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Science is for everyone

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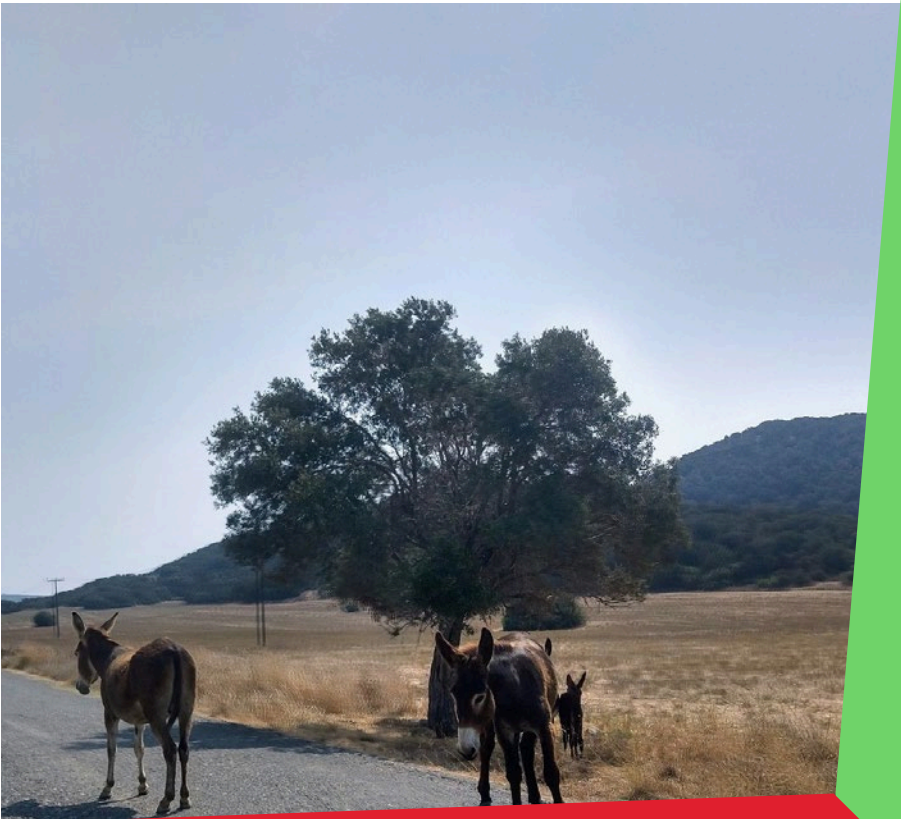
university of
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Prof. dr. L. Avraamidou

Science is for everyone

Possible futures, possible selves



Inaugural Lecture

15 September 2023



Science is for everyone – Possible futures, possible selves

Science is for everyone

Possible futures, possible selves

Inaugural lecture by

Prof. dr. L. Avraamidou

15 September 2023

On acceptance of the post of professor of

Science Education

at the

Faculty of Science and Engineering

University of Groningen



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**Members of the Board of
the University, colleagues,
students, friends, and families,**

Science is for everyone: possible futures, possible selves

It is a real privilege to have this opportunity today to reflect on my work, with all of you, near and far, in person in Groningen and behind the screen in different parts of the