These registrations forms can be found in Annexes 3 and 4.

In these forms, our team created a mechanism that matches scientists with their elementary schools, since CRE promotes the return of scientists to the elementary schools they attended as children. Matches between the scientists and the schoolteachers are IT-mediated and are initially made through an algorithm that identifies registrations in our system from scientists and teachers with common zip codes for the school municipality.

The outcome is a list of scientist-teacher matches that we use to further implement CRE in elementary schools. Until April 2022 we have already collected over 280 and over 100 registered scientists and teachers, respectively.

3.10 Website development

CRE had a need for an online interface that would allow us to reach all the stakeholders involved with the programme, and through which to disseminate the programme. This need urged us to develop a website that would be intuitive, simple, and user-friendly (www.cientistaregressaescola.pt).

The website's purposes are straightforward, including spreading the word about the programme, explaining to stakeholders its features and characteristics, informing people about our team and our partners, and about where and how they can register to participate or host the programme.

The website's conceptualization was carried out in June 2021, the actual programming and setting up occurred in July 2021, and the launch took place in September 2021. Social Media channels (Facebook, LinkedIn and Twitter) were also created.

3.11 Dissemination and launch of the programme

For the second milestone of the launch of the CRE programme, different efforts were executed to maximize the dissemination of CRE among a wide range of stakeholders, including scientists, teachers, schools, research institutions and municipalities.

We successfully launched the programme on September 8th, 2021 – the International Day of Scientific Literacy. Noteworthy, the programme was endorsed by the Ministry of Education (see Annexe 5). The inauguration included:

- The website launch;
- Synchronous social media publications on our own and our partner's social media platforms (Facebook, LinkedIn and Twitter);
- Press releases to Portuguese mass media outlets;
- Dissemination of emails to scientific diasporas, learned societies, and teacher societies;
- Publications in our partners' newsletters (e.g., Annexe 6) or websites (e.g., Annexes 7 and 8);
- Word of mouth and activation of contacts.

A communication kit for research institutions (RI) was developed beforehand to support the programme launch. It included a suggested publication about CRE to be shared on RI social media platforms, a programme description to include in RI newsletters, and a suggested email to be sent to the RI networks of scientists and/or teachers. Finally, after half a year of programme design, preparation, and development, we were ready to launch the programme, disseminate it and spread the word.

The CRE programme dissemination and external communications are being leveraged by digital tools and digital marketing as the major means of communication with the different stakeholders, as these have the best cost-efficiency ratio and are the most eco-friendly way to give voice to the programme.

3.12 Piloting the programme

Since the beginning of the conceptualization of the programme, our team have been participating in social entrepreneurship programmes. The “NOVA ImpACT! Challenges”, organized by NOVA Impact, was one of these, which allowed us to implement a pilot of CRE, meeting CRE’s third milestone.

On October 20th, 2021, we promoted the first workshops for knowledge exchange between students and scientists of the same hometown and tested the format of the workshops held in schools. This was done in EB1/JI de Miratejo, in Corroios, Portugal, a school with a high percentage of students from low-income families, and where 75% of the students met a scientist for the first time in their lives in that workshops. Here is a brief account of how it unfolded.

The scientist started the workshop by showing the students a picture of when she was a student herself (Figure 4a). Then, she moved on to explain the structure of the workshop to the students, which consisted of:

1) an overview of vaccines: “what are vaccines?”, “what are they used for?”, “what were their origins?”,… ;

2) time for questions and debate;

3) an interactive game about vaccines (Figure 4b and 4d);

4) an activity example of a plasticine moulding on pathogenic agents and immune system cells (Figure 4c);

5) students' feedback on the workshop (Figure 5).

At the end of each workshop, all the students received a participation certificate.

Figure 4. CRE pilot workshops: (a) The scientist showing the students a picture of when she was a child, attending the same school as these children - top left. (b) Students playing an interactive game about vaccines - top right. (c) Student moulding plasticine in the shape of a virus - bottom left. (d) Students are excited to participate in the interactive game the scientist created - bottom right.

Figure 5. Student's feedback of the workshop, from the left to the right: (a) The question "Did you learn new things?", (b) The question "Did you like meeting the scientist?", (c) The question "This was the first time you have met a scientist?".

Based on feedback from the school director, the teachers, the scientist, and the students, we were happy to realise that the concept and structure of the programme workshops are feasible and pertinent, and that our commitment to the programme is viable.

Furthermore, as this report is being written, the first workshops of CRE in Portuguese elementary schools nationwide have started taking place in the municipalities of Ponte de Sor, Armamar, Vila do Porto (Santa Maria, Açores), Nordeste (São Miguel, Açores). On March 17th, 2022, the mass media outlet Jornal Público released a piece (Figure 6) about the

programme, detailing how the first two workshops went in the Municipality of Ponte de Sor on March 14th, 2022. It can be accessed in the following link: www.publico.pt/2022/03/17/ciencia/reportagem/cientistas-regressam-escola-primaria-inspirar-novos-1999064.

Ciência Novo programa educativo já está em acção

Cientistas voltam à sua escola primária para inspirar os mais novos

Programa leva os cientistas à sua antiga escola. Todos os interessados podem inscrever-se no *site* da iniciativa. Este é o primeiro ano do projecto e as oficinas começaram esta semana

Reportagem

Teresa Sofia Serafim Texto
Matilde Fieschi Fotografia

"Foros de Arrão, 14 de Março de 2022" – no quadro de giz já se marcou o início de mais uma aula na Escola Básica de Foros de Arrão, numa aldeia de Ponte de Sor. Mas esta está a ser uma lição diferente. José Diogo Lopes nem esconde o entusiasmo e, de minuto a minuto, levanta o dedo. O aluno de sete anos parece ter bichos-carpinteiros – mas dos bons – e faz perguntas, responde a questões ou até tenta contar histórias do seu quotidiano. Afinal, está a conhecer pela primeira vez um cientista.

À sua frente, no lugar da sua professora, está Nuno Canha, um investigador do Centro de Ciências e Tecnologias Nucleares do Instituto Superior Técnico, em Lisboa, que estuda a qualidade do ar. Para Nuno Canha, esta também é uma aula diferente – e nostálgica. Há cerca de 30 anos, este cientista estava sentado na mesma sala de José Diogo Lopes. Agora, está a transmitir-lhe a sua matéria-prima de investigação e pergunta a todos os alunos: "Sabem o que é o ar?" De imediato, surgem muitas mãos no ar, de onde se destaca a de José Diogo Lopes. "No ar não o conseguimos ver, só o respiramos para sobreviver. Até rimou!", diz divertido para o seu colega de mesa.

Mas Nuno Canha não voltou apenas à sua escola para falar sobre a sua investigação, mas também para transmitir aos seus conterrâneos uma mensagem: "Podem ser o que quiserem! Têm tempo para decidir e é importante fazerem algo que gostem. Sempre quis ser cientista e, se consegui, vocês também conseguem." E os alunos escutam-no atentos. Agora, até José Diogo Lopes ficou com vontade de ser cientista. "Quero ser cientista para fazer as mesmas coisas que ele disse. O cientista faz poções, curas e estuda coisas."

A apresentação de Nuno Canha foi o lançamento oficial das oficinas do programa educativo "Cientista Regressa à Escola". Nesta iniciativa, os cientistas podem regressar aos bancos da sua escola para realizar uma oficina de ciência com crianças, sobretudo do quarto ano.

Desmistificar estereótipos

Esta iniciativa nasceu da vontade das suas três co-fundadoras: Joana Moscoso, directora do projecto Native Scientist; Joana Bordalo, mestranda em Comunicação de Ciência na Faculdade de Ciências Sociais e Humanas (FCSH) da Universidade Nova de Lisboa; e Matilde Gonçalves, investigadora no Centro de Linguística da FCSH. A articulação-chave aconteceu porque Joana Moscoso já tinha a experiência da Native Scientist – que funciona a nível europeu – e Matilde Gonçalves tinha coordenado um projecto de promoção de literacia científica a nível nacional.

Por agora, a grande intenção do novo projecto é funcionar a nível nacional. "Há relatórios que apontam para que as crianças em Portugal não têm todas o mesmo acesso à ciência", indica-nos Matilde Gonçalves, responsável pela parte de avaliação do impacto da iniciativa. Para si, há um grande mote neste programa: "Ao chegarem ao quarto ano [de escolaridade], todas as crianças em Portugal devem ter a oportunidade de dizer 'conheci um cientista'."

Dentro desse mote, há grandes objectivos a serem cumpridos, desde a redução das desigualdades do acesso à ciência, passando pelo enriquecimento curricular a nível científico, até à desmistificação de alguns estereótipos. "Quando falamos com as crianças, vimos que há muito a ideia de que um cientista é um homem caucasiano, de bata branca e de cabelos brancos. A nossa ideia é desfazer esse mito", nota Matilde Gonçalves.

Também não é em vão que as oficinas são feitas para crianças no quarto ano – embora possam ser pensadas para outros anos. A investigadora refere que há estudos que provam que alunos perdem o interesse pela ciência ou começam a criar a ideia de que é difícil por volta dos dez ou 12 anos, ou seja, na transição do primeiro para o segundo ciclo. "A nossa ideia é actuar no final do primeiro ciclo para mostrar que a ciência não é assim tão complicada. Para isso, levamos pessoas que estudaram naquela escola."

Há cerca de 30 anos, já Nuno Canha sonhava ser investigador. "O Nuno de oito anos ainda não tinha conhecido nenhum cientista, mas tinha muita curiosidade", recorda. "Quando era pequeno e me faziam a pergunta sobre o que queria ser quando fosse grande, tinha duas opções: ser cientista ou piloto de aviões. E consegui!"

Assistiram a esta oficina 15 dos 18 alunos da Escola Básica de Foros de Arrão. Na mesma sala, estão crianças do primeiro ao quarto ano, informa-nos Carla Alpalhão. A professora não tem dúvidas da importância desta actividade. "A pandemia veio fechar-nos muito na sala de aula. Quando surgiu a oportunidade de participarmos, percebi que lhes podia dar novas experiências", nota.

Sempre a acompanhar a apresentação de Nuno Canha, Carla Alpalhão evidencia que o papel do cientista não costuma ser algo muito presente nestas idades. "Quando lhes perguntamos o que querem ser, dizem que querem ser bombeiros ou polícias. Ser cientista não é uma profissão que lhes é próxima." Agora, com este programa, vir alguém que estudou na mesma escola pode ser determinante e salientar uma grande mensagem para o que quiserem ser no futuro: "Basta querer, sonhar e trabalhar para isso. Há alguém que lhe é próximo e conseguiu ser cientista."

Assim que Nuno Canha soube do projecto achou a ideia fantástica e agora sentia a nostalgia de ter voltado à sua escola. Até agora, já se inscreveram 260 cientistas no programa. Lançado a 8 de Setembro de 2021, Dia Internacional da Literacia, a iniciativa teve uma oficina experimental em Outubro com a cientista Teresa Serafim, que agora faz a comunicação do programa. "Passava pela minha escola várias vezes e pensava: 'Será que está diferente?' E depois não é só a curiosidade de saber como tinha evoluído, mas também saber que posso ter ali algum impacto [com a apresentação]", lembra.

Como se pode participar

Esta semana foram lançadas as primeiras oficinas "a sério". Por enquanto, estão marcadas mais 13 oficinas, que serão guiadas por cientistas como Antónia Estrela (do Centro de Linguística da FCSH), Cláudia Cavadas (vice-reitora da Universidade de Coimbra) ou Rogério Colaço (presidente do Instituto Superior Técnico).

"A adesão por parte dos cientistas tem sido extraordinária", transmite Matilde Gonçalves. E não só. Também tem existido uma boa resposta de professores ou de municípios. Além de cientistas, podem inscrever-se e participar de alguma forma no programa professores, municípios, escolas privadas, entidades de investigação e desenvolvimento e mecenas. O formulário está aberto todo o ano.

Sempre muito atento à oficina, Lourenço Andrade responde já com algum conhecimento às perguntas de Nuno Canha. "E se o ar que respiramos estiver poluído?", pergunta o cientista. "Cria doenças", responde logo o aluno de nove anos. Mas Nuno Canha fala ainda de outros microorganismos no ar: as bactérias. "Já as viram?", questiona. "Só sei o nome, mas nunca as vi", diz-lhe José Diogo Lopes. Agora, terá essa oportunidade. O investigador mostra às crianças caixas de Petri com bactérias do ar. Numa das caixinhas podem ver-se pintinhas, as tais bactérias, que passam de mesa em mesa. As crianças miram-nas de olhos arregalados.

Toda a apresentação de Nuno Canha convenceu o atento Lourenço Andrade. Nunca tinha pensado bem nisso, mas agora também ele quer ser cientista. "Assim podia melhorar o mundo, como com uma fábrica que não liberta fumo." Mas é só uma das suas ambições. Se fosse cientista, adoraria estudar História. "Gostava de descobrir os segredos do mar."

Após esta apresentação, Lourenço Andrade e os seus colegas podem participar num concurso que está a ser organizado pelo programa. Em par ceria com os professores, as crianças podem realizar um trabalho que demonstre aspectos da oficina a que assistiram.

A longo prazo, Matilde Gonçalves tem as suas ambições sobre o programa: "Gostava que as crianças se entusiasmassem pela ciência e que sentissem cada vez mais interesse e curiosidade. Não quero que encarem a ciência como algo difícil ou inalcançável."

Também Nuno Canha termina a sua oficina com a ambição de ter transmitido aos seus conterrâneos que o ar e a ciência são de todos. E, já agora, que o ar – tal como a ciência – dá para brincar. Para isso, mostra-lhes um moinho de vento de papel. "Querem um?", pergunta à sua plateia. Ouve-se um "sim" em uníssono. Espera-se agora que os sonhos de José Diogo Lopes, Maria Matias, Lourenço Andrade e dos seus colegas vosm também. E, quem sabe, um dia poderão vir a ser cientistas e regressar a esta escola para inspirarem os mais novos.

Oficina do programa "Cientista Regressa à Escola" em Foros de Arrão, Ponte de Sor

Ao chegarem ao quarto ano, todas as crianças em Portugal devem ter a oportunidade de dizer 'conheci um cientista'

Matilde Gonçalves
Investigadora

Figure 6. Jornal Público article about CRE and the first two workshops conducted in March 2022 in Ponte de Sor, Portugal.

3.13 Training the scientists

Since participating scientists act as role models and instructors for the students, it is key that they receive training to develop and deliver CRE science workshops effectively.

Likewise, the scientists that were matched with their schools attended a one-hour-long online webinar on science communication for children. A first webinar was held in December 2021 and a second one was held in February 2022. The webinar was previously designed throughout October and November 2021 by me and Dr Sara Marques (Native

Training Manager), and it includes topics such as: communicating to children and young people, effective communication, culturally-sensitive pedagogical methods, classroom management, citizen science, and health and safety.

Importantly, upon completion of the training, we administered a feedback survey to the scientists to be able to make future improvements. The delivery of the training corresponded to the fourth milestone of the implementation of CRE.

3.14 Core-process and workflow

We conceptualize CRE as a continuously-running, year-round process (Figure 7).

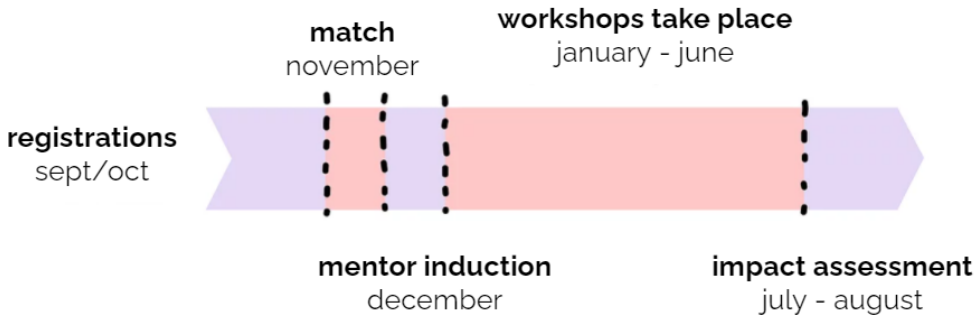

Figure 7. The yearly core process of implementing CRE.

We make a call to action to scientists and teachers to register for the programme at the beginning of every school year so that in September and October they can register to present at their school or to host the programme, respectively.

In CRE, scientist-teacher matches are the main pairing criteria to implement the programme nationwide, as the goal is to take scientists back to their own elementary schools. Based on the pairing mechanism, we collect the successful matches in November and work to ensure the promotion of gender balance, diversity and inclusiveness in the pool of scientists involved. The match of scientists with teachers also takes into consideration the ratio of schools in rural/urban areas, north/south areas, coastal/inland areas, and continent/islands.

Additionally, in case we do not meet our aim for matches, we make specific calls to action to the scientists who attended specific schools, the “strategic schools”. These are underserved and/or underprivileged schools where the implementation of CRE can have a

deeper impact. We identified 20 schools in Portugal where school underachievement is high, access to science is low and the number of students on free or subsidised school meals is high, taking into consideration the national list of schools of educational intervention priority (Retrieved February the 10th, 2022, from www.dge.mec.pt/teip).

A proposal with a budget is sent to the school/municipality for approval. If the proposal is approved a date arrangement is made, whereas if the proposal is not approved, matches on the waiting list are considered.

As mentioned above, we conduct a one-hour long webinar training for scientists in science communication for younger audiences, which takes place in December.

The CRE workshops run from January to June, and the logistics of the schools' visits/workshops are taken care of prior to then. The logistics include structuring the day of the visit for each scientist-teacher pair (personalised from a template programme structure), making travel arrangements for the scientist, ensuring food and beverage for the scientist is provided, printing and posting branded materials like student certificates and feedback forms, arranging for photographs/video footage, and inviting the local press to attend the event and report it locally.

Finally, at the end of the school year in July, an impact assessment takes place. Some of the metrics we will look at include: Science Intrinsic Interest, Science Attainment Value and Future Participation in Science.

3.15 Barriers faced and recommendations

Designing and implementing a new educational programme brings a lot of challenges and needs to adapt.

Have backup matches

After several months since its launch, we came to understand that it is pertinent to have more scientist-teacher matches than we initially aimed to have. This is mainly due to two conditions: (i) some scientists register, but then their actual availability to participate in the programme might be compromised due to personal or professional matters, and (ii) not all the municipalities are easy to reach and/or may not be interested in supporting the

programme in the short term. Based on these realizations, having extra options for scientist-teacher matches is, therefore, vital to avoid compromising the number of workshops the programme aims to implement in a given school year.

Flexibility

Even though a focused and precise concept is defined for the CRE programme, some adaptation of the concept definition may be required since different communities and different geographic locations can vary greatly in their demographic features and/or internal organization. Schools located closer to urban areas, for example, tend to have greater numbers of students in each class, and more classes per school, compared to schools in rural areas that tend to group students of different ages and grades in the same class and to have a lower number of classes per schools. These variations imply flexibility and caution.

Assure financial sustainability

Secure funding is key for implementing any project, whether to purchase supplies, cover travel costs, or compensate human resources. Financial sustainability ensures the implementation of a nationwide science enrichment and outreach programme, allowing it to expand annually to additional schools.

Don't give up

Based on these experiences, I recommend persistence, sticking to the concept of the programme, picking up the phone and calling the different stakeholders with initial small goals, and improving and expanding the programme step-by-step.

3.16 Future goals

In the short term, CRE will be successful by implementing 15 nationwide initiatives (1 initiative = 2 workshops) in its first year, 2021/22, including locations on Islands and in rural communities (Figure 8). Our aim is to duplicate the number of initiatives every year so that CRE is implemented in an increasing number of schools (Figure 9). Therefore, our estimates

show that in the 5th year of programme implementation, 12,000 pupils will be directly impacted, and in the 8th year, all 4th graders in Portugal may be reached.

Figure 8. First 15 municipalities of Portugal where CRE will take place in its first year.

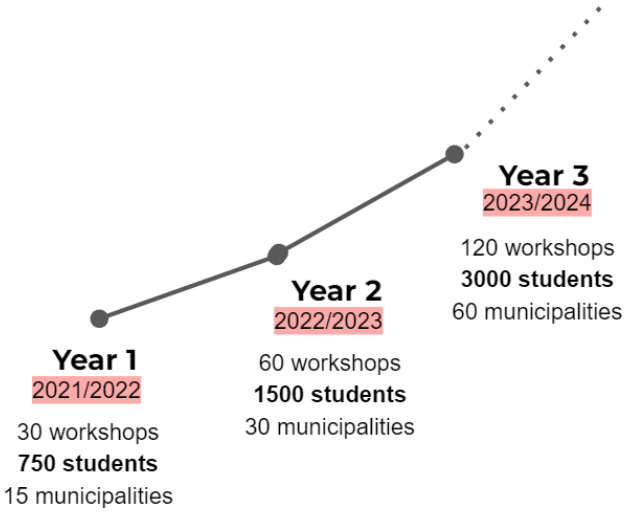

Figure 9. Expected evolution in the number of CRE workshops, students reached, and municipalities reached over the years.

To make this programme a sustainable one, we will also keep working on building and securing key partnerships and resources, as well revenue streams including fundraising streams, to guarantee programme sustainability in the long term.

As this report is being written, a pilot of CRE in Spain is being devised by a Spanish Coordinator of *Native Schools*, with the goal that in the year 2022/23 CRE will expand to Spain.

If this replication exercise is successful, it might be possible to replicate CRE across different European countries.

3.17 Key points

We have learnt in this chapter how a new science enrichment programme was designed and what efforts were committed to making it happen.

Alongside Dr Joana Moscoso and Dr Matilde Gonçalves, I co-founded *@ Cientista Regressa à Escola*, an educational and outreach programme that results from our will to improve scientific literacy in Portugal and tackle social inequities in access to education.

As the coordinator of the programme, I tried to provide the reader with a clear understanding of the steps involved in the creation of CRE, which are based on my own experience. I hope I can inspire and instigate other organizations, teams, or individuals in pursuing their ideas on what concerns social entrepreneurship and science communication efforts.

CRE is today a Native Scientist's programme that is being implemented in Portugal. In its first year of implementation, a total of 30 workshops will take place across the country (Islands included), which translates to 15 scientists having the chance to return to the elementary schools they attended when they were children to inspire over 650 students for science and higher education, and most importantly, to empower them to reach their full potential no matter of their socio-cultural background.

Chapter 4
United States: Implementing science enrichment and outreach programmes

In the previous chapter, I described my experience in Portugal, designing and implementing a new science enrichment programme called *@ Cientista Regressa à Escola*, which was built upon my first internship at Native Scientist.

My willingness to engage in science communication activities beyond European borders found me travelling to live in the United States (US) as a Fulbright Visiting Scholar for five months, from July to November 2021. In this and the next chapter, I will elaborate on the final part of my journey as a science communication student that took place in the US.

This chapter addresses the internship I completed at the Communications and Outreach Office (COO) of the Carl R. Woese Institute for Genomic Biology (IGB) at the University of Illinois, and my second working experience as a science communication professional. In it, I explore my experience as a member of COO, the office responsible to bring science closer to society through the implementation of communication and outreach projects. The IGB is an interdisciplinary institute dedicated to transformative research and technology in life sciences.

Section 4.1 of this chapter begins with an overview of the institute and the specific office where I undertook my internship. Then, in section 4.2, I elaborate on the projects and programmes in which I was more directly involved and describe the different tasks I performed, and the dimensions explored throughout this *in-person*-international experience.

4.1 The Institute and the Communications Office

4.1.1 The Carl R. Woese Institute for Genomic Biology

The Carl R. Woese Institute for Genomic Biology is a collaborative and interdisciplinary research institute from the University of Illinois at Urbana-Champaign (UIUC), US. It was founded on March 29th, 2007, to facilitate cohesion of genomic research across the campus (Vasi et al., 2017) and centralize biotechnology research at UIUC. As director of the IGB Dr Gene E. Robinson stated: "The IGB was officially launched with the provocative goal of bringing together some of the biological and biotechnological pursuits that at the time were dispersed widely among several departments and individual labs on campus".

IGB members are drawn from many backgrounds, schools (i.e., faculties) and departments, from biology and chemistry to sociology and business, with an unwavering commitment to interdisciplinarity and diversity. In 2019, IGB counted a total workforce of 934 members (Figure 10) and is celebrating during 2022 its 15 years.

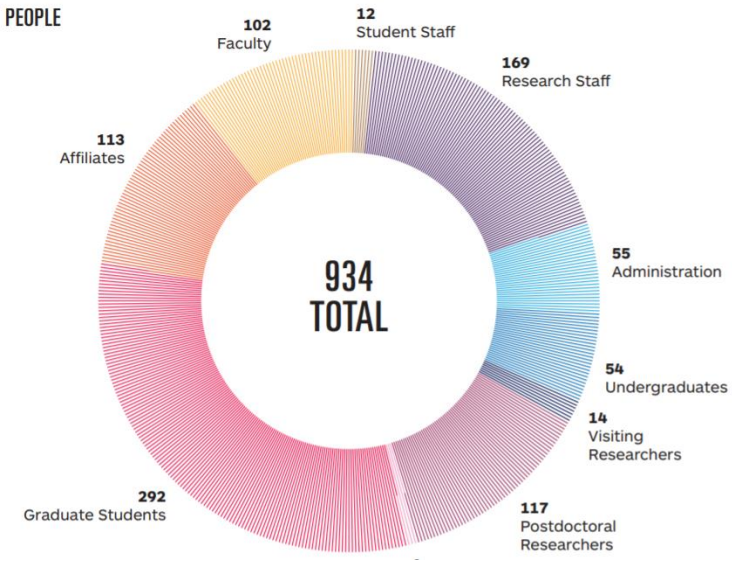

Figure 10. IGB workforce in 2019.

IGB's mission statement includes: "to advance life science research at UIUC and to stimulate bio-economic development in the state of Illinois" (IGB, 2020). To this end, IGB's fundamental and applied research in live sciences is organized into research themes, each of which includes different laboratory groups.

According to Robinson:

> "Today, IGB can proudly claim to have delivered on those early expectations. The IGB is lauded for excellence in research, bringing in over half a billion dollars in funding since inception and securing some of the most prestigious grants on campus. IGB hosts world-class infrastructure, houses highly regarded administrative support groups and esteemed faculty members, and provides widely recognized public engagement and outreach programmes. IGB is one of the only comprehensive genomics institutes in the nation, with a research portfolio that spans health and wellness, agriculture, energy, technology, and society. IGB created a Committee on Diversity and a Task Force to critically review and promote diversity, equity, and inclusivity efforts at our institute, striving to embrace change and bring new initiatives to light even as we realize there is much more work to be done by us in this space."

Importantly, IGB is not only focused on grand societal challenges but also has a robust communication and outreach programme embodying its motto: "Where science meets society".

4.1.2 The Communications and Outreach Office

Today's Communications and Outreach Office (COO) is a well-established office, counting 11 engaged and committed people, that includes outreach managers and coordinators, designers, content creators and science writers. Structurally, the members of the office and their roles are highlighted in the following figure (Figure 11):

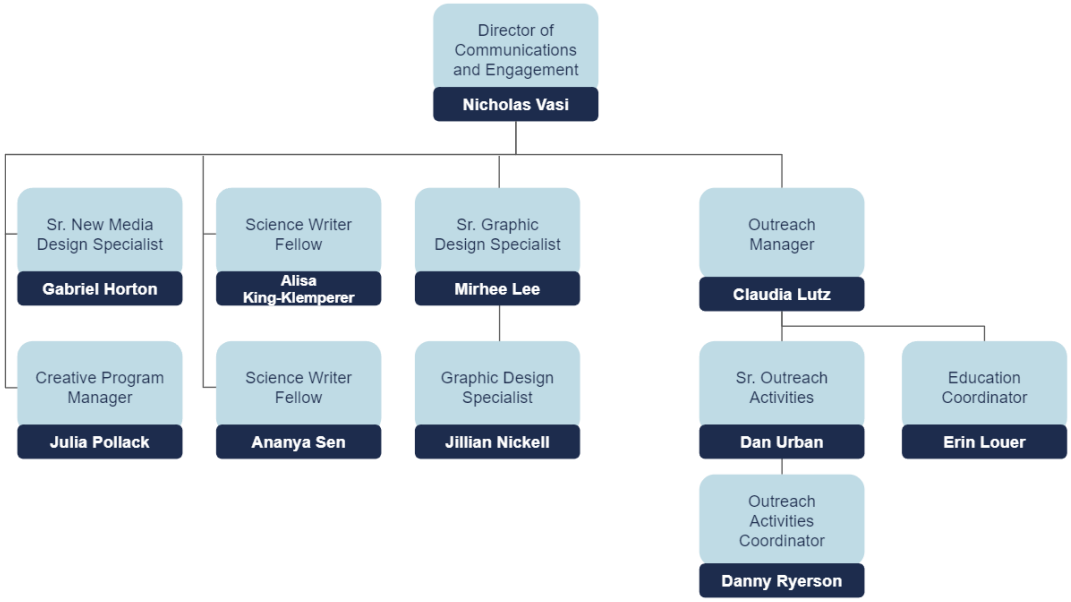

Figure 11. The organizational structure of the Communications and Outreach Office in 2021.

The COO journey had no clear beginning and was not always straightforward, but developed instead through the continuous actions of people who were committed to bringing science closer to society. The process of this occurrence happened over a length of time through a series of outreach efforts that led to the development of a team, and eventually, to what we know as COO today. In 2013 people started joining COO to improve communication efforts and boost outreach endeavours, paving the way to create what is nowadays the Communications and Outreach Office (Retrieved November the 12th, 2021, from www.igb.illinois.edu/facilities-services/communications). Eventually, communications and outreach at IGB started to blossom and gained more traction. By 2015, IGB established a commitment towards outreach endeavours, in part sustained by the fact the UIUC is a land grant institution acknowledged for recognizing and respecting native people and the community (Retrieved November the 12th, 2021, from chancellor.illinois.edu/land_acknowledgement.html). Hence, the foundations of a larger, more structured office were officially laid in 2016 as more personnel was hired, such as the first Outreach Manager and other Outreach Coordinators. Some activities and events started to take place by that time (e.g., Genome Day) and other projects achieved cohesive sustainability (e.g., Art of Science, Retrieved November the 12th, 2022, from www.igb.illinois.edu/gallery/artofscience).

Since then, sustained growth has led to the existence of an empowered group able to generate and capture more impact through its work and improved practices. Through outreach activities in 2019, before the stop of in-person activities due to the pandemic crisis, the COO was able to reach 7,000 people from 4 to 73+ years in 87 days and 225 hours of outreach events, organized in 17 locations - 6 cities across 3 states (Institute for Genomic Biology [IGB], 2019).

4.1.3 Internal Communications

Constant internal communication among all members of the COO team is key for the smooth implementation of office projects and activities. Sharing the right amount of ongoing information within the team is a mandatory requirement if we are to successfully work together (Klünder et al., 2016). Noteworthy, evidence suggests it is also crucial for one's engagement, feeling of belonging and a positive emotional culture overall (Yue et al., 2021).

The communications and outreach weekly meetings ran every Wednesday and Thursday, respectively, and served to update all members of the team on progress made, plans/outcomes to be achieved, and to provide feedback and suggestions on each other tasks. As part of an established science communication office, the meetings were instituted by the members of the team either directly involved in the communications activities or in the outreach efforts.

Outstandingly, every Friday a diversity and inclusion discussion meeting was conducted. Members of the COO team attended the meetings on an as-available basis. Those meetings were a space for positive discussion and reflection on a large variety of topics related to institutional problems of the science workforce, from diversity and inclusion in the workplace and beyond, to societal issues and concerns, among others. Any member of the COO team could suggest a piece of their interest (an opinion article, a journal article, a movie, a podcast episode, …) to be the starting point of the discussion of the following week so that every week a new topic was discussed. I believe these initiatives are efforts that pave the way to better workplace cultures, that create change, build more inclusive communities, and broaden the horizons and points of view of scientific institutions personnel, who are themselves citizens.

On top of the aforementioned meetings, several working group meetings, that also contributed to the smooth implementation of programmes and projects, cooperation, and collaboration within the team, ran on an as-needed basis.

Most unfortunate about my experience as a scholar working at the COO were the restrictions caused by the vicissitudes of the pandemic. I am convinced that some ideas and discussions that could have been generated from team and working-group meetings were not due to meeting online.

In spite of that, the internal communications within the team always ran smoothly and regularly. Even with the pandemic constraints, many opportunities were made possible and the anticipated goals of my experience in the US were accomplished.

4.2 The Internship

4.2.1 Role and Onboarding

The goal of my internship at the IGB was twofold: first, to collaborate with the Communications and Outreach Office team in the development and delivery of ongoing projects and deliverables, and second to conduct an independent focus group study, with the support of the COO (see chapter 5).

The reasons behind joining the COO of IGB included but were not limited to: working in different workplace cultures and at an institute related to my scientific background, making the most out of teamwork potential, having direct contact with an American community to develop my study, and foster new transatlantic partnerships, inter-culturalism, and cooperation. My main role as an intern of the COO at the IGB was to support the team in the delivery and implementation of existing educational programmes and outreach projects.

I arrived in the United States on July 9th, 2021, to join the COO of IGB on July 15th. On that day, director of the office Dr Nicholas Vasi introduced me to all the members of the team that were present at the office. Eventually, I got to meet, engage with and work with all of them (Figure 12).

Figure 12. Part of the Communications and Outreach Office team at the entrance of IGB, from left to right: Dr Alisa King-Klemperer, Dr Ananya Sen, Ms Mirhee Lee, Dr Claudia Lutz, Joana Bordalo, Dr Daniel Urban, Mr Nicholas Vasi, Ms Julia Pollack and Dr Daniel Ryerson.

We visited the IGB infrastructures, laboratories, and facilities. Outreach Coordinator Dr Daniel Ryerson offered to share *his* office with me. Later I took some appropriation from that, calling it also *mine*. *Our* office, like all offices allocated to the COO team, was located in the Gatehouse building of IGB. All the buildings, as well as the campus itself, looked just like in a movie.

In the first week of my stay in the US, I had to complete an onboarding process that involved the fulfilment of acknowledgement responsibilities and risk forms, emission of a university member card, and completion of safety and compliance training. With these tasks taken care of, my journey at the COO of IGB started; at the beginning, I had no idea how much I would gain from it.

4.2.2 Hands-on, key responsibilities and tasks

The COO of IGB implements a wide range of initiatives from public engagement to professional development (IGB, 2019). During my time at the COO, I was involved in three educational and outreach programmes (STEAM TRAIN, Genome Day, Mahomet Science Club), one training programme (Professional Skills for Biosciences) and one communication project (the Monthly Profile). For the purpose of this report, I will delve into the initiatives I have contributed to and had a first-hand experience with.

STEAM TRAIN

I supported the implementation of STEAM TRAIN during my internship at the IGB. STEAM TRAIN is a science enrichment educational programme directed at 6th-grade students and implemented at Franklin Middle School in Urbana-Champaign. Franklin hosts a culturally diverse student body with a predominant demographic of students from underserved communities. Through this programme with guidance and mentorship, Franklin students engage with University of Illinois High School Students and IGB researchers to develop their own research projects throughout one school year. Alongside the Senior Outreach Activities Coordinator Dr Daniel Urban, I first presented the programme to Franklin students at the school open day, an initiative that allows students to get to know all the after-school programmes available to them. We talked to and engaged students to let them know what they could expect from the STEAM TRAIN and exhibited some science curiosities to instigate

their enrolment in the programme (Figure 13a). Afterwards, I continued to contribute to the programme as a mentor, which role was to help students choose a topic to research, help them narrow their research questions accordingly, and later, guide, support and assist students in conducting their research projects. The programme ran every Tuesday from 3-4 pm, involving scientist mentors, high school student mentors, and middle school students that were divided into working groups. The science club operated in a hybrid structure, with sessions being online and in-person (Figure 13b).

Figure 13. The STEAM TRAIN programme, from left to right: (a) Presentation of the programme on the school open day, (b) Kick-off session of the programme.

Genome Day

Five years ago, the COO began implementing an annual outreach programme called Genome Day. In 2021 the programme was held in October, and I contributed to it by developing and implementing a new activity called “Herd Immunity Activity” (Figure 14). The goal of this hands-on activity was to showcase to children and their parents how immunization works in a community and to convey to them the role and importance of vaccination.

This public-awareness activity sought to increase the scientific literacy and understanding of the Urbana-Champaign community on this topic and to counter the high prevalence of COVID-19 vaccine hesitancy in the US (Khubchandani et al., 2021).

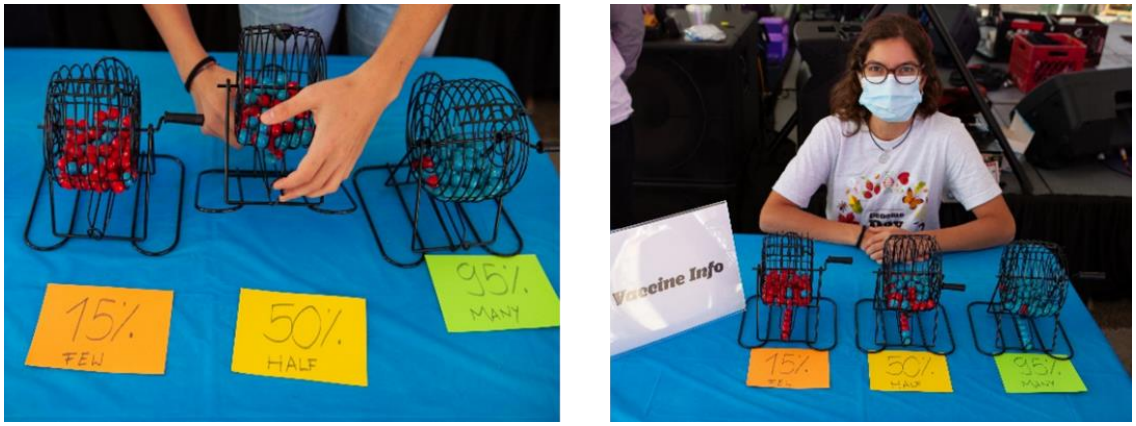

Figure 14. "Herd Immunity Activity", a new outreach activity I designed for Genome Day.

Mahomet Science Club

Mahomet Science Club was the last educational programme I supported while in the US. Alongside Ryerson or Urban, we went to two middle school classrooms in Mahomet-Seymour, Illinois, a conservative-leaning town a small distance from Urbana-Champaign. There, we developed hands-on activities with the students, focusing on topics from microscopes to evolution and phylogenetic trees. The activities also included either an introduction on the topic addressed or a discussion on the take-home messages from the activity.

Professional Skills for Careers in Biosciences

Alongside two other members of the team, I supported the implementation of the Professional Skills for Careers in Biosciences programme (Retrieved April the 10th, 2022, from www.igb.illinois.edu/acquainted/professional-skills-careers-biosciences-pscb). PSCB is a series of workshops intended for graduate students and postdocs to develop and enhance their universal job skills, including communication, professionalism, marketing, budgeting, and leadership. The one-year-long course is offered to all science students and professionals from the IGB workforce. My main responsibilities included the invitation of speakers and facilitating their reception on the day of the workshop, supporting their workshops if needed, printing and delivering the biographies of each speaker and sending workshop reminders to the participants two days in advance.

Monthly profile

I contributed to one communication project, the IGB monthly profile. A monthly article featuring any IGB employee, from staff to PhD students or their supervisors is shared in the IGB newsletter. I was responsible for the editions of October and November 2021 (Annexes 9 and 10; Retrieved April the 25th, 2022, from www.igb.illinois.edu/services/communications/newsletter).

4.2.3 Minds-on, lessons learnt

There are a lot of hard and technical skills one gets to develop through hands-on work and through working within a team of experienced professionals. Examples of these were addressed in Chapter 2 of this report. In this segment, I would like to highlight the main lessons learnt from an *in-person*-international exchange.

Firstly, the experience of being an exchange student in the US provided me with exposure to learning opportunities around intercultural dialogue, inclusion, and institutional organization. It taught me how to cooperate and collaborate with communities of people in a country that was not my own, to listen actively and be always open to learn, and to build partnerships around project development for the promotion of active citizenship.

Secondly, and perhaps not surprisingly, the most relevant lesson learnt from this period of professional and personal development was the urge to tackle social inequities and increase scientific literacy through truly inclusive educational and outreach initiatives. Initiatives that at their roots can effectively improve opportunities for underserved students, break vicious cycles and, ultimately, contribute to prosperous, inclusive, healthy, and informed societies.

> "Science education programs that specifically target underrepresented groups, promote a sense of belonging, and focus on increasing meaningful connections with science can have a huge impact on how science is perceived and accessed." (Moscoso, 2022).

4.3 Key points

This chapter addressed the internship I completed at the Communications and Outreach Office of the IGB, a research centre at the University of Illinois.

Firstly, we have learnt about the IGB and the COO, their history, organizational structure, and the internal communications of the COO.

Secondly, we have learnt about all the educational and outreach programmes I have contributed to during my 5-months-long internship as a Fulbright Scholar in the United States.

Throughout this period, I continuously brought different perspectives and points of view to group discussions related to the implementation and development of the COO projects and contributed to collaborative and constructive work practices.

To conclude, I am sure that interning in the US shaped me both professionally and personally and that, however it happened, I eventually returned to Portugal with wider views on my academic field and a stronger will to keep contributing to education and cooperation across the globe.

Chapter 5
United States: A focus group study on science enrichment programmes

This chapter delves into a study that I have carried out in the United States (US) using a focus group methodological approach. After an extended European experience in the management of science enrichment programmes and reinforced by the setting up of a nationwide programme in Portugal, I felt that it would be useful to use the opportunity brought to me by the internship at a US research institution to embrace another challenge, that of eliciting the views of local scientists and science communicators about the feasibility of creating a similar enrichment programme in the US.

The purpose of this study was to collect and analyse the views, opinions, and ideas of American citizens about the implementation in the US of an educational programme that promotes the return of scientists to their schools. The study consisted of a set of focus groups aimed at contributing to the understanding of which adaptations such a programme would require according to public perceptions of local science communicators and scientists. Final remarks on using the insights of the focus groups in the implementation of the programme in Portugal are made at the end of the chapter.

5.1 Informing the present

One of the key driving factors behind the focus group study that I conducted in the US derives from the differences in science communication (SciCom) and education across countries, specifically between the US and Portugal. These countries are, indeed, an ocean apart. In terms of population, for example, Portugal is one of the smallest EU countries with just over 10 million inhabitants (Retrieved March the 31st, 2022, from www.pordata.pt), while the US, on the other hand, is the fourth largest country in the world and counting over 332 million inhabitants (Retrieved March the 31st, 2022, from www.census.gov/popclock). In 2010, about 26,76% of the US population completed tertiary education (Retrieved March the 31st, 2022, from ourworldindata.org/tertiary-education) compared to 10,26% in Portugal (Retrieved March the 31st, 2022, from www.pordatakids.pt) and while in the US, 40% of the population graduated from high school (Retrieved March the 31st, 2022, from ourworldindata.org/primary-and-secondary-education), 15,4% of the Portuguese population finished secondary education in that year.

According to Bevan & Smith (2020), science communication in the US may be traced back to the 19th century, whereas SciCom activities emerged and flourished in Portugal only during the mid-1990s, anchored by a top-down government policy (Entradas et al., 2020).

While the US was one of, if not the main, precursor countries and pioneers in several SciCom practices (e.g., the first interactive science centre, the first association of science writers, the first SciCom awards, the first significant radio and TV programme in SciCom, the first systematic training in SciCom), Portugal tended to implement such practices over the course of decades. The first master's in science communication illustrates that interlude, as it was offered for the first time in the world in the US in 1960, while in Portugal the same didn't happen until 2002 (Schiele & Gascoigne, 2020).

In terms of education, both in Portugal and in the US, compulsory education lasts 12 years, between the ages of 6 and 18 or until the conclusion of upper secondary education, and public education is free and universal until higher education (Retrieved April the 4th, 2022, from https://eacea.ec.europa.eu/national-policies/eurydice/content/portugal_en; Irwin et al., 2021). While education in Portugal, until university, is the responsibility of the Ministry of Education, the United States, in turn, has a decentralized education system, which reserves power over education to the states and local authorities, as well as to individual

schools and higher education institutions (Retrieved April the 4th, 2022, from www2.ed.gov/about/offices/list/ous/international/usnei/us/edlite-org-us.html and www2.ed.gov/about/overview/fed/role.html).

According to Merolla & Serpe (2013, p. 2) "one major component of federal policy efforts to improve STEM education [in the US] are enrichment programs". Despite differences in practices, both countries converge in the need to stimulate and build interest in STEM, as science, and therefore science education, is central to the lives of all citizens regardless of nationality: "Virtually all people of all ages and backgrounds engage in activities that can support science learning in the course of daily life" (Bell, 2009).

5.2 The purpose of this study and its guiding questions

Science enrichment programmes have been implemented worldwide, as they complement the formal school curriculum and often foster students' aspirations and motivations towards science. In general, those programmes can greatly vary on the age range of their target audiences, duration, locations, setting, and activities, among other characteristics. Naturally, there are differences across the globe in what concerns the execution of these programmes.

In a first attempt to assess whether a science enrichment that is being implemented in Portugal would be feasible in the US, I carried out two focus groups with key stakeholders: science communicators and scientists of the University of Illinois. These sessions were aimed at eliciting their views about an eventual common ground to implement a similar programme to CRE in the US.

In this regard, I posed the following three guiding research questions for this focus group study:

1. "What are the personal experiences on science enrichment programmes of science communicators and scientists of the University of Illinois?"
2. "What are the perceptions of science communicators and scientists about barriers and opportunities for the implementation in the US of an enrichment programme based on student-scientist interactions?"

3. “What are the ideas of science communicators and scientists for the implementation of *@ Cientista Regressa à Escola* [Scientists Return to School] in the US?”

5.3 Methodology

5.3.1 Why focus groups?

The methodology applied in this study applies the focus group method. Suggested by literature, the nomenclature “focus group” stems from interrogating a purposeful sample, the group, ideally a small number of individuals, and *focuses* on a preselected centralized topic. This methodology takes the form of group interviews (Morgan, 1997). The selection of the participants in the two focus groups followed a purposeful sampling approach, mainly guided by the need to obtain rich and pertinent information.

Summarised by Palinkas et al. (2015), the purposeful focus group sampling technique is widely used in qualitative research. It identifies and selects individuals or groups of individuals who are especially knowledgeable about or experienced with a phenomenon of interest, who are available and willing to participate, and who can communicate experiences and opinions in an articulate, expressive, and reflective manner. Therefore, the cited literature informed my decision of forming the two focus groups, since homogeneity is often used to select focus groups participants, and works “to describe a particular subgroup in-depth, to reduce variation, simplify analysis and facilitate group interview”(Palinkas et al., 2015, p. 535).

The focus group method is earning recognition in the field of communication (Allen, 2017), regardless of having been used by other disciplines, from social to political sciences (Morgan, 1997), and in different ways (Wilkinson, 1998). For the purpose of this report, they are used “as a primary research method in their own right” (Wilkinson, 1998, p. 184), i.e., as a qualitative research methodology “employed to gain valuable insights into attitudes and behaviours” (Allen, 2017) of the selected participants. Therefore, we use the focus group “as a controlled group discussion, on the basis that the group interaction generated through discussion is of prior importance to the methodology” (Smithson, 2000, p. 104).

Perhaps more important than its definition are the practical outcomes of performing such a methodological approach. Through this method, scholars are equipped to understand and meaningfully explain certain communication phenomena with descriptive data (Allen, 2017). Conceivably, "the biggest benefit of a focus group is that it provides an opportunity for a group to engage in interactive discussion and generate ideas that the individuals would not have necessarily provided on their own" (Allen, 2017, pp. 113-114). Thus, they allow for eliciting participants' own ways of thinking and perceiving a given topic. As such, the poll and diversity of participants imply a wider collection of perceptions.

This process unfolds from a moderator guiding a discussion while the small group of participants discusses the selected topic that has been raised, as the method serves the understanding of a research topic based on the participant's own experiences. Likewise, the group should consist of 6 to 10 participants (Morgan, 1988 as cited in Bender & Ewbank, 1994) who share key characteristics, i.e., are relatively homogenous in some features. According to Bender & Ewbank (1994), "small groups allow a greater contribution from each individual participant, but larger groups permit more people to participate, and thus avoid potentially uncomfortable exclusions". The focus groups should take from 2 to 3 hours and are usually once-only meetings.

Smithson (2000) highlights three constraints and limitations on the use of this methodology, which include: (i) having one or several dominant participants within the group (ii) using the approach to research minority groups, (iii) and the group dynamics obscuring controversial perspectives, i.e., a tendency for certain types of socially acceptable opinions to emerge.

Given the abovementioned constraints, special considerations should be taken into account in the preparation of the focus group. The meeting setting, for example, should be considered neutral (Powell & Single, 1996) with no special significance to the participants: a place where they feel free to express their opinions without feeling threatened (Bender & Ewbank, 1994) and feel willing to contribute to frank and critical discussion.

The moderator should facilitate open and uninhibited dialogue, be relaxed and a good listener, be skilled at pacing the group (Bender & Ewbank, 1994) and ideally, share some of the participant's characteristics (such as age, gender or language). Importantly, the moderator should encourage all members to speak and contribute to the discussion

(Smithson, 2000). According to Bender & Ewbank (1994), "the effective facilitator encourages interaction between participants rather than between facilitator and participants". This contributes to the position of the facilitator as a quasi-observer, the reason why oftentimes, the moderator may be accompanied by a note-taker (Powell & Single, 1996).

Because focus groups are widely regarded as appropriate for eliciting the views and opinions of particular groups of people, an effective way to gain insightful information about a given research topic, I chose to apply this technique as the core of the methodology. The technique was implemented as follows.

Recruitment and composition of the groups

The focus groups (FG) were administrated into two different groups, whose participants volunteer out of interest (Table 4). In total, 18 people participated in both FG. The first FG was composed of 9 science communicators who are experienced in implementing science education and outreach programmes in the US and who belong to the same science communication office. The second group involved the participation of 9 scientists, from different scientific fields of expertise and at different stages of their careers, who have attended elementary school in the US. As most of the participants were or are currently scientists, they were in a good position to reflect on the implementation of an outreach programme that involve the direct and active participation of scientists.

I used a variety of recruitment methods, including advertisements in the IGB newsletter (Annexe 11), personalised invitations via email to IGB employees (Annexe 12), and personal invitations. Details of the composition of these FG are presented in Table 4.

Table 4
Focus groups participants

		FG1	FG2	TOTAL
Participants	Total	9	9	18
Gender	Female	6	6	12
	Male	3	3	6
Age	18-35	5	9	14
	35-50	4	0	4
Nationality	American	7	9	16
	Other	2	0	2
Elementary education	United States	7	9	16
	Outside the US	2	0	2

Higher Education	United States	9	9	18
	Outside the US	0	0	0
Employment	Science Communicator	9	0	9
	Science student or professional	0	9	9

Ethical issues

Before the start of the focus groups, participants were informed that they would be audio-recorded for research purposes and that their participation would be voluntary and anonymous. This awareness was also reinforced using a letter of consent. The group was mindful of the academic context in which the focus groups were being developed and of the centralized topic of the discussion – the implementation of a similar programme to CRE in the US. This study was conducted in accordance with University guidelines for research involving human subjects.

Preparation of the focus groups

Focus groups do not just happen on the meeting day. Thorough preparation is required to make sure all aspects of the focus group run smoothly on that day. Being both the moderator and the *promoter* of the focus groups, I worked on a PowerPoint presentation to guide participants throughout the sessions (Annexe 13) and wrote a script to guide myself on the moderation of the focus groups. The conference room was booked in advance and the space was organized to facilitate that participants could face each other at all times and could have a clear view of the presentation. Snacks and water for the participants were ordered, the materials (recorder, pens and markers, white papers, nameplates, and stickers) were collected, and, in the end, the interventions ran smoothly.

The focus group interventions

The focus group with science communication professionals took place on October 21st, 2021 (FG1) and the focus group with scientists took place on December 2nd, 2021 (FG2). Both lasted exactly two hours each and were conducted in the conference room of the IGB, having in mind the environmental conditions previously described.

On the days of the focus groups, I started by presenting myself, as well as the context, structure and norms of the focus groups. The goal of the introduction was to explain CRE so that participants would be fully knowledgeable about the topic under discussion. By the end of the introduction, participants were expected to be able to discuss the scenario of implementing CRE in the US. Afterwards, participants were asked to carry out four activities (with a 15-minute break in the middle), as it is generally done in focus groups.

Self-reflection and background: The first activity took 20 minutes and was aimed at engaging people with the topic under discussion, by individually reflecting on their own experiences with science enrichment programmes and briefly sharing intuitions and associations with the other participants. That is how focus groups usually start, with the participants familiarizing themselves with the topic, which results in a broad collection of stories (Figure 15).

Figure 15. First focus group activity (FG1).

Parallel individual reflections: The second activity also lasted 20 minutes and aimed at identifying barriers and challenges in implementing CRE in the US, as well as suggestions on recommendations, solutions, and opportunities. Acting as the moderator, I made sure that all participants contributed to the activity, proceeding by clustering these contributions into categories and presenting them one by one on a whiteboard (Figure 16).

Figure 16. The second focus group activity (FG1).

Group consensus exercise: The third activity was intended to stimulate debate, engagement and reflection among the participants (Figure 17). Participants were asked to reach an agreement on collaborative action to decide on the best ideas, recommendations, actions, and solutions, therefore taking advantage of inherent group interactions. In this exercise, I wrote on the whiteboard brief notes of the topics mentioned and explained by the spokesperson of each of the three groups.

Figure 17. The third focus group activity (FG1).

Plenary consensus exercise: The final activity had at its core identifying the group consensus regarding the priority to be given to each of the topics/recommendations formulated in the previous group exercise (Figure 18). For that purpose, I used a "funding" metaphor, by which participants were given three stickers, each representing $ 1M (one million dollars), and were asked to, all at the same time (to avoid influence by peers' choices),

move to the whiteboard and allocate the stickers to the ideas they thought were important to prioritise. Once finished, the most voted recommendations indicated a level of consensus – the greater the number of stickers, the higher the priority. In the last 10-15 minutes of the session, a plenary discussion took place to reveal and debate the participant's most voted solutions, i.e., the ones that have been given high levels of priority for action.

Figure 18. The fourth focus group activity (FG1).

Participants' feedback

An anonymous feedback questionnaire was sent to all the participants to collect their opinions on what went well or could be improved (Annexe 14). As previously mentioned, both sessions were, with respondents' permission, recorded and transcribed.

Role of the moderator

As the moderator, it was my responsibility to create an environment where everyone feels needed, respected and comfortable, and overall, I orchestrate the whole intervention. Additionally, I tried to boost participation and interaction among the participants, listened carefully, guided, and maintained the focus of the discussion and related it to the research goal. According to the participants' feedback that effort was well-succeeded, and I was able to get the best out of each participant. Without a note-taker to assist me during the focus groups, I was responsible for collecting the participants' answers and, simultaneously, asking pertinent questions.

To sum up, I recruited, prepared, conducted, audio-taped and transcribed the interventions. Results and discussion of the focus groups follow. Analysis was carried out by

me: transcripts were read over repeatedly and key themes that emerged within their content are reported below.

5.4 Results

The results of the focus groups are divided into three segments, structured according to the activities performed and to the guiding questions. The first segment provides insight into what participants think, did or do with respect to science enrichment programmes. The second segment provides an overview of the barriers and concerns of the participants about implementing a similar programme to CRE and identifies underlying reasons for the reported barriers and concerns. The third segment presents participants' ideas and solutions for the implementation of such a programme in the United States.

5.4.1 Experiences in science enrichment programmes at UIUC

This segment describes what scientists and science communicators know, feel, and do with respect to science enrichment programmes at the University of Illinois Urbana-Champaign.

5.4.1.1 First exposure to science enrichment programmes

Most focus groups participants admitted having had a lack of exposure to science, outreach activities or any type of science enrichment programme at a young age:

'I don't really have had any experience or exposure to science [as a kid].' [FG1, P8]

'I apparently grew up with a terrible science education because I can't even remember a science class that I was impacted by or thought anything was interesting. I think my science education was pretty shady and I don't really remember going to science enrichment activities or programmes with my family.' [FG1, P7]

'Honestly, I did not have much exposure to science enrichment when I was growing up in Wisconsin.' [FG1, P4]

'I think as a kid growing up, I don't think I had a formal science enrichment programme. We went to museums a lot in Chicago, we did like a sleepover at the museum I remember, that is one of the big things I remember as a kid.' [FG1, P6]

'I did not have any science enrichment programmes.' [FG1, P9]

'I also grew up here in Champaign-Urbana, so I am sure I have met scientists while growing up, but I can't remember I was introduced to someone, or someone was introduced to me as a scientist and I don't remember any kind of extra enrichment programme.' [FG2, P6]

Only three participants reported having had access to science and outreach programmes, and added that it positively impacted their educational journey in science:

'I participated in quite a few sciences enrichment programmes like a tiny baby person. I grew up in a fancy suburb and at a fancy school that was closed to Northwest University, so it was always kind of a joke that all the big universities would do tests on us, so they gave us all these weird programmes in math and science, I think in other things as well (…).' [FG1, P2]

'I also started participating in a science enrichment programme when I was essentially a baby (…).' [FG1, P3]

'I don't ever remember meeting a scientist, but we did lots of general enrichment activities. I especially remember liking one about pricks, and here I am a biologist, so apparently, that worked.' [FG2, P5]

5.4.1.2 Engagement with science enrichment programmes

Most participants mentioned that their engagement with science enrichment programmes started either in higher education, contributing to several initiatives within their departments, labs, or institutes, or when they joined the COO of IGB, in the case of FG1 participants.

'I think the biggest thing is being at the IGB.' [FG1, P7]

'The first thing I was involved in was in undergrad in Alabama.' [FG1, P1]

'I started to engage in science enrichment programmes and outreach initiatives during graduate school.' [FG1, P3]

'The only time I did a science enrichment programme, or that I helped one, was when I was in grad school.' [FG1, P9]

'And then this job is my first opportunity doing science enrichment programmes myself.' [FG1, P2]

'Then, since joining the IGB, as a grad student I did help with a couple of other science outreach activities at local schools, those were kind of my big ways of doing outreach.' [FG1, P6]

'My first exposure to enrichment was probably here [IGB], actually, so the first thing that I participated in was Pollen Power and Genome Day [outreach activities run by COO of IGB].' [FG1, P4]

In terms of outreach, I have done as a grad student (…).' [FG2, P7]

'Last year I got involved in an enrichment programme, STEAM TRAIN, at the IGB, which was my first time.' [FG2, P6]

'When I graduated in my undergrad, I went back to my high school to do a science mentorship programme.' [FG2, P4]

'I don't remember any enrichment while I was in elementary or middle school.' [FG2, P1]

In summary, all the participants, without exception, mentioned currently being or having been involved in the implementation of one or more science outreach programmes. Yet, only a few remembered participating as school students in science enrichment programmes before higher education.

5.4.2 Barriers and concerns about the implementation of CRE

Participants from both FG1 and FG2 identified various challenges related to the implementation of a programme like CRE in the US. Some of these relate to the teachers and schools, which are grouped in the school setting scene section; while others relate to the scientists and their institutions and are grouped in the scientific community scene section.

The school setting scene

Participants from the FG1 mentioned that some elementary schools have closed:

'I was thinking about the practical terms. My elementary school is closed now. It does not exist anymore.' [FG1, P6]

One participant highlighted, based on personal experiences, that some schools lack resources, which was seen as a problem:

'My school is located in a very poor neighbourhood, so I was thinking about resources that the school would have available to the scientists.' [FG1, P4]

It was interesting to note that differences in student's level of education and their socioeconomic, cultural, and educational backgrounds were ideas discussed in both of the focus groups:

'I feel there could be a lot of discrepancy within the country in terms of the level of education, depending on the neighbourhood…, the income level…, socio-economic level.' [FG1, P7]

'The US is too large, but more importantly, the US is too diverse (…). I lived in South Dakota and the Northeast, and the same pre-level is completely different between the two, I mean, in terms of what the kids know, in terms of what they are exposed to. So even within the same state, somewhere like inner-city Chicago is completely different from southern Illinois. So, if I am teaching 5th graders in a predominantly middle-class area, they are going to have an entirely different understanding of, you know, what is college, what is science, than kids from low-income areas. Also, the school staff will be less open in those areas.' [FG2, P7]

Similarly, the inflexibility of the US educational system or the school curriculum was mentioned by participants in both the focus groups:

'Sometimes traditional curriculum is too mapped-out or forced packed for them [teachers] to deviate.' [FG1, P5]

'School systems in the US are kind of inflexible, so teachers have a very specific set up of things that they need to teach, and they pretty much expect to have, you know, every day to teach that set of curricula, uh., so may be hard to find a class in a school ready to set aside that one structure.' [FG2, P5]

Difficulties in disseminating the programme to all and reaching rural areas were mentioned in focus groups one and two, respectively:

'Schools run very locally, so it might be hard to get to know about the program.' [FG1, P2]

'Pay attention to schools in rural areas, making sure that the communities that are harder to reach have the opportunity… because the US is large in a way that may be hard to

reach these suburb areas. I'd say it'd be a challenge to reach schools in rural communities that already are kind of neglected because they are hard to get to compared to metropolitan areas.' [FG2, P3']

Scientists from FG2 highlighted the lack of involved and motivated girls in STEM. This topic is pertinent in light of recent reports (see, for example, *Women in STEM and STEM MOOCs*, n.d.):

'My obstacle is kind of more towards the students, but it just like, making sure like those girls especially are motivated to do something controverted, because of like…in a lot of low-income areas, but also in general, I feel like girls are discouraged to participate in research… my dad always told me that in science were mostly guys doing it.' [FG2, P2']

Finally, the lack of educational funding was stated in FG2 as a barrier:

'Funding is what I put. I think that we already have a problem with science funding, but with institutional funding in general.' [FG2, P9]

The scientific community scene

Most of the participants in both focus groups have a scientific background (the majority have completed or are completing a PhD degree in a scientific area). Therefore, as one could expect, both groups mentioned challenges and barriers related to the scientists themselves and the scientific workforce within a large spectrum, which include:

1. Scientists lack the ability to convey information in an appropriate language and use right content: *'My challenge is getting the right content and level to the kids.' [FG1, P3] 'I had something similar, if they point to something too technical or use jargon, the audience might not know what mRNA is, for example.' [FG1, P8]*
2. Difficulty in signing up for the programme: *'I feel like the people who already do this kind of work would be on the programme like in a second, but there will be so many other people that might be like "I wanna be part of this program".' [FG1, P2]*
3. Difficulty in recruiting scientists: *'I said recruiting scientists but in a different perspective, not in the way to be able to find about the opportunity but be willing to be part of it. I think you could get some [scientists], but I question if you'd get enough.' [FG1, P1]*

4. Lack of motivation or willingness to participate*: 'Some scientists are more involved with their current hometowns.' [FG1, P7] 'I liked my elementary school, but when I came as a grad student, I realised most of my colleagues hated their elementary schools. They would not want to go back.' [FG1, P8]*
5. Lack of institutional support/acknowledgement: *'I think we have some kind of institutional problem in the US where scientists don't get credit for doing anything like this. You get credit for publishing papers and getting grant money. But going outside of the university and do something for the public…' [FG1, P1]*
6. Stereotypes of scientists persist: *'I wrote that people think scientists are boring and they don't trust them, so they wouldn't want to bring them in or talk to their students.' [FG1, P8]*
7. Lack of time to participate: *'My barrier was time. So, both for teachers who, again, need to, like, meet certain standards, but then also, especially in academia. We are all covering different directions like we are working on publishing something, or teaching, so in terms of… one more thing we are expected to do on top of everything else.' [FG2, P8]*
8. Difficulty in meaningfully engaging the community: *'Yeah, that is actually what I wrote down as well. I put down 'it's hard to engage with the community and I guess by that I meant that it's hard to get people to do something more than just to show up for a one-shot type of deal, because of all the demanding on time, so... I think the barrier is that they will be only willing to do it for one time…the impact of a one-time thing…' [FG2, P1]*
9. While one participant mentioned the over or under-representation of scientific fields across hometowns, another participant questioned the discrepancies nationwide in the representation of scientists: *'No first scientist. So, like, what if there is a town that doesn't have someone to go home and teach science, right? so what do you do to help meet the town where there is no scientist.' [FG2, P4] 'I have something similar, maybe not that there are no scientists, but maybe the scientists are too homogenous.' [FG2, P3]*

5.4.3 Ideas of science communicators and scientists on how implementing CRE in the US

This segment presents participants' suggestions and ideas for implementing a like-minded science enrichment programme. These are summarised in Table 4. In addition, the priority of each idea given by the participants is catered in the table using a circle to indicate the number of stickers assigned by the participants to each idea (each ● refers to 1 million dollars). Both the ideas that were prioritised and the ones that were not included in the table. Interestingly, some suggestions converged in both FG.

Table 5
Focus Groups participants' suggestions prioritized

Idea	Aim	Priority
Hands-on activities, interactive and memorable	The success of the interventions at schools	●●●●●●●●●
Build long-term relationships/ create a network	The success of the interventions at schools based on scientist-teacher interactions	●●●●●●●●
Programme coordinator & Local Coordinators (state/region)	Effective organization of the programme	●●●●●●●
Awards for participants/universities	Recognize and boost scientist's participation in outreach	●●●●●●
Funding Sources	Effective organization of the programme and recognizing scientist's participation	●●●●●
Create a Lesson Plan	The success of the interventions at schools	●●●●
National registration database	Effective organization of the programme	●●●
Advertisement/Campaign	Effective organization of the programme	●●
Recruit scientists outside academia/companies	Eclectic poll of participants	●●
Start small, in a state/region	Effective organization of the programme	●●
Loosen the hometown concept	Effective organization of the programme	●●
Scientist's coaching session	The success of the interventions at schools	●
Promote more initiatives to reinforce interactions, e.g.,	The success of the interventions at schools based on scientist-teacher interactions	●

meeting with teachers before school starts		
Creating a database of activities developed	Improve scientist's interventions and their impact	●
Town halls to talk about curriculum	The success of the interventions at schools based on scientist-teacher interactions	
Non-profit consultant	Advice on the implementation of the programme	

An important note on the results of the exercise should be made since participants on the first FG prioritized solutions in terms of the monetary efforts they would require:

'I also think that some of these things take more money than others to implement, and so I was not necessarily voting for, like, what would be the most important but also what I thought it'd need the most money to make it possible.' [FG1, P3]

'I think that number 4 is also really important, especially monetary wise because you'd need a lot of money to attain all the, like, materials that you want to use to get it really interactive for the kids, and that obviously would cost a lot to make it a nationwide programme, so make sure the hands-on portion is available.' [FG2, P2]

In FG2 participants deepened discussion on the scientists returning to their hometowns:

'It came up a lot in our group, it does seem that committing to going to your hometown school created a lot of problems and some flexibility may be necessary.' [FG2, P4]

'My parents don't have a hometown, I don't have a hometown…but I have an environment I grew up in and I understand that environment, so by going to a similar environment I could interact with the students that way. And so, I think that is more what you are looking for … So, the solution is understanding the demographics and trying to match more demographics rather than specifically someone's hometown.' [FG2, P7]

'I kind of disagree… because I don't think it is that important for the scientists to be from the same hometown or demographics. I personally wouldn't pay that much attention to where the scientist is from, I'd pay attention to the content.' [FG2, P2]

'I do think demographics are important, my PhD advisor was from rural Wisconsin, and he was teaching in rural South Dakota, and he related to them better than what I would possibly do.' [FG2, P7]

5.5 Discussion

This study allowed to elicit the views and opinions of scientists and science communicators of the University of Illinois on what concerns the implementation of a CRE similar enrichment programme in the US. This study is a contribution to the understanding of these stakeholders' views and perceptions on science enrichment programmes, and the restrictions and conditions to implement them in the US. Bellow, I present the main findings of the analysis of two focus groups held in October and November 2021. Then I delve into the ideas identified and prioritised by the focus groups participants. I close with a short reflection on the indirect contributions of these key findings to the ongoing implementation of CRE in Portugal.

Overall, results from the focus groups show that both science communicators and scientists converge in ideas, opinions, solutions, and barriers related to the implementation of a similar programme in their country. These consisted of:

- Details on the educational system in the US and the inflexible curricula of elementary school students;
- The lack of willingness of scientists in participating in outreach activities;
- The magnitude and diversity of the country imply high levels of organization and funding streams.

Tisza et al. (2020), for example, have also suggested that funding issues and the fact that enrichment activities are not part of official curricula are some of the reasons why science enrichment activities cannot reach their full potential.

Interestingly, while participants of FG1 highlighted solutions more connected to the implementation and management of the programme as a whole, participants of FG2 focused on the details of the activities themselves, as well as the scientist-teacher and scientist-student connections. The latter aligns with literature that assumes that students' perception of the relevance of the activities relates to both autonomous and controlled motivation

(Vennix et al., 2018). FG2 participants also emphasised the necessity for creating scientist-student meaningful interactions and the creation of long-term relationships, highlighting the need to perform activities that effectively stimulate and engage the students:

'And part of the problem is that I'd have wanted a longer-term relationship to know what the class have been doing, where the kids were, in what the kids are interested and what I could do or say that they would actually care about and have a meaningful sort of interaction, rather than a one-time thing you won't remember tomorrow.' *[FG2, P1]*

'*You need them [kids] to remember the event, so that's why the hands-on activities and the interactive activity is important because you are trying to make something rememberable, like in 5 6 years, for now, they will be like "Oh, I met a scientist, I remember it was pretty cool and I could do that too".' [FG1, P7]*

Accordingly, the above statements seem to corroborate Vennix et al. (2018) assertation that students' autonomous motivation is related to the teaching methods: students prefer workshops over projects and lectures.

Participants were aware that the geographic magnitude of the United States would require having a Programme Coordinator and/or Local Coordinators per state/region in which the programme is being implemented. This priority connects to FG1 participants' working background and their expertise in implementing similar initiatives:

"*I actually liked the programme coordinators… yeah. I think it is very important... and also realised now that's us". [FG1, P6]*

Results from the first focus group show that funding is a key factor. However, although FG2 participants did not mention fundraising as a solution, they mentioned the lack of educational funding as a problem. This is a bottleneck that has been identified by other researchers (Tisza et al., 2020), which calls for both national and European financial support. Accordingly, FG1 participants suggested that for every other aforementioned solution, funding would be always a requirement anyhow. This insistence on the implementation cost of an educational programme might be again explained by participants of FG1 being members of a science communication office that implements outreach programmes, which may render them more aware of costs involved, particularly in terms of human resources, materials, database management, overall logistics. This is consistent with previous studies (Entradas &

Bauer, 2017) that underline that funding increases the likelihood of research institutions to communicate more frequently with the general public in the Social and Natural Sciences.

It was mentioned that giving a financial reward would also tackle scientists' willingness to participate in an outreach programme (a problem not faced in Portugal so far). Noteworthy, literature also suggests that many scientists in the US are not willing to engage because outreach initiatives are time-consuming or because scientists believe it is hard to communicate their scientific and technical work in simplified terms (Besley et al., 2018). Participants also admitted that the United States is lacking in recognizing scientists in their efforts to communicate their science and interacting with broader audiences. This seems to be witnessed across countries, since according to Jensen (2011, p. 35), the real message sent by institutions to popularise science is: "interact with the public if you find it fun, but not within your working time, which must be used for publication of articles in international journals". To tackle this problem, participants propose different efforts to contradict it, for example, universities receiving recognition for instigating scientists' participation in outreach activities. They suggest the need for a paradigm shift on this topic.

The (lack of) willingness of scientists in participating in an educational programme kept most attention to science communicators participants. Evidence shows that public communication remains a minority priority among active scientists (Jensen, 2011). The requirement of a long-time commitment and effort, or the lack of scientists' knowledge and tools to do it were reasons highlighted by the participants (e.g., "*knowing what level of content is right content*" *[FG1, P8]*). Similarly, FG2 participants, who are scientists themselves, admitted being willing to participate in a similar programme, but suggested including complimentary changes to do so: "*Ideally meet the teacher before the semester starts, understand what that class is even teaching, understand who the kids are, where they come from, what their backgrounds are, what they like, who they are as people, and to work with the teacher to come up with a something that would both be enriching but also entertaining to them and tailoring to their interests*." *[FG2, P1]*

In conclusion, FG1 participants deepen their discussion on the logistical aspects of implementing an educational and outreach programme: highlighting the need of coordinating the programme locally but with overall supervision, the need to assure funding streams that would support human resources and materials fundamental to implement the programme. A

strategical advertisement was mentioned to be key to engaging volunteers and later giving them recognition and visibility. These rely on participants belonging to experienced communication and outreach offices. On the other hand, participants of FG2 highlighted characteristics related to the activities developed by the scientists with the students and addressed the need to establish relationships with the teachers. For the latter, all the solutions aimed at generating a greater impact on the students, and were justified by personal experiences they had both as students and as scientists. FG1 and FG2 participants agreed on similar problems and solutions, even though they deepen the discussion differently.

Unsurprisingly, the findings of the focus groups methodology not only constitute a pertinent contribution to delivering a CRE-similar programme in the US but also add to the ongoing implementation of CRE in Portugal. In this regard, I would like to bring two considerations to the discussion. Firstly, the suggestion of giving visibility to the scientists by awarding them or their institutions. It is a solution that will be incorporated into the programme in Portugal and is also aligned with suggestions from the literature: "the creation of an annual prize for the best popularization initiative" (Jensen, 2011, p. 34). Secondly, the need to secure funding streams is on the top of the programme priorities in Portugal, albeit not for the same purposes. In the Portuguese case, scientists are not monetarily compensated, as we witness a high buy-in and interest of scientists in Portugal, but funding streams are rather used to secure other costs, like human resources.

As some of the focus group's priorities are in line with the programme priorities in Portugal, I can conclude that efforts in implementing science education and outreach initiatives are similar regardless of the country in which the programme operates. Moreover, the fact that experts in outreach programmes, from other parts of the globe, mention solutions incorporated in the programme in Portugal is an excellent indication of the success of the programme, or at least the direction it is taking.

5.6 Limitations and future recommendations

An obvious note of caution should be exercised here. Although particularly telling in many regards, this study has some limitations. The most important of which is the short spectrum of stakeholders represented in the focus groups. It would have been relevant to bring on board other groups of interest, such as teachers and decision-makers, for example.

The composition of the two focus groups was not fully balanced in terms of gender or ethnicity. It is, therefore, wise not to seek a generalization of the results. After all, this generalization was not a goal of my study, but rather the richness of the subjective perceptions of both scientists and science communicators, and this is indeed one of the strong aspects of the focus group methodology.

These limitations suggest that future research will most likely benefit from a follow-up quantitative research method based on the results obtained by the present focus groups' findings. Additionally, focus groups should be implemented with teachers and policymakers from the US. This could quantify the relevance of the solutions posed by the participants, and/or identify similarities and differences in a new pallet of stakeholders. While gaining access to teachers as research subjects can be difficult, there is a range of research opportunities open to those who want to help increase the frequency and quality of scientist-student interactions across the world.

5.7 Reflection and lessons learnt

The focus groups were effective in eliciting participants' experiences, values, views, ideas and expectations concerning science enrichment programmes that promote scientist-student interactions, particularly in scenarios where scientists go back to their hometown to implement science activities with elementary school students. The focus group participants generally found it easy to express their views and were keen to share their experiences and perspectives. As the moderator and the driver of this research, I was glad to witness that the participants respond and built on the views expressed by the other participants. That interaction succeeded in unravelling a variety of opinions and ideas and provided insightful information.

Participants' feedback on the focus group was very positive and overall, the structure of conducting the activities and the atmosphere surrounding the discussion were appreciated and provided them with a learning environment. Many participants were pleased to be engaged in this public consultation, they very much enjoyed taking part in the sessions, and felt they learned and contributed to it:

"I thought it was a great mix of ages and research areas in the focus group! It was interesting to hear other perspectives."

"Thank you for this opportunity! I had a great time, good luck with this project."

"It was very nice to participate, I hope we helped!"

"This was so much fun and a great way to discuss openly with everyone!"

Personally, conducting this research project was a unique opportunity and positive experience for me. It impacted and stimulated me for the better. By developing this initiative independently, I developed interpersonal communication skills (through perceptive listening, verbal and nonverbal speaking and sensitivity). I worked on process management, by leading the group in the process, challenging the participants and modelling neutrality simultaneously. And finally, I improved my intellectual agility, by assimilating information quickly and clustering, looking for connections between statements, and self-awareness.

5.8 Key points

This chapter addressed the focus group study I developed as a Fulbright Scholar in Urbana-Champaign, Illinois, United States, under the internship I completed at the Communications an Outreach office of IGB, a research centre at the University of Illinois.

Firstly, we have learnt about the personal experiences of the focus group participants concerning their participation in science enrichment programmes. In general, almost all of the participants enrolled in outreach activities only as university students or scholars, and most of them did not have the chance to participate in such activities as school students.

Secondly, we have learnt about the barriers and concerns drawn by participants on implementing a CRE similar programme in the US. Those related either to the school setting or to the scientists. Examples of the first include the closure of some elementary schools; the differences in students' level of education related to their socioeconomic, cultural, and educational backgrounds; or the inflexibility of the US educational system. Examples of the latter include the low ability of scientists to communicate in an accessible manner; difficulty in recruiting scientists; the lack of scientists' willingness/time to participate in outreach activities; or the lack of institutional acknowledgement.

Thirdly, the focus groups allowed to elicit participants' recommendations on implementing a CRE similar programme in the US (see Table 5). As discussed, these priorities not only align with literature suggestions but also contribute to the implementation of the programme in Portugal. They particularly include but are not limited to securing funding streams, ensuring hands-on activities, establishing meaningful connections between the scientists and the students, having programme coordinators and recognising scientists for their participation in outreach activities.

Limitations of this study were mentioned, as well as the participant's feedback and a brief remark on the study's relevance to my academic background.

Chapter 6
Europe: Contributions for an application to European funding programmes

In this last chapter of the report, I use the opportunity to provide a set of contributions to an eventual proposal to be submitted to a European fundraising call. Naturally, and because it is inspired by my internship experiences and by creating a new science enrichment programme, the proposal addresses the design, development, and implementation of a science education programme, and it draws heavily on my experience in the creation of CRE.

I present this contribution to other organizations, based on my personal experience, with the expectation those agents who eventually wish to mobilize a European consortium to support the development of a similar programme will find it useful to adapt to the needs, context, and specific circumstances of a real consortium.

As a disclaimer note, and because the present document is not written as a project report, a consortium willing to use my contributions in its own proposal would necessarily have to further elaborate on its own specific context, especially on what concerns the management structure and procedures, the project effort, the resources to be committed, and the risks and the associated contingency plan, if the project were to be submitted to a real call. The composition of the consortium in this contribution is fictional and purely illustrative for this purpose. Hence, the absence of a budget and estimated person-month.

For practical and application purposes, these contributions were written according to the template and guidelines for submission to a Call under Horizon2020, the EU's research and innovation funding programme from 2014 to 2020.

I wrote these contributions in the form of a stand-alone chapter, as an autonomous document (in relation to the main body of this report), to facilitate its use and dissemination.

That is why some aspects, particularly those related to matters of scientific underpinnings, goal setting and impact forecast may appear redundant in view of chapter 4 of this report.

6.1 General information

Proposal Title: Scientists Return to School

Project Coordinator: Native Scientist

Duration: 18 months

Keywords: non-formal education, circular education, equity and quality education

List of participant institutions:

Participant No.	Institutions	Short-name	Country
1	Native Scientist	NS	Portugal
2	Fundação Champalimaud	FC	Portugal
3	Centro Interdisciplinar de Ciências Sociais NOVA	CICS	Portugal

6.2 Summary

This project, called *Scientists Return to School* (SRS), consists of the design, implementation, and evaluation of a European science enrichment programme.

The project seeks to tackle educational inequities and empower children to pursue higher education and scientific careers among children in Europe. To do this, scientists and students from the same homeland are brought together in meaningful interactions to provide students, especially from underprivileged backgrounds, with engagement in personally relevant and scientifically authentic workshops implemented by the scientists.

Working at a European level, this 18-months project will help students, especially from underserved and underrepresented communities in science to: (i) break down stereotypes about scientists by interacting with role models; (ii) develop their identities as people who can enrol in science if they want to; (iii) broaden their horizons and increase their interest in pursuing higher education and science-related carers; (iv) improve scientific literacy and critical thinking by raising their awareness on scientific topics.

The project offers science communication training for participant scientists to develop their science interventions and promotes the interaction of children with role models, the scientists, thus endowing tomorrow's leaders with better hard and soft skills.

6.3 Objectives

The goal of this project is to contribute to excellence in science education and enhance young people's interest in science by showcasing what it means to be a scientist. The project's most prominent promise is to increase students' literacy and soothe educational inequalities.

To create a collaborative, sustainable and feasible environment to develop this project, among all the stakeholders involved, the project focuses on the following priorities: (i) bring together a multidisciplinary programme director whose members complement each other on their skills-sets, (ii) boost scientists' active participation in society with training and support, (iii) implementing science workshops for elementary school students, and (iv) create partnerships between the scientific community, the educational sector and the policymakers. Grounded on these priorities, the specific objectives for the project are listed in Table 6.

Table 6
Relation between objectives and work packages

OBJECTIVES	Work Package
Bring together and manage a motivated and multidisciplinary project coordination team, ensuring proper delivery of tasks, milestones and deliverables established for each WP	WP1 – Project Management
Create a robust programme concept and structure	WP2 – Concept Definition & Programme Design
Identify key stakeholders and gauge their interest in the project, and test the feasibility of the project	WP3 – Market Research & Market Testing
Produce and deliver science communication training for scientists	WP4 – Design & Delivery of Scientists Training
Create a mechanism that matches scientists with their elementary schools	WP5 – Proof-of-concept: run pilot interventions
Implement 100 interventions (1intervention=2workshops)	WP5 – Proof-of-concept: run pilot interventions
Define and produce evaluation methodologies and criteria	WP6 – Quality Monitoring & Impact Evaluation

Monitor and evaluate the programme's impact	WP6 – Quality Monitoring & Impact Evaluation
Define and implement a communication and marketing plan	WP7 – Communications & Marketing

6.4 Background and rationale

SRS aims to tackle three major problems through this programme:

1- *Society's low scientific literacy.* A survey found a percentage of 27% for low levels of scientific capital in youngsters (Archer et al., 2015). Thus, improving their science capital (interests, attitudes, and resources for science topics) will increase public scientific literacy and encourage them to pursue thriving careers (Archer et al., 2013). Noteworthy, middle school is typically seen as a point of disconnect where science interest wanes, especially in underserved communities (Blotnicky et al., 2018).

2- *Educational disadvantages*. Children in disadvantaged situations have worse results regarding education, health, and satisfaction, therefore impacting life opportunities (Mowat, 2019). Poverty and rural-urban discrepancies require change (Shucksmith et al., 2009). Reports (Justino et al., 2014) show that the average education level among children aged 10-15 years old in Portugal, for example, has been improving, but inequalities among children from rural and urban areas remain. Despite the improvements made from 1991 up to 2011, now 10 years later in 2021, the need to address this problem remains actual and solutions to improve it are of utmost importance.

3- *Poor scientist's participation in outreach*. Although most scientists agree that interacting with the public is a valuable endeavour (Davies, 2008), they report feeling unprepared and believe that the public is not interested (Besley et al., 2018; Royal Society, 2006).

It is crucial to address these problems in order to prevent social inequities to widen. In this perspective, this project aims to (i) diminish attainment gaps between low-income, low-educated families and high-income, high-educated families; (ii) prevent misinformation and pseudoscience to proliferate (e.g. movements against vaccination); (iii) combat stereotypes about scientists and science careers; (iv) students' disinterest in STEM-related

careers; (v) increase the abundance of diversity of highly skilled STEM professionals and (vi) value innovation potential in a diversity of countries.

6.5 Concept and approach

First and foremost, SRS promotes science education by implementing and celebrating the concept of Circular Education (see section 1.6). Scientists give back to their communities by developing unique and interactive science workshops where they serve as role models for students, thus empowering the next generation of students of their hometown in their pursuits. While doing this, students' positive attitudes towards science and science knowledge are improved, and scientists' feelings of belonging and giving back to the community are also improved.

The project complements and enriches the school curriculum of the target audience – elementary finalist students based in Europe, including students from underserved areas, rural areas, and low population density areas. Noteworthy, for students, participating in the project will be a once-in-a-lifetime experience, a unique and, for a lot of them, first opportunity to meet a real scientist.

The project stands out:

(i) by geographically "decentralizing" access to scientific education – scientists will have the opportunity to create meaningful connections with the children that are now students at the elementary schools they attended, thus reaching less accessible towns nationwide.

(ii) by providing scientists training on science communication for children and advanced outreach – scientists will learn how to create impactful outreach activities and how to communicate their science to children;

(iii) by offering opportunities for lived hands-on and minds-on experiences for students nationwide – through a diverse approach to formal education the project promotes inclusiveness and reaches wider audiences of children, especially the traditionally underserved in STEM education and the ones that continue to be left out or feel detached from science.

6.6 Expected impacts

By implementing SRS, the project expects to impact different stakeholders in a variety of aspects. For the target audience of the project, 4th-grade students, the main expected outcomes of the project are:

1) *to increase the overall Science Capital* of elementary school students (and their families) in Europe, by increasing their exposure to science;
2) *to increase school students' self-concept in science* by increasing the number of students who feel science is a domain in which they can succeed and that they can scientists if they want to;
3) *to reduce the number of students that never met a scientist in their lives* by ensuring that students European-wide have the same opportunity of meeting a scientist: no matter their socio-cultural-local background the project will run in rural and urban areas, on the mainland and islands, in coastal and inland sides;
4) *to increase access to higher education* by empowering girls and boys to pursue the career they want to;
5) *to target 4,000 students* within this proposal.

For the scientists, key outcomes include:

1) *to have professional training in science communication* for a younger audience;
2) *to increase scientists' participation in communication and outreach activities* in schools;
3) *to promote scientists' citizenship* by returning to their hometowns and contributing to their communities;
4) *the increment feeling of belonging* and self-esteem by giving back to their communities.

For other stakeholders:

1) teachers become more confident while developing original scientific activities for their students;
2) teachers have a chance to co-work with scientists in a creative and close way;
3) policymakers are contributing to the equity and quality education of tomorrow's leaders;

4) policymakers are creating opportunities to retain students in science fields and pursue higher education;
5) all stakeholders will be key to instilling a scientific culture in their society.

By indirectly involving and impacting the communities where the students belong, the project expected outcomes also include:

1) to wider community members' perspectives on who scientists are and look like;
2) to broaden community members' views on what is the impact of science and research in peoples' lives;
3) to increase community members' trust in science and the scientific method;
4) to increase the number of people interested in science and technology;
5) to increase the number of underprivileged people that pursue higher education and/or a scientific career in Europe;

Ultimately, implementing this project contributes to the democratization of science, and contributes to the United Nations Social Development Goals, namely Quality Education (4), Reduce Inequalities (5) and Partnerships for the Goals (17).

6.7 Measures to maximize the impact

6.7.1 Communication activities

The project dissemination and communication will be leveraged by digital tools and digital marketing, as the major means of communication with the different stakeholders, as these have the best cost-efficiency ratio and are also the eco-friendliest way to give voice to the project.

For the launch of the project, different efforts will be committed to maximizing the dissemination of the project to the target audiences including the scientists, teachers and schools, research institutions and the city councils.

The communication strategy encompasses social media campaigns; the creation and launch of the website and the visual identity of the project; press releases to European mass media outlets; dissemination of emails to scientific diasporas, learned societies and teacher societies; word of mouth and activation of contacts; participation in events and conferences,

for example, “Noite Europeia dos Investigadores”; dissemination of the project among established networks and partners; and synchronised social media publications.

6.7.2 Exploitation of impact

Different metrics will contribute to monitoring the progress of the project. These include the number of schools reached; the ratio between rural/urban schools; the number of students reached; science attainment value and self-concept in science before and after the intervention; the number of students who meet a scientist for the first time in their lives; and the number of students interested in participating in science-related activities in the future. The project will be successful if it reaches 100 schools and observes a positive change in science self-concept and future participation in science.

Impact measurements will be assessed directly by administering feedback forms to school students at the end of each interaction with a scientist, and indirectly through feedback forms to scientists and teachers. The project forecasts partnering with social scientists to develop a scientific study on the effectiveness of the programme via a randomized controlled trial design (WP6). Results will be included in the communication activities previously mentioned and explored in WP7.

6.8 Work plan

6.8.1 Project structure

The project is mainly divided into three fundamental parts: (i) Project Preparation, (ii) Project Implementation and (iii) Project Evaluation. The project created within the 18 months of this proposal will be structured to be able to run every 12 months if fundraising streams are secured.

Within the first part of the project, the conceptual details of the project will be defined, including its social mission, vision, values, workshop structure, team management, and key steps (WP 2). In addition, a market test for the school and scientific communities takes place, as well as meetings with external partners to assure its viability (WP3).

Project Implementation (WP 4, 5 and 7), the second part of the project, will follow the below core process:

1) Scientists register to show interest in volunteering to go to their school;
2) Teachers and schools/municipalities register to show interest in hosting the scientist;
3) The match of scientists with teachers is made taking into consideration the ratio of schools in rural/urban areas, north/south areas, coastal/inland areas, continent/islands;
4) A date arrangement is made;
5) The matched scientists attend training on science communication for children;
6) The logistics of the school visit/workshop are taken care of, which includes preparing the programme for each teacher-scientist pair (personalised from a template programme), making travel arrangements for the scientist, ensuring food and beverage for the scientist is provided, printing and posting branded materials like certificates for students and feedback forms to the teacher, arranging for photographs/video reportage, and inviting the local press to attend;
7) Visit/workshop takes place;
8) Feedback from all parties is collected.

Finally, Project Evaluation and Impact Assessment (WP6) will take place to ensure project effectiveness via a randomised controlled trial design.

6.8.2 List of work packages

SRS is structured around seven linked work packages, as detailed in Table 7, and shown in the Gantt chart in Figure 19 and the PERT chart in Figure 20. A detailed description of each work package follows.

Table 7
List of work packages

WP No	WP Name	Leader ID	Leader Name	Timeline
1	Project Management	1	NS	M1-M18
2	Concept Definition & Programme Design	1	NS	M1-M3

3	Market Research & Market Test	3	CICS	M1-M3
4	Design & Delivery of Scientists Training	2	CF	M4-M10
5	Proof-of-concept: run pilot interventions	1	NS	M3-M7
6	Quality Monitoring & Impact Evaluation	3	CICS	M1-M18
7	Communication, Marketing & Dissemination	2	CF	M1-M18

6.8.3 Project planner - Gantt chart

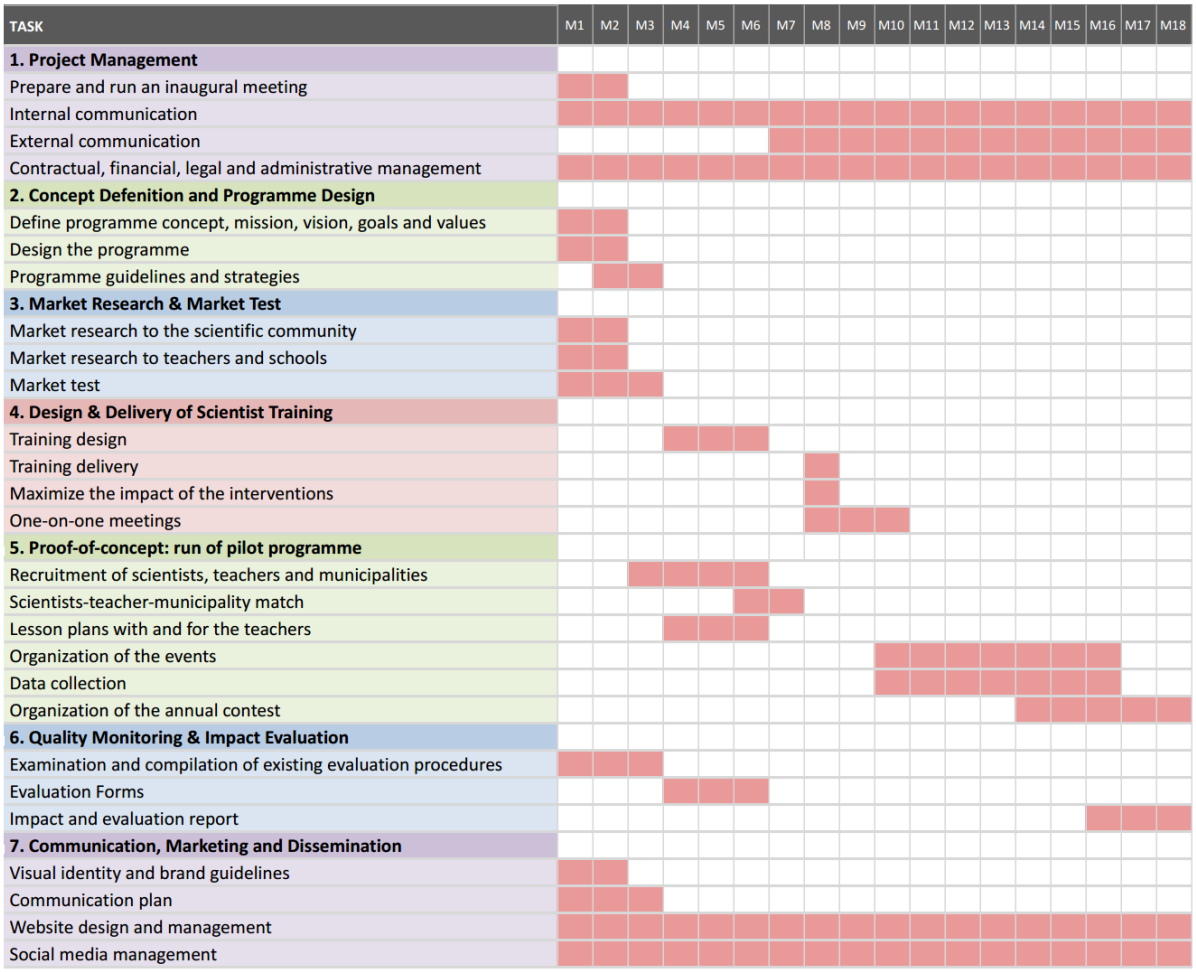

Figure 19. SRS Gantt chart: schedule of the different tasks throughout the project.

6.8.4 Pert chart

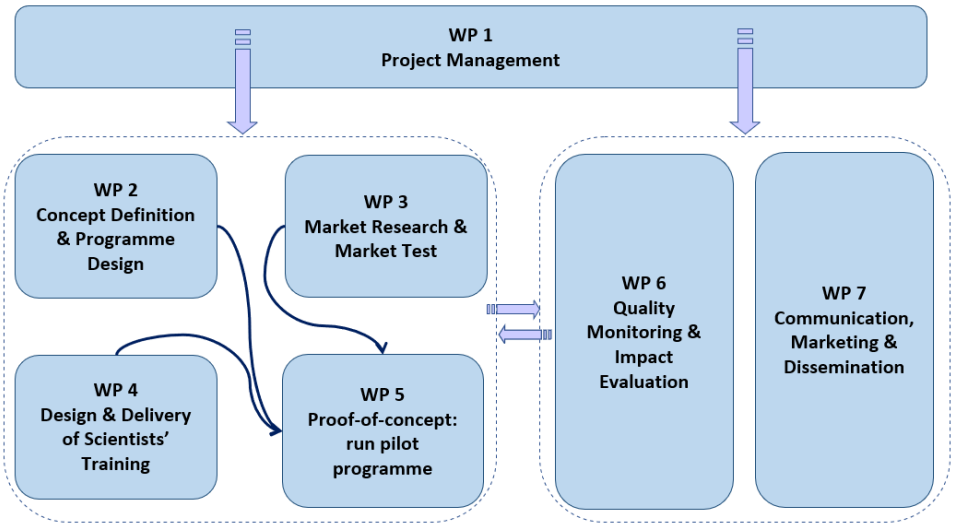

Figure 20. SRS Pert chart: work packages and their connections.

6.8.5 Detailed work package description

Table 8
Description of work package 1

Work Package Number	1	Timeline	1-18
Work Package Title	Project Management		

Objectives
- Ensure human resources commitment and understanding of the project; - Ensure effective and smooth communications both internally and externally; - Manage, supervise, and coordinate human resources; - Ensure timely execution of project's tasks and deliverables; - Ensure effective and responsible financial and administrative management.

Description of work
This work package is dedicated to coordinating and managing the day-to-day operation of the project to take it to high standards, promote a smooth and inclusive work environment within the Management Board, ensure that the project deliverables and milestones are timely accomplished and guarantee the financial and administrative management of the project in respect to contract rules with all contractors. The major focus of this work package is to ensure the quality of the project and make sure the project follows its normal course. The following tasks will be developed:

Task 1.1. Prepare and run an inaugural meeting

Team meetings will be online throughout the project except for the inaugural meeting. Thus, the goal of this task is to bring together the team (Milestone 1) of the project so that the team can work on a detailed structure and description of the project, a commitment between all people involved is settled and deadlines are established, and discussion on the Memorandum of Understanding takes place (D1.1). The project coordination and internal communication will be drafted at the beginning of the project and approved by all partners.

Task 1.2. Internal communication

To be developed throughout the project and to provide a comprehensive *status quo* of the project in order to define how the overall objectives are being accomplished. Bi-weekly decision-making meetings take place, as well as team monthly meetings to report on progress and plans. Smaller working groups meet on an as-needed basis. This will assure a smooth development and implementation of the project. The Project Manager is responsible to spread key information within the management board. Internal communication guarantees the creation of synergies, which is key to achieving a commonly shared view for the project's best success.

Task 1.3. External communication

Throughout the project, execution meetings with external partners and stakeholders take place to guarantee an up-to-date exchange of information and nurture trusted relationships, given the vast array of stakeholders. This task will outline the strategy for ensuring that there is sufficient and consistent communication to support all project activities and reach the desired target audiences.

Task 1.4. Contractual, Financial, Legal and Administrative Management

This task will assure the administrative and financial legal aspects of the project, as well as lots of logistical details (D1.2). It will guarantee all the payments, operating expenses, and project expenditures for the project to run smoothly and the objectives and key results to be met. This task will support the elaboration of the financial statements, manage budgets, and guarantee the salary to all partners involved. In addition to this, green materials and low-emission forms of transport will be made, and a privacy policy will be established.

Deliverables

D1.1- Memorandum of Understanding

D1.2- Financial activity and overview report

Table 9
Description of work package 2

Work Package Number	2	Timeline	M1-M3
Work Package Title	Concept Definition and Project Design		

Objectives

- Set up the project structure and achieve a degree of consensus on the strategies to do so.
- Design a project capable of widening public perspectives on who scientists are and what the scientific process entails.

Description of work

The main goal of this work package is to set up the educational project that will be delivered in elementary schools (WP5), whereby partners will get together to discuss and agree on the project structure, features, guidelines and strategies.

Task 2.1. Define Project Concept, Mission, Vision, Goals and Values

Immediately upon project initiation, we will define the main features and characteristics of the project to establish a common working line towards action within the team and all the stakeholders involved. A short document compiling all the information will be created (D2.1) and the outputs of this task will be shared via WP7.

Task 2.2. Design the programme

Upon defining the concept of the project to be delivered in Europe, we will design the project interventions themselves (How will the interventions be held on-site? How will we make the bridge between the scientists, the teachers, and the municipalities? How will the annual contest be celebrated?). The design of the project will consider the practical organization, implementation, and evaluation of the interventions (D2.2) that will be delivered in 100 elementary schools (WP5). The outcomes of this task will consist of Milestone 2.

Task 2.3. Programme guidelines and strategies

Programme guidelines include considering the ethical implications of working closely with children, as well as taking into account the responsibility of managing personal data and safety. Thus, this task will include the development of informed consent forms to be signed by the parents or legal guardians of the students and will include information on the programme objectives, length, format, expected outcomes and contact points. Regarding strategies, a list of schools of strategic interest, that include underserved and/or underprivileged students, will be used as a reference (D2.3). These are schools where the implementation of the programme may have a deeper impact and include schools in Europe where (i) school underachievement is high, (ii) access to science is low, and (iii) the number of students on free or subsidised school meals is high.

Deliverables
D2.1- Programme Features Catalogue
D2.2- Framework for the implementation of the initiatives
D2.3- List of schools of strategic interest

Table 10
Description of work package 3

Work Package Number	3	Timeline	M1-M3
Work Package Title	Market Research & Market Test		

Objectives
- Ensure programme feasibility and traction. -Ensure availability and willingness to run the scientific initiatives at the elementary schools.

Description of the work
This work package will include the production of a survey, meetings with stakeholders and analysing and testing of the market to assure a successful implementation of the *Scientists Return to School* programme. Task 3.1. Market research to the scientific community The team will hold online meetings with science students and professionals, which contacts coming via each partners' network of scientists, to assure their interest in taking part in the interventions that are proposed here and guarantee a pool of skilled researchers available to volunteer for one day to the project. Task 3.2. Market research to teachers and schools The team will launch a survey (D3.2) for teachers and schools with the aim to gauge interest in a project like the *Scientists Return to School*. Results will indicate if there is a market opportunity in Europe for the science enrichment programme. Importantly, survey respondents will include mostly elementary school teachers, but also school directors and extra-curricular-activity teachers. We will assure a representation (at least 40% of respondents) of people considered from rural areas (less than 50k inhabitants), as the project aims to contradict rural exclusion from science and scientific careers. Task 3.3. Market test Before implementing pilot interventions (WP5) and based on the previous tasks, a final market test will be conducted to predict the market potential for the project. For that, the

team will assess the demographics of the target audience and use various methods to create a conclusive analysis of whether the framework of the programme (D2.2, task 2.2) will be successful to reach the expected outcomes. Those methods include feedback collected from partners and stakeholders, online market testing, and competitive analysis.

Deliverables

D3.1- Collection of scientists' perceptions

D3.2- Market research questionnaire

D3.3- Collection of teachers' perceptions

D3.4- Market test report

Table 11
Description of work package 4

Work Package Number	4	Timeline	M4-M10
Work Package Title	Scientists Training		

Objectives

- Develop and deliver training for scientists in order to maximize the impact end effectiveness of the interventions.
- Ensure support to the scientists and the teachers in the preparation of each intervention.

Description of work

This work package is dedicated to the development of a training for scientists focused on science communication for children, directed to researchers from any field of expertise. Supporting both research practitioners will favour a smooth implementation of the interventions and allow for the establishment of meaningful relationships with the students.

Task 4.1. Training design

A specialised training programme for scientists will be designed. The training for researchers will include topics such as communicating to children and young people, communicating effectively, culturally sensitive pedagogical methods, classroom management, citizen science and health and safety, which will result in D4.1.

Task 4.2. Training delivery

Based on D4.1, and D5.2 informed by task 5.2, the participant scientists, that will act as role models and instructors for the students, who will receive training to develop their science intervention effectively for children (Milestone 5). A feedback survey will be administered

upon completion of the training and the feedback received will be summarised in a short report (D4.2).

Task 4.3. Maximize the impact of the interventions

A briefing session with the teachers will be conducted to maximize the impact of the workshops (D4.3).

Task 4.4. One-on-one meetings

Before each intervention, an online one-on-one meeting will be conducted both with the scientist and the teacher to ensure a smooth implementation of the workshops on-site (D4.4).

Deliverables

D4.1- Science communication training for scientists

D4.2- Scientist's feedback on the training

D4.3- Briefing session with the participating teachers

D4.4- Meetings with the participating scientists

Table 12
Description of work package 5

Work Package Number	5	Timeline	M3-M18
Work Package Title	Proof-of-concept: run pilot interventions		

Objectives

- Successfully organise and run 100 interventions (200 workshops) at strategic European schools to run a pilot of project where scientists return to the elementary schools they attended.
- Collect data related to the implementation of the interventions.
- Bring together 4000+ students with scientists in meaningful hands-on science workshops.

Description of work

This work package is dedicated to the implementation of a pilot, whereas all the tasks described below will be key to that purpose.

Task 5.1. Recruitment of scientists, teachers and municipalities

This task will collect contacts from scientists, teachers and municipalities, i.e., people interested in participating, hosting or supporting the implementation of the educational programme (D5.1). Contacts will be gathered through emails and online forms. Personal data will be stored according to the privacy policy established in Task 1.4.

Task 5.2. Scientists-teacher-municipality match

As the main goal of implementing the proposed science enrichment interventions is to take scientists back to the elementary schools they attended as children, the scientist-school effective matches will be the main pairing criteria to further run pilot interventions. The match between the scientists and the schoolteachers will be IT-mediated and is initially made through an algorithm that identifies registrations, from scientists and teachers with common zip codes for the school municipality (D5.3). A list of all the paired scientist-teacher and researcher-student partnerships established will be created to inform Tasks 4.2. and 4.3 (D5.2). Efforts will point towards gender parity, diversity, and inclusiveness in the pool of scientists involved, Milestone 4.

Task 5.3. Lesson plans with and for the teachers

Support for teachers will be assured in parallel with the capacitation of scientists. Through a co-creation approach, a lesson plan for a pre-workshop and post-workshop class will be created in partnership with teachers (D5.4). This will contribute to the preparation of the students for the day of the event and for the consolidation of learnings, respectively.

Task 5.4. Organization of the events

Building on D5.2 (Task 5.2) date arrangements will be established upon scientists' and teachers' availability and the events will be implemented in the schools. The hands-on workshops in elementary schools will have a 90-minute duration and will be STEM-based. One visit of the scientists to the school includes the implementation of two workshops. The first two workshops delivered under the project will constitute Milestone 6. Before any activity, informed parental consent for image and data collection will be sought and all will comply with school external visitor guidelines (D5.5).

Task 5.5. Data collection

Importantly, throughout the pilot initiatives, data will be collected through pre-post surveys in all the 100 initiatives (1 initiative = 2 workshops), providing relevant data for the WP6 framework. Additionally, a brief report with the total number of children reached and 10 selected photos of each event will be produced (D5.6).

Task 5.6. Organization of the annual contest

During the post-workshop sessions (Task 5.3) students will conceptualise and create, individually or in groups, their learning outputs which will be selected to enter and be presented and/or showcased at the final Annual Conference (D5.8, Milestone 7). Contest entries can be made in any format, like drawings, paintings, graffiti, texts, videos, sculptures/art installations, choreographies, theatre plays, songs, stand-up comedy, among others. A multidisciplinary jury will select five winners to travel to Portugal to have the opportunity to present/display/showcase their output at the Annual Conference. Given the potentially high number of entries, the remaining outputs will be showcased on the project's website (D5.8).

Deliverables
D5.1- List of scientists, teachers and municipalities interested in participating
D5.2- Matching mechanism
D5.3- Table of matched scientist-teachers paired
D5.4- Lesson Plans
D5.5- Parental consents
D5.6- Report on number of students reached + representative photos
D5.7- Annual Conference programme
D5.8- Website highlight: name and photo of the contest winners

Table 13
Description of work package 6

Work Package Number	6	Timeline	M1-M18
Work Package Title	Quality Monitoring and Impact Evaluation		

Objectives
- Ensure a high degree of work quality within the team, achieving project goals in a responsible and timely manner.
- Report on the performance of the leading team and outputs of each WP.
- Ensure that the interventions at schools meet the project aims through effective planning, assessment, and reporting.
- Create an effective and sustainable impact evaluation approach and design.
- Analyse and report data collected in WP 5.

Description of work
This work package is dedicated to monitoring the quality of the project and evaluating the impact of the interventions at schools, which includes the following three tasks.
Task 6.1. Examination and compilation of existing evaluation procedures
This task will involve collecting best practices for impact evaluation in education in general and science outreach in particular (D6.1). It will also involve the review of project-specific data aligned with WP2. We will hold a Theory of Change workshop with key stakeholders and partners to agree on overall outcomes for the initiatives to be evaluated, both intermediate and long-term outcomes (D6.2). An evaluation framework document will be developed to bring the above together (D6.3).
Task 6.2. Evaluation forms

Impact measurement will require administering feedback forms to pupils at the end of each interaction with a scientist (intervention), and indirectly through feedback forms to scientists and teachers (D6.4). These forms will thus serve to collect data in schools, which will be analysed and reported in Task 6.3.

Task 6.3. Impact and evaluation report

The goal of this task involves analysing the quantitative and qualitative data and summarising key results in a final impact report (D6.5), Milestone 8. This task also includes collaboratively presenting findings to wider stakeholder/partner groups as appropriate. Aside from having a section dedicated to the evaluation of the pilot initiatives, the report will also report on the overall internal evaluation of the team, informing about difficulties, successes, general outcomes, and others.

Deliverables

D6.1- Collection of good evaluation procedures

D6.2- Impact assessment workshop

D6.3- Evaluation framework document

D6.4- Feedback assessment forms

D6.5- Final Impact report

Table 14
Description of work package 7

Work Package Number	7	Timeline	M1-M18
Work Package Title	Communication, Marketing and Dissemination		

Objectives

- Coordinate and drive all the dissemination activities of the project
- Promote public awareness about the project goals, initiatives, and impact through project implementation.
- Increase public perception of the scientific work and method.
- Engage the public and the stakeholders involved.

Description of work

This work package is dedicated to the dissemination of the activities and outcomes of the project, thus focussing on sharing information and knowledge through different communication efforts (website, social media, mass media, etc.).

Task 7.1. Visual identity and brand guidelines

This task compromises the development of the visual identity of the project, which includes the design of the logo of the project, the conception of artwork templates, the colour palette, among others), as well as the establishment of brand guidelines to be followed throughout the project (D7.1).

Task 7.2. Communication plan

Immediately upon project initiation, the team will define a communication plan, that involves the external dissemination of the project and a awareness campaign. It will be accomplished by identifying the most up-to-date and effective mechanisms to reach target audiences and engage the various stakeholders - teachers, parents, school students, researchers, artists. A guide plan will be produced with key communication and dissemination recommendations to be used by all partners of the consortium (D7.2). The plan will include, but is not limited to, the preparation of media kits to be used in Task 7.4. (D7.3), press releases and public presentations or participation in conferences and/or other types of events (D7.4).

Task 7.3. Website design and management

To design, develop and implement a project website (D7.4, Milestone 3) as it is crucial to showcase the project's scope and announce the project initiatives, i.e., the workshop at the schools, and establish a consistent public perception. The website will be user-friendly in order to be consulted easily by all the stakeholders and beneficiaries. Upon its creation, the website will be regularly updated by the team. The website will constitute an important centralised space for disseminating information about the project activities and the number of visitors will be a key metric to track the project's traction through its implementation. A summary of the project outcomes and the final Impact Report resulting from W6 (D6.5) will be published on the project's website.

Task 7.4. Social media management

Building on the communication plan defined in Task 7.2, the project will create its own social media pages (D7.6) and further build a strong presence on social media by synchronizing publications with the channels of the partners, by using a set of common hashtags, and by presenting an appellative template artwork developed in Task 7.1. In parallel to this online public presence through social media, we will also promote the Scientists Return to School programme through newsletters and mailing lists.

Both tasks 7.3 and 7.4 include the public dissemination of activities and opportunities, as well as dissemination of collected data, impact assessment reports, and general project outcomes.

Deliverables

D7.1- Visual Identity Kit

D7.2- Communication and Dissemination Guide

D7.3- Media Kit
D7.4- Press Release in mass media
D7.5- Website
D7.6- Social Media Platforms

6.8.9 List of deliverables

Table 15
List of deliverables

Deliverable Number	Deliverable Name	WP
D1.1	Memorandum of Understanding	WP1
D1.2	Financial activity and overview report	WP1
D1.1	Catalogue of guidelines and good practice standards	WP1
D2.1	Programme Features Catalogue	WP2
D2.2	Framework for the implementation of the initiatives	WP2
D2.3	List of schools of strategic interest	WP2
D3.1	Collection of scientists	WP3
D3.2	Market research questionnaire	WP3
D3.3	Collection of teachers perceptions	WP3
D3.4	Market test report	WP3
D4.1	Science communication training for scientists	WP4
D4.2	Scientist's feedback on the training	WP4
D4.3	Briefing session with the participating teachers	WP4

D4.4	Meetings with the participating scientists	WP4
D5.1	List of scientists, teachers, and municipalities interest in participating	WP5
D5.2	Matching mechanism	WP5
D5.3	Table of matched scientist-teachers paired	WP5
D5.4	Lesson Plans	WP5
D5.5	Parental consents	WP5
D5.6	Report on number of students reached + representative photos	WP5
D5.7	Annual Conference programme	WP5
D5.8	Website highlight: name and photo of the contest winners	WP5
D6.1	Collection of good evaluation procedures	WP6
D6.2	Impact assessment workshop	WP6
D6.3	Evaluation framework document	WP6
D6.4	Feedback assessment forms	WP6
D6.1	Final Impact report	WP6
D7.1	Visual Identity Kit	WP7
D7.2	Communication and Dissemination Guide	WP7
D7.3	Media kit	WP7
D7.4	Press Release in mass media	WP7
D7.5	Website	WP7
D7.6	Social Media Platforms	WP7

6.8.10 List of milestones

Table 16
List of milestones

Milestone Number	Milestone Name	WP	Expected Date
M1	Inaugural meeting	WP1	M1
M2	Programme structure at schools	WP2	M2
M3	Awareness champaign with website launches	WP7	M4
M4	100 scientist-school matches	WP5	M7
M5	Scientists training	WP4	M8
M6	1st interventions	WP5	M10
M7	Winners' selection and annual conference	WP5	M17
M8	Impact & Evaluation Report	WP6	M18

Conclusion

This report has sought to provide a review of the work I developed as a master's student in science communication. We have seen how the acquired knowledge of international experiences provided me with a wide scope of insights into the framework of science education and communication, with a particular focus on the design, management, and implementation of science enrichment programmes.

The attention to the topic of science enrichment programmes is driven by a recognition that there is still a gap in the education of science - "all is not well with school science and far too many pupils are alienated by a discipline that has increasing significance in contemporary life, both at a personal and a societal level" (Osborne et al., 2003, p. 1073).

As Bevan & Smith suggest, and as science communication solidifies:

> "We need more members of the public, and especially those publics long excluded from science, to inform its formation. For some of us, this may mean that we need to 'lean out' so that others - those representing and working with communities who have not been an active or visible part of the history of science communication - can 'lean in' and create a more inclusive, and therefore more impactful, field of practice." (Bevan & Smith, 2020, p. 977)

Firstly, I have learned about the educational challenges faced by ethnic minority and migrant children during my internship experience at Native Scientist. Secondly, as a Fulbright scholar in the US, I have witnessed social inequalities, framed access to education, and the lack of diversity, equity, and inclusion practices in American society. These experiences have led me to the conclusion that continuous, systematic, and collaborative efforts in science communication and education are a worldwide pressing need.

I also hope the research project described in the last chapter of this report, the focus groups study in the United States, will serve to inform science communication researchers about the specific considerations required to take into account in implementing enrichment programmes where scientists go back to their elementary schools or hometowns to deliver workshops for the students.

Finally, I expect this report will guide science practitioners and communicators to further explore science enrichments programmes that promote interest in science, tackle

educational inequities, and accelerate the transition towards inclusive and equitable practices in the science education and science communication frameworks.

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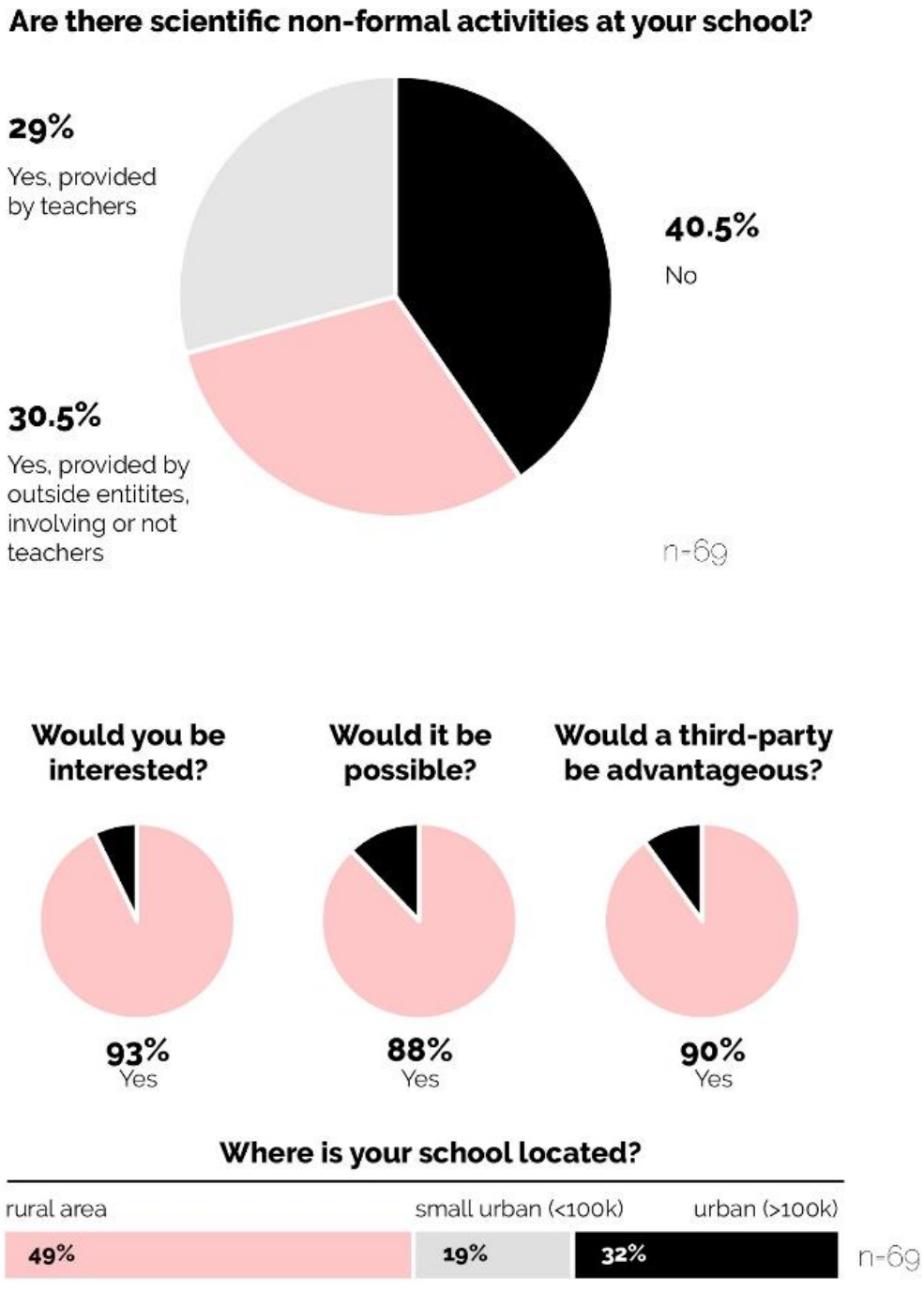
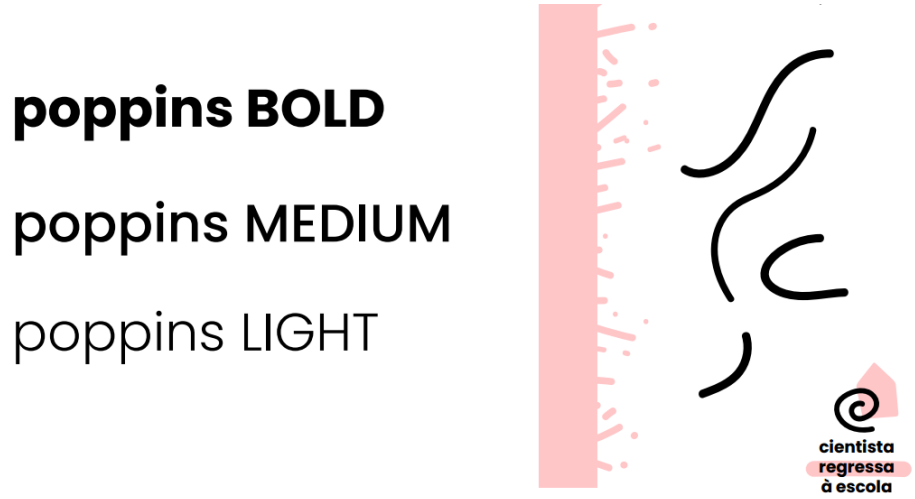
Annexes

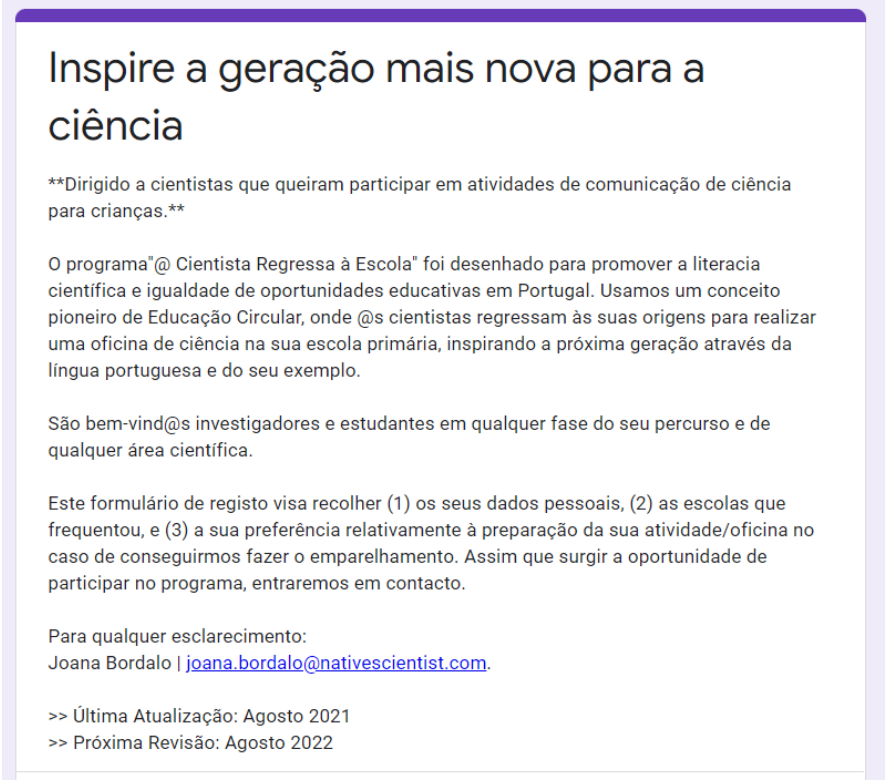
Annexe 1 – Results from market test to teachers and schools



Annexe 2 – CRE Visual Identity Kit



Annexe 3 – CRE Registration form for scientists



Inspire a geração mais nova para a ciência

Dirigido a cientistas que queiram participar em atividades de comunicação de ciência para crianças.

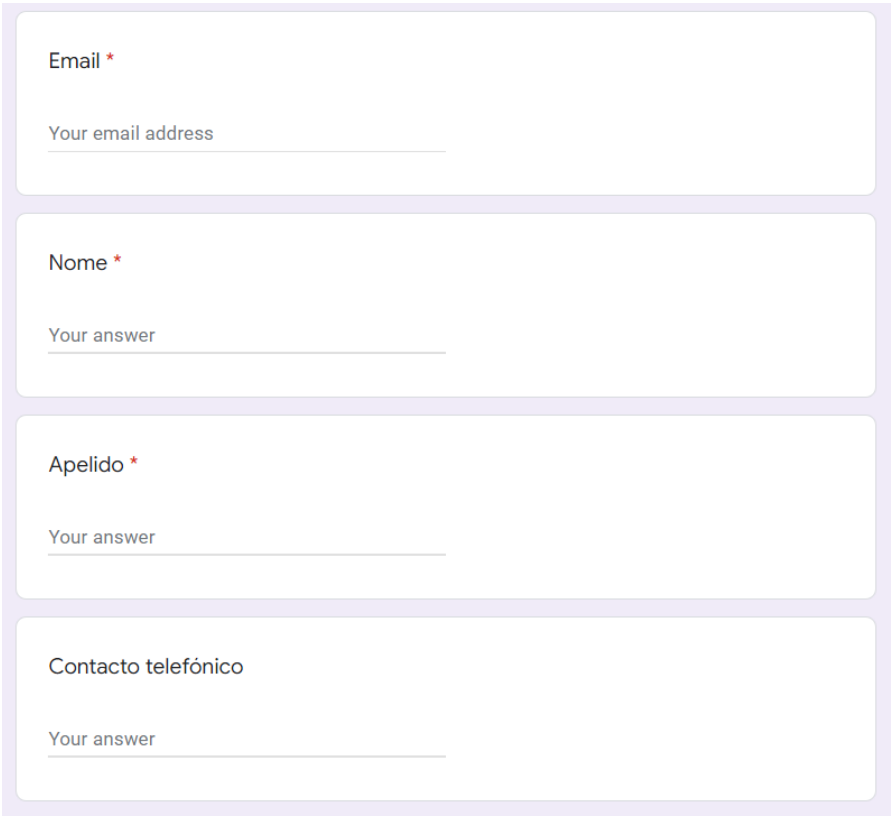
O programa"@ Cientista Regressa à Escola" foi desenhado para promover a literacia científica e igualdade de oportunidades educativas em Portugal. Usamos um conceito pioneiro de Educação Circular, onde @s cientistas regressam às suas origens para realizar uma oficina de ciência na sua escola primária, inspirando a próxima geração através da língua portuguesa e do seu exemplo.

São bem-vind@s investigadores e estudantes em qualquer fase do seu percurso e de qualquer área científica.

Este formulário de registo visa recolher (1) os seus dados pessoais, (2) as escolas que frequentou, e (3) a sua preferência relativamente à preparação da sua atividade/oficina no caso de conseguirmos fazer o emparelhamento. Assim que surgir a oportunidade de participar no programa, entraremos em contacto.

Para qualquer esclarecimento:
Joana Bordalo | joana.bordalo@nativescientist.com.

>> Última Atualização: Agosto 2021
>> Próxima Revisão: Agosto 2022



Email *

Your email address

Nome *

Your answer

Apelido *

Your answer

Contacto telefónico

Your answer

Género *

- ◯ Feminino
- ◯ Masculino
- ◯ Prefiro não responder
- ◯ Other: _____

Qual a sua situação: *

- ◯ Mestrando/a
- ◯ Doutorando/a
- ◯ Postdoc
- ◯ Técnico/a ou Assistente de investigação ou Assistente
- ◯ Investigador/a Auxiliar ou Professor/a Auxiliar ou Professor Adjunto/a
- ◯ Investigador/a Principal ou Professor/a Associado/a ou Professor/a Coordenador/a
- ◯ Investigador/a Coordenador/a ou Professor/a Catedrático/a ou Professor Coordenador/a Principal
- ◯ Other: _____

Qual é a área científica em que trabalha? *

- ◯ Biologia
- ◯ Química
- ◯ Engenharia
- ◯ Geologia
- ◯ Humanidades
- ◯ Matemática
- ◯ Medicina
- ◯ Física
- ◯ Ciências Sociais
- ◯ Tecnologia
- ◯ Other: _____

Em que instituição estuda/trabalha? *

- ◯ CLUNL - Centro de Línguas da Universidade Nova de Lisboa
- ◯ FCSH - Faculdade de Ciências Sociais e Humanas
- ◯ Fundação Champalimaud
- ◯ INL - International Iberian Nanotechnology Laboratory
- ◯ IST - Instituto Superior Técnico
- ◯ ITQB - Instituto de Tecnologia Química e Biológica
- ◯ Universidade do Porto
- ◯ Other: _____

Qual o nome da escola primária (1º Ciclo) que frequentou? *

No caso de ter frequentado mais do que uma escola, por favor especifique em que anos frequentou cada escola.

Your answer

Qual o nome da escola primária (1º Ciclo) que frequentou? *

No caso de ter frequentado mais do que uma escola, por favor especifique em que anos frequentou cada escola.

Your answer

Em que distrito se localiza essa escola primária? *

No caso de ter frequentado escolas primárias em distritos diferentes, por favor especifique aqui apenas a escola onde completou o 4º ano de escolaridade.

Choose ▾

Em que concelho se localiza essa escola primária? *

No caso de ter frequentado escolas primárias em distritos diferentes, por favor especifique aqui apenas a escola onde completou o 4º ano de escolaridade.

Choose ▾

Que outras escolas frequentou e em que anos?

Por exemplo: 2º e 3º ciclo, Escola Básica XX. Ensino Secundário, Escola Secundária YY.

Your answer

Tem algum contacto da(s) escola(s) que frequentou ou da(s) junta(s) de freguesia que nos possa facultar? *

- ◯ Sim
- ◯ Não
- ◯ Talvez

Qual a localidade (cidade e país) onde vive atualmente? *

Your answer

Como classifica o seu nível de proficiência nas seguintes línguas: *

	1 - Sem conhecimento	2 - Nível Elementar	3 - Nível Intermédio	4 - Nível Avançado	5 - Nativo
Português	◯	◯	◯	◯	◯
Inglês	◯	◯	◯	◯	◯
Língua Gestual Portuguesa	◯	◯	◯	◯	◯

No caso de conseguirmos fazer o emparelhamento com a sua antiga escola primária, como gostaria de desenvolver o conteúdo da sua atividade/oficina: *

A atividade/oficina terá duração aproximada de 1 hora.

- ◯ De forma autónoma e independente
- ◯ Com apoio/co-criação da organização do programa

No caso de conseguirmos fazer o emparelhamento com a sua escola primária, receberá uma T-shirt to programa. Que tamanho gostaria de receber? *

- ◯ S
- ◯ M
- ◯ L
- ◯ XL

Por favor deixe neste espaço os seus comentários ou informação adicional que considere relevante.

Your answer

Consentimentos: *

- ☐ Autorizo a que me contactem face a assuntos relativos a este programa.
- ☐ Autorizo a que me adicionem à newsletter do programa.

Annexe 4 – CRE Registration form for teachers

Inspire @s seus/suas alun@s para a ciência

Dirigido a professor@s que queiram acolher oficinas de ciência para alun@s.

O programa "@ Cientista Regressa à Escola" foi desenhado para promover a literacia científica e igualdade de oportunidades educativas em Portugal. Usamos um conceito pioneiro de Educação Circular, onde @s cientistas regressam às suas origens para realizar uma oficina de ciência na sua escola do 1º ciclo, inspirando a próxima geração através da língua portuguesa e do seu exemplo.

Nas oficinas, as crianças:
- interagem diretamente com cientistas;
- aprendem conceitos científicos e novo vocabulário;
- interagem com uma pessoa que já frequentou a sua escola do 1º ciclo.

Formato das oficinas:
- 60 minutos, 1 cientista, 1 turma (~/25 alunos).

Preencha este formulário para registar o seu interesse em receber um/a cientista na sua turma/escola.

Para qualquer esclarecimento:
Joana Bordalo | joana.bordalo@nativescientist.com.

>> Última Atualização: Agosto 2021
>> Próxima Revisão: Agosto 2022

Nome *

Your answer

Apelido *

Your answer

Contacto telefónico

Your answer

Nome da escola onde leciona *

Your answer

Nome do agrupamento onde se insere a escola *

Se não for aplicável, por favor responder "NA".

Your answer

Em que distrito se localiza a escola? *

Choose

Em que concelho se localiza a escola? *

Choose

Qual o ano que leciona? *

Your answer

Quantos eventos poderia a sua escola acolher? *

Cada evento inclui duas oficinas. Cada oficina é desenhada para uma turma (~25 alunos). O custo de organização de cada evento é geralmente comparticipado pela escola ou câmara municipal.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ Mais de 4

Quando gostaria de realizar as oficinas? *

- ◯ 2º Período
- ◯ 3º Período

Tem algum contacto de um/a cientista que tenha frequentado a escola onde leciona? *

Your answer

A escola dispõe de algum laboratório onde se possam realizar as oficinas? *

- ◯ Sim
- ◯ Não
- ◯ Talvez

Por favor deixe neste espaço os seus comentários ou informação adicional que considere relevante.

Your answer

Consentimentos: *

- ☐ Autorizo a que me contactem face a assuntos relativos a este programa.
- ☐ Autorizo a que me adicionem à newsletter do programa.

Annexe 5 – Launch of CRE in the Ministry of Education website

8 Set. Lançamento do Programa "@ Cientista Regressa à Escola" no Dia Internacional da Literacia (8 de setembro de 2021)

E se cada aluna/o em Portugal pudesse dizer "Eu já conheci um/a cientista"?

No dia em que se comemora o Dia Internacional da Literacia, a Native Scientist lança um programa educativo em Portugal com o intuito de reduzir desigualdades de acesso à ciência, contribuir para o enriquecimento curricular na área das ciências e promover o ensino superior junto dos estudantes mais novos.

A iniciativa surge na sequência da expansão da Native Scientist (www.nativescientist.com) em Portugal, originalmente fundada por duas investigadoras portuguesas no Reino Unido, e visa fomentar a literacia e a cultura científica na sociedade portuguesa, aproximando a ciência da sociedade e ancorando o projeto a conceitos tão importantes como a humanização da ciência e a educação circular.

Com o nome "@ Cientista Regressa à Escola" (www.cientistaregressaescola.pt), o novo programa de enriquecimento curricular dá às alunas e alunos do 4.º ano de escolaridade a oportunidade, única e inesquecível para muitas/os, de conhecerem e interagirem de perto, durante um dia, com um/uma cientista nas suas escolas.

Os docentes do 1.º ciclo, as direções de agrupamentos e/ou os municípios interessados em acolher este programa e receber cientistas devem aceder ao *website* www.cientistaregressaescola.pt e registar-se no formulário disponível para o efeito. Segundo as fundadoras do projeto, qualquer

conhecerem alguém que é cientista e aprenderem, de uma forma vivida, novos conceitos e vocabulário através da interação direta com um profissional das ciências.

O programa visa combater a baixa literacia científica e a desigualdade de acesso à ciência, estando por isso alinhado com os interesses nacionais e as metas do desenvolvimento sustentável estabelecidas pelas Nações Unidas para 2030 e conta com o apoio do Ministério da Educação, através da Direção-Geral da Educação.

Para mais informações contactar joana.bordalo@nativescientist.com

ou visitar *website* ou redes sociais:

- www.cientistaregressaescola.pt
- handle@cientistare
- www.facebook.com/cientistare
- https://www.linkedin.com/company/cientistare
- https://twitter.com/CientistaRE

Annexe 6 – Launch of CRE in Fulbright newsletter

Procura leitura para o seu fim de semana?
Fique a saber o que os(as) Fulbrighters escreveram, disseram ou fizeram ao longo dos últimos dias.

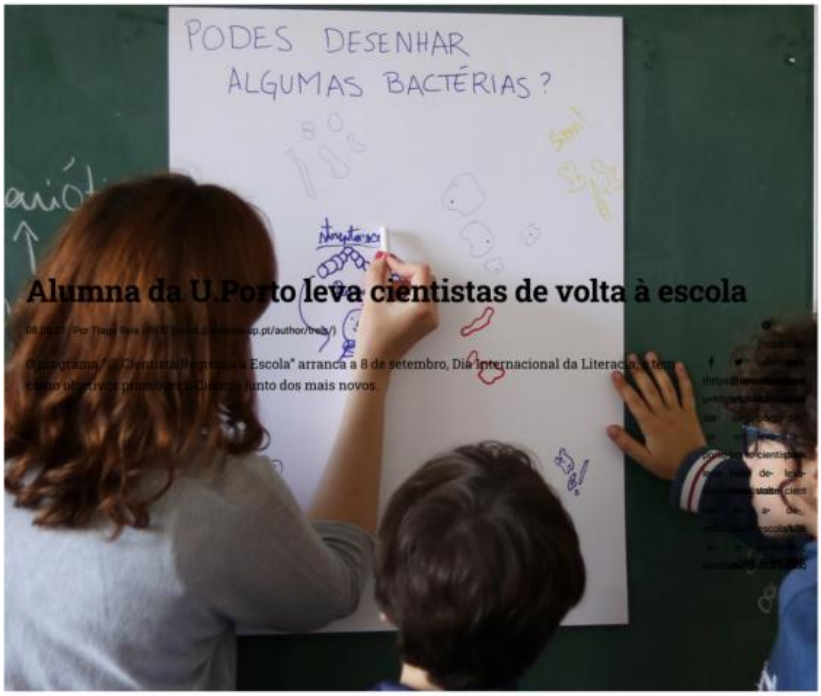
Joana Bordalo inaugurou o programa "**@ Cientista Regressa à Escola**" no Dia Internacional da Literacia, 8 de setembro. Esta iniciativa tem como objetivo reduzir as desigualdades de acesso à Ciência e promover o Ensino Superior junto dos estudant@s mais novos. Enquadra-se ainda no plano de atividades da organização sem fins lucrativos *Native Scientist*, que visa promover uma educação científica de maior qualidade e mais humanista.

Gostaria de regressar à sua escola primária? Aceite o desafio: «para participar no programa como cientista basta fazer investigação em qualquer área do conhecimento, numa instituição científica nacional ou internacional, e ter frequentado o 1º ciclo do Ensino Básico em Portugal. Uma vez recebidos os registos de cientistas e docentes através do website do programa, o emparelhamento entre cientistas e docentes será feito pela equipa e comunicado atempadamente por email aos registados. Todas as pessoas inscritas e emparelhadas terão formação, bem como apoio logístico necessários à realização das oficinas.».

Saiba mais, aqui: «www.cientistaregressaescola.pt».

Esta iniciativa faz parte ainda do plano de trabalhos da bolseira, que ao abrigo de uma **Bolsa Fulbright com o apoio da FLAD** se encontra na *University of Illinois at Urbana-Champaign*, IL, EUA, a desenvolver um estudo por forma a averiguar se "**@ Cientista Regressa à Escola**" é viável noutros contextos socioculturais.
Muitos Parabéns, Joana, pelo excelente trabalho!

Annexe 7 – Launch of CRE in University of Porto website



Alumna da U.Porto leva cientistas de volta à escola

O programa "@ Cientista Regressa à Escola" arranca a 8 de setembro, Dia Internacional da Literacia, tem como objetivos promover a literacia junto dos mais novos.

Lançado esta quarta-feira, 8 de setembro, Dia Internacional da Literacia, este novo programa de enriquecimento curricular – que conta com o apoio da U.Porto – assenta numa premissa tão simples quanto inovadora: **"dar aos alunas e alunos do 4.º ano de escolaridade a oportunidade, única e inesquecível para muitas/os, de conhecerem e interagirem de perto com um/a cientista"**.

Na prática, o foco passa por "aproximar crianças e cientistas, promovendo o regresso destes à sua escola primária, à sala de aula onde aprenderam o ABC e o 1+1 são 2". Para o efeito, cada cientista participante é desafiado a visitar a sua escola primária durante um dia inteiro e partilhar, de forma lúdica e interativa, conceitos científicos relacionados com o seu trabalho.

"Queremos levar a ciência aos finalistas do 1º ciclo do ensino básico"

Ao criarem este programa, Joana Moscoso e as restantes fundadoras do projeto (Joana Bordalo e Matilde Gonçalves) assumem como objetivos fomentar a literacia e a cultura científica na sociedade portuguesa, aproximando ao mesmo tempo a ciência da sociedade e ancorando o projeto a conceitos tão importantes como a humanização da ciência e a educação circular.

"Há estudos e relatórios que indicam que muitas alunas e alunos perdem o interesse pela ciência ou catalogam a ciência como "difícil" muito cedo no seu percurso escolar, por volta dos 10 e os 12 anos. Por isso, queremos levar a ciência aos finalistas do 1º ciclo do ensino básico", explica Joana Moscoso,

"O objetivo é que alunas e alunos sintam a utilidade e a relevância da ciência desenvolvida por pessoas que já foram crianças 'como elas e eles' e 'até' frequentaram a mesma escola", acrescenta a investigadora e cofundadora da Native Scientist (https://www.nativescientist.com/),

O *@ Cientista Regressa à Escola (http://www.cientistaregressaescola.pt/)* surge, de resto, na sequência da expansão da empresa sem fins lucrativos criada em 2013, no Reino Unido, por Joana Moscoso (ver percurso abaixo) e outra investigadora portuguesa. A missão da Native Scientist passa por criar pontes entre crianças e cientistas, reduzir desigualdades e promover o ensino superior.

Como participar?

Para participar no *@ Cientista Regressa à Escola* (https://www.cientistaregressaescola.pt/cientistas), os cientistas interessados terão de fazer investigação em qualquer área do conhecimento, numa instituição científica nacional ou internacional, e ter frequentado o 1º ciclo do Ensino Básico (isto é, a escola primária) em Portugal.

"Uma vez recebidos os registos de cientistas e docentes através do website do programa, o emparelhamento entre cientistas e docentes será feito e comunicado atempadamente por email aos registados. Todas as pessoas inscritas e emparelhadas terão a formação e o apoio logístico necessários à realização das oficinas", explica Joana Moscoso.

Alicerçado numa lógica de sustentabilidade, o programa junta crianças e cientistas da mesma terra natal e pretende alargar o seu alcance todos os anos até todas as turmas do 4º ano poderem participar anualmente. Para tal, a adesão de cientistas e docentes é essencial. No primeiro ano, o programa pretende contar com a participação de cerca de 750 estudantes e perto de 15 – 30 cientistas e docentes. Com o evoluir do projeto, para chegar a todas as turmas do 4º ano o programa prevê contar com o envolvimento de cerca de 4 mil cientistas anualmente.

Para as três fundadoras do projeto, "são objetivos ambiciosos e arrojados, mas acreditamos que com boas parcerias e com o apoio da sociedade portuguesa os podemos alcançar."

Annexe 8 – Launch of CRE in Centro de Línguas da Universidade NOVA de Lisboa (CLUNL) website

New project: @ Cientista Regressa à Escola

The educational programme **@ Cientista Regressa à Escola** is an inspiring project designed to promote scientific literacy and equal educational opportunities in Portugal.

Aimed at children aged 6 to 12, this project's mission is to strengthen the relationship between Science and Society, promoting the return of Portuguese scientists to the elementary schools they attended to conduct dynamic and didactic science workshops, inspiring the next generation through the Portuguese language and their example.

Integrated in the international network of scientists Native Scientist, the project contributes to the Sustainable Development Goals, namely, in the access to quality education (goal 4), gender equality (goal 5), decent work and economic growth (goal 8), and reduced inequalities (goal 10).

@ Cientista Regressa à Escola is part of the Clinton Foundation initiative and the team is promoting the collaboration with other institutions and entities.

Matilde Gonçalves, researcher at CLUNL, is a co-founder and coordinator of the project, with Joana Bordalo (student of Science Communication at NOVA FCSH) and Joana Moscoso (chair of Native Scientist).

Discover this project at: https://www.cientistaregressaescola.pt/

Matilde Gonçalves
New Project Coordinator

native scientist

Annexe 9 – Monthly profile: Dr Amy Cash

MONTHLY PROFILE

Amy Cash-Ahmed is a Research Laboratory Manager at IGB, where she manages Dr. Gene Robinson's laboratory.

Amy Cash-Ahmed

Research Laboratory Manager, Robinson Lab

Originally from Farmer City, Illinois, Amy Cash-Ahmed was always passionate about animals, and by the time she was six years old, she wanted to become a veterinarian. She had a high school teacher who inspired her to pursue her undergraduate studies in biology. "Plus, I've always had a love for animals, so I knew going into college that I wanted to do biology," she said.

Eventually, during undergraduate school, her ambitions to become a veterinarian changed into becoming a researcher. She fell in love with honey bee work developed by one of her teaching assistants who was working in Gene Robinson's lab. She started to do undergraduate research in the same lab. Cash-Ahmed shared with enthusiasm: "I loved it all: the molecular biology, the bees, the research. I also loved working in the outreach events. Those experiences set the tone for the rest of my career."

Cash-Ahmed received her PhD in molecular biology in 2012, from Indiana University. Since she has always been a fan of the Midwest, when there was an opportunity for her and her husband to start their careers in Champaign-Urbana, "We jumped at that chance as we love it here since it just feels like home," she said. Cash-Ahmed continues working directly with honey bees.

"They're fascinating. They are tiny creatures that exhibit amazing behaviors and tasks in the hive and are important to agriculture," Cash-Ahmed explained. "They are also really cool organisms to get other people excited about science," she said. She went on to explain how working with honey bees is an easy way to introduce people to animal behavior, as they are generally interested in what goes on in honey bee colonies.

"I truly love mentoring, and I love getting other people excited about science."

Amy is passionate about mentoring students and doing science outreach. You would be hard-pressed to find such an enthusiastic mentor - "I truly love mentoring, and I love getting other people excited about science," she explained.

In her workplace, besides doing research, Amy is a mentor for students of different age groups including high school students, undergraduate students, PhD students, and even postdoctoral research scientists. Her goal is to help and support all these students, not only with their hands-on work in science but also with their life goals, including what they want to do with their lives and careers.

For her, Champaign-Urbana is the perfect place for a work-life balance. "I love my job, I love the research, I love working with honey bees and this is also a great place for my kids to go to school and it's safe," she explained.

When she is not at the IGB, Cash-Ahmed spends a lot of time with her husband and their six- and eight-year-old kids. However, during the Covid-19 pandemic, it has been a struggle. "Balancing work and family and trying to do it safely," has been her biggest career challenge. Nevertheless, they spend time riding bikes, going to beaches, kayaking, and hiking. ■

Written by Joana Bordalo.
Photo by Jessica Quicksall.

Annexe 10 – Monthly profile: Dr Sheng Wang

MONTHLY PROFILE

Sheng Wang is a Research Assistant Professor at the Department of Natural Resources and Environmental Sciences (NRES) and a Research Scientist at the Agroecosystem Sustainability Center (ASC) at the Institute for Sustainability, Energy, and Environment (iSEE).

Sheng Wang
Research Assistant Professor

When chatting with Sheng Wang, you instantly feel his passion for research. As an environmental scientist working on bioenergy crop monitoring, he takes pride in his work knowing that his research efforts contribute to tackling environmental concerns such as climate change and increased carbon emission. Wang's inspiration to pursue environmental science stemmed from the natural surroundings in his hometown.

Originally from Southwest China, Wang grew up in a mountain city called Chongqing with the Yangtze River, the largest river in China, flowing through. Surrounded by mountains, water, and gorges, Wang became fond of nature and its beauty. "My hometown has one of the best primaeval forests of the same latitude in the world and is also close to the giant panda habitat," he said. "This also motivated me to explore nature."

After completing his BS in Geography at Nanjing University, Wang moved to Europe, in his first international experience of studying abroad. He received his double masters degree in Geography and in Water and Environment, a cooperation between the Chinese Academy of Sciences, in China, and the University of Copenhagen, in Denmark. After that, he developed airborne sensing systems to monitor willow bioenergy plantations at Risø National Laboratory for Sustainable Energy and received his PhD in Environmental Engineering from the Technical University of Denmark. "As an environmental enthusiast, I really like the Nordic lifestyle of cycling to work. I also like Copenhagen, which has strong ambitions to become the world's first carbon-neutral city by 2025," Wang said.

In the same year, Wang continued to travel the world and familiarize himself with different cultures, moving to UIUC in 2019. "I was attracted to the advanced research in biology, agriculture, and computer science here at the University of Illinois," Wang said. "The University of Illinois is a good environment for collaborating with students and professors on interdisciplinary research." Here, he continues working as a research scientist in Kaiyu Guan's (CABBI) lab where he works at the interface of biology, ecology, artificial intelligence and agro-ecosystems. "I enjoy working with great scientists here like Dr. Kaiyu Guan and Dr. Lisa Ainsworth (CABBI/GEGC). They always give great inspiration to my research," Wang said.

Specifically, his research focuses on "leveraging satellite and airborne remote sensing technology along with artificial intelligence for monitoring large-scale bioenergy crop traits, soil properties, and farming management practices for sustainable agriculture in the US Corn Belt, the food basket of the world." Wang's approaches are used to address how climate and human practices affect bioenergy crop nutrients, productivity and ecosystem functioning.

"在不同国家学习工作，
这让我非常幸运体验到了不同风土文化。"

"I'm quite lucky I could experience different cultures since I used to work and study in different countries around the world."

"I am very enthusiastic about disseminating our research to the public to improve public awareness of climate change, environmental sustainability and carbon issues," Wang said. "It's important that we raise awareness for environmental concerns through outreach and dissemination events."

Most recently, Wang participated in the first year of the newly-formed Young Innovator Program, a collaboration between the Catherine and Don Kleinmuntz Center for Genomics in Business and Society and the IGB. The program challenged trainees to become innovative leaders in their fields by bringing their science to society, culminating in a final presentation that highlighted a real-life problem and its solution.

When asked about his participation in the Young Innovator Program, he described it as "an amazing experience that other IGB postdocs and graduate students should also experience. I learned a lot of knowledge on how to make market sizing surveys, how to file IP and protect innovations, and how to link our current research with societal potential," he said. "I am thankful to Dr. Catherine Kleinmuntz, the Kleinmuntz Center, and the IGB for this opportunity."

When asked about the pandemic, Wang mentioned having to adjust his work style. "During the beginning of the pandemic, everything changed and we had to work from home. My research was affected because we were short-handed at that time and so we didn't have a lot of people who could go to the field to collect data," he said. Wang found himself jogging more often after realizing how "we are always working from home with very limited physical exercise."

"The pandemic gives us a brief lesson on how anthropogenic activities influence global society," Wang said. "We need to not only be aware of climate change but try to reduce our carbon footprint and make our environment more sustainable by developing new technology for renewable energy. In my hometown, we have around 80% of the energy coming from renewable hydropower. Renewable energy technology, for example bioenergy, is very important for the future of humankind." ■

Written by Joana Bordalo and Alisa King-Klemperer. Photo by Sheng Wang.

Annexe 11 – Newsletter invitation to scientists to participate in the focus group

The Communications and Outreach Office is inviting scientists (who attended elementary school in the US) to take part in a Focus Group Session that will be conducted as part of a research project related to science enrichment programmes in Europe and the US.

The focus group takes about 2 hours with a coffee break in the middle, it will take place in IGB on the first week of October and will be audio recorded.

The goal is to have your insights, ideas, values, needs and expectations discussed there. No prior or subsequent work is needed, just be present and share your own views!

Please contact joanab@illinois.edu if would like to contribute to this project. Thank you in advance.

Annexe 12 – Email invitation to scientists to participate in the focus group

Subject:

Invitation to participate in a Focus Group | Communications and Outreach Office

Body:

Dear *(scientist name)*,

My name is Joana Bordalo, and I am a Fulbright Visiting Student from Portugal, currently working at the Communications and Outreach Office of IGB.

I am developing a research project in the fields of Science Education and Science Communication, especially related to science enrichment programmes in Europe and the US.

I invite you to take part in a focus group I am conducting as part of that research project.

The focus group takes about 2 hours with a coffee break in the middle. The session will be audio recorded so that anonymized comments and feedback can be analysed. The goal is to have your insights, ideas, values, needs and expectations discussed there. No prior or subsequent work is needed, just be present and share your own views!

You will get to know more about an educational program that aims to connect scientists with their childhood communities and schools to engage in outreach and you will be asked to share your views related to developing a like-minded science enrichment program here in the US. Because of the nature of this topic, I am seeking researchers who attended elementary school in the US. Your contribution is highly valued!

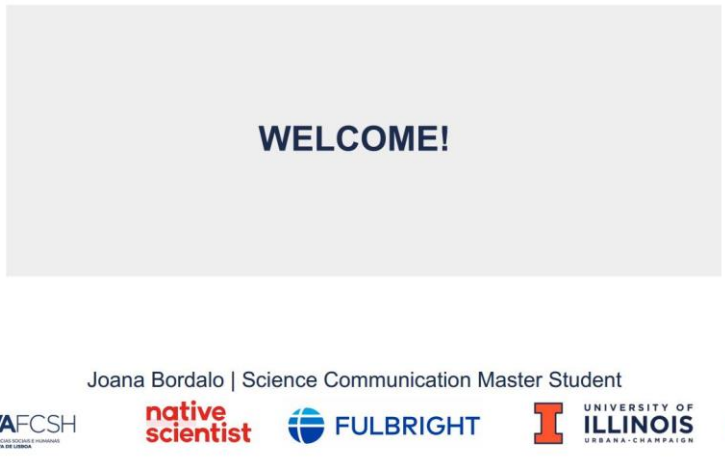
Please do let me know if you would like to contribute to this small case study. The focus group will take place in the first week of November.

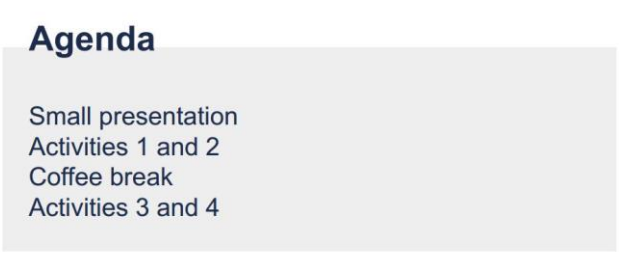
Thank you so much in advance!

Looking forward,

Joana Bordalo

Annexe 13 – Focus group Presentation





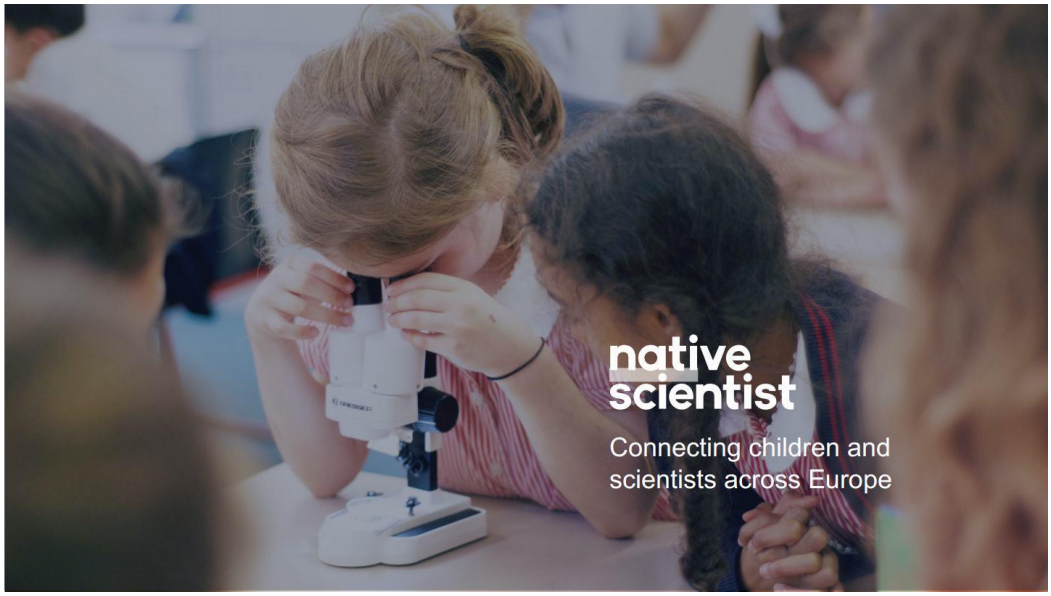
Focus Group

Group discussion about a given topic

Several activities: individual, small groups, plenary

Use of visualizations, post-its, markers, stickers

All your opinions are **valuable**, there are no wrong points of view!
It is **your view** and opinion that counts.



8 years of experience

tackling inequality in education
celebrating diversity in science and education
training scientists in science communication and outreach
promoting scientific literacy
creating social impact

native scientist

native scientist

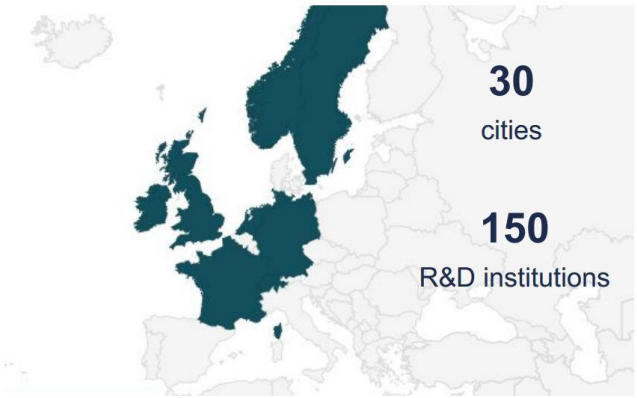
230 schools

9 countries

5 500 children

1250 scientists

native scientist



30 cities

150 R&D institutions

native scientist

Joana Bordalo
Science Communication

Gil Costa
Science & Design

Joana Moscoso
Social Entrepreneurship

Ricardo Marvão
Fundraising

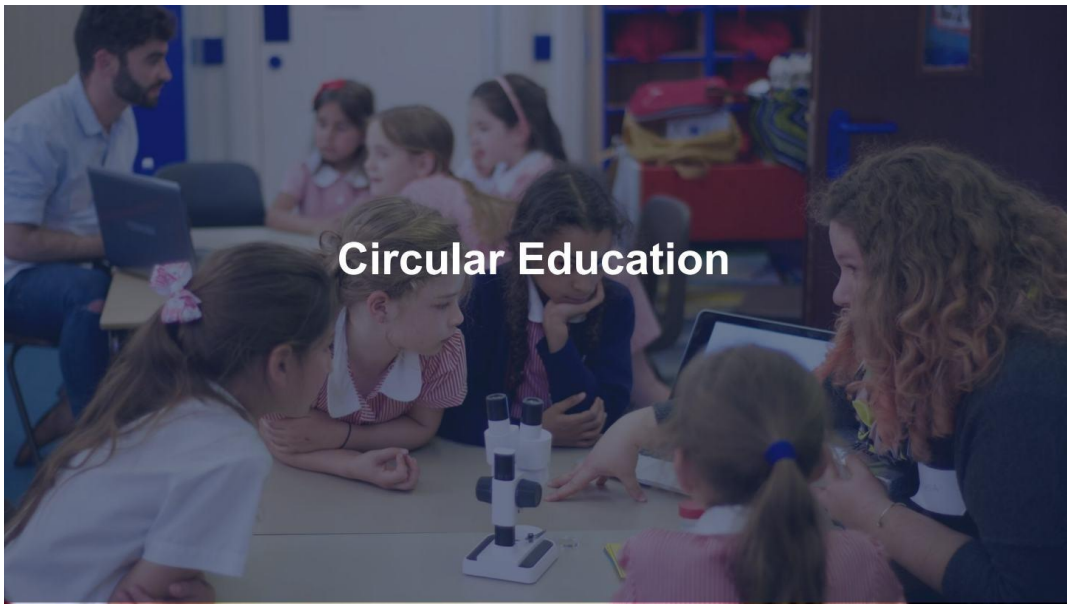
Matilde Gonçalves
Scientific Literacy

native scientist

www.cientistaregressaescola.pt

cientista regressa à escola

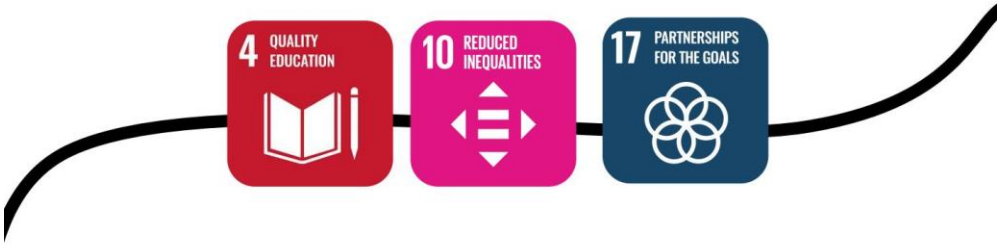
Translated to English as “Scientists Return to School”



Unique Program

Easy to organise	Promotes the interaction of **students** with **scientists**	**Local action** that can scale **nationally**

Aligned with the SDGs



Mission and Vision

VISSION

Close the gap between children and scientists so that every school student can say "**I have met a scientist**".

MISSION

To broaden the horizons of school children by promoting **scientific literacy** through an innovative concept of circular education.

Partners

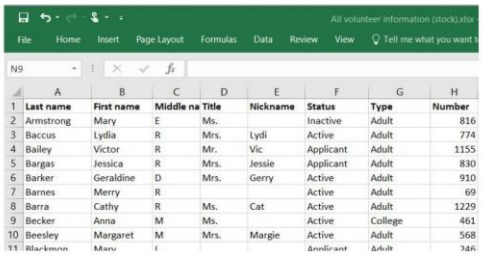
1. Create a legal entity

2. Create a website, registrations forms and social media platforms

3. Collect interest

PARTICIPAR

4. Match scientists-elementary schools



	A	B	C	D	E	F	G	H
1	Last name	First name	Middle na	Title	Nickname	Status	Type	Number
2	Armstrong	Mary	E	Ms.		Inactive	Adult	816
3	Baccus	Lydia	R	Mrs.	Lydi	Active	Adult	774
4	Bailey	Victor	R	Mr.	Vic	Applicant	Adult	1155
5	Bargas	Jessica	R	Mrs.	Jessie	Applicant	Adult	830
6	Barker	Geraldine	D	Mrs.	Gerry	Active	Adult	910
7	Barnes	Merry	R			Active	Adult	69
8	Barra	Cathy	R	Ms.	Cat	Active	Adult	1229
9	Becker	Anna	M	Ms.		Active	College	461
10	Beesley	Margaret	M	Mrs.	Margie	Active	Adult	568

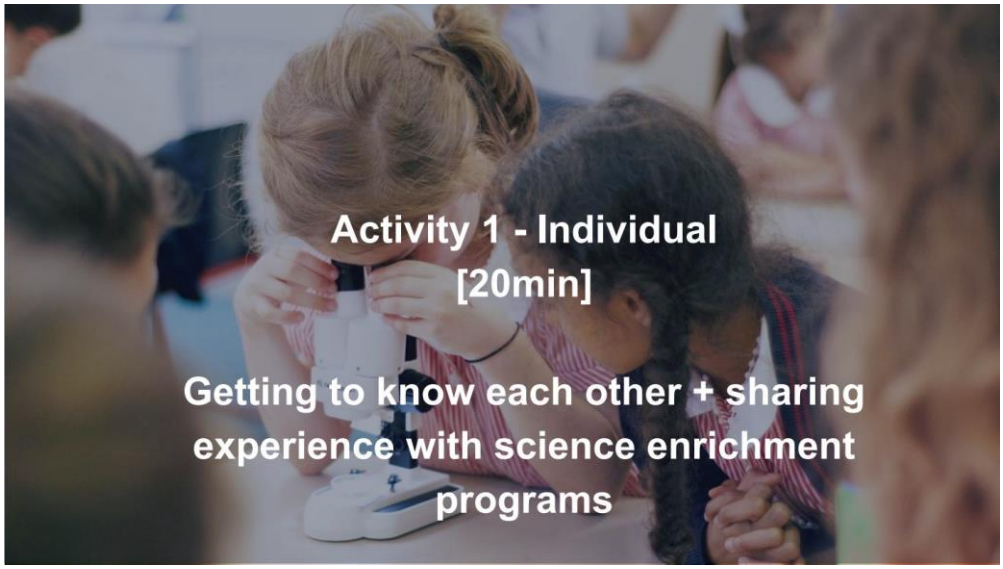
5. Make invitations and establish the sponsor

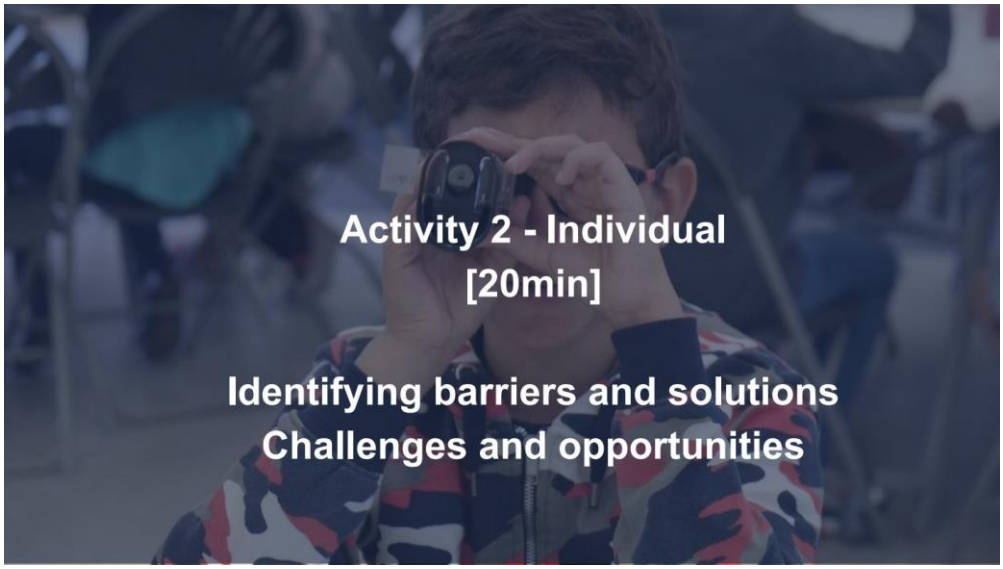
6. Train the scientists on scicomm (mentor induction)

7. Deliver a unique 60-minute workshop to students from the scientist's homeland.

Pilot event

How could we do it in the US? What would be the format?



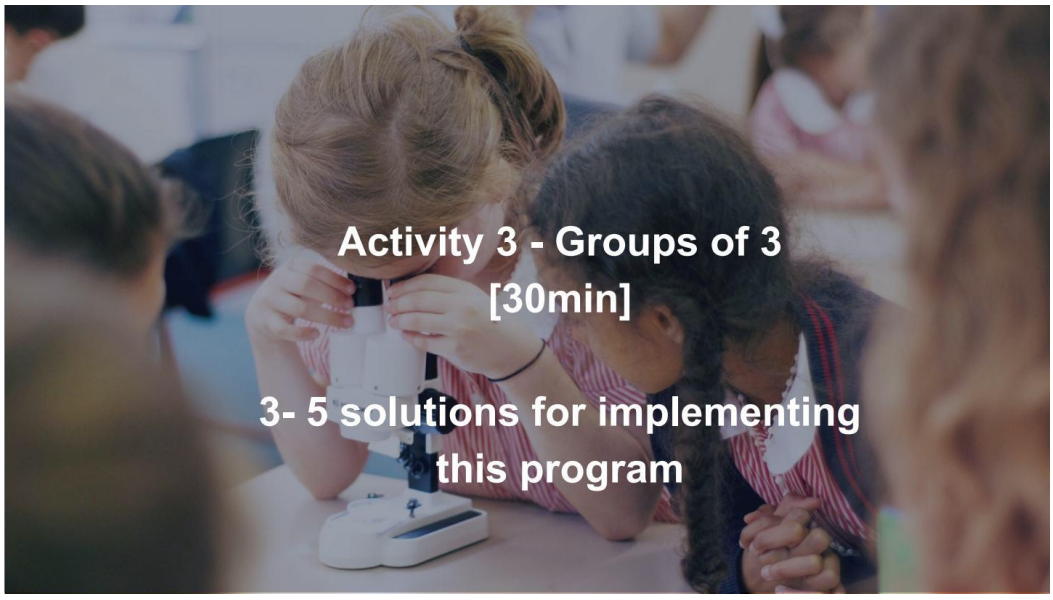


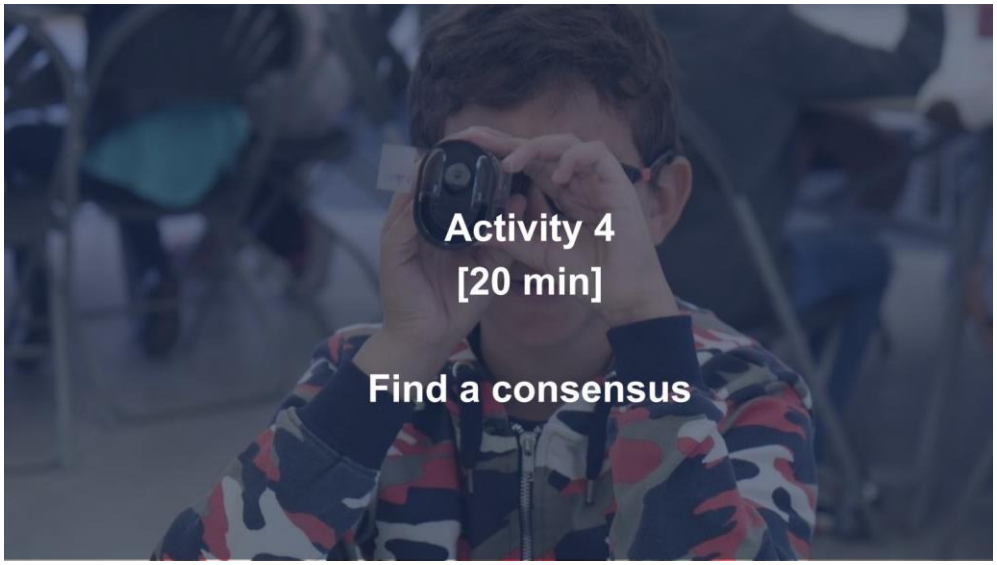
Activity 2 - Individual
[20min]

Identifying barriers and solutions
Challenges and opportunities

Barrier/Challenge/Obstacle	Solution/Opportunity

Coffee Break!
[10min]





Thank you !

Annexe 14 – Participants' feedback questionnaire about the Focus Groups

Focus Group Feedback

Thank you very much for being willing to collaborate in the Focus Group. This feedback form is anonymous and takes approximately 2 minutes to fill.

The duration of the session was: *

- ◯ Short
- ◯ Adequate
- ◯ Too long
- ◯ Other: _____

Regarding the Focus Group, what do you think of: *

	Totally Disagree	Disagree	Neutral	Agree	Strongly Agree	.
I had the opportunity to express my opinion.	◯	◯	◯	◯	◯	◯
I got to know a new Science Enrichment Program.	◯	◯	◯	◯	◯	◯
The recommendations suggested by the group were adequate.	◯	◯	◯	◯	◯	◯
The moderator conducted the session well.	◯	◯	◯	◯	◯	◯
I would like to participate/implement in a like-minded science enrichment program.	◯	◯	◯	◯	◯	◯
The materials used in the session were adequate.	◯	◯	◯	◯	◯	◯

Regarding this focus group, what do you think worked well? *

Your answer

What didn't go that well? *

Your answer

Is there any question related to the topic discussed that were not addressed? If so, which ones?

Your answer

Please add any comments you may have here.

Your answer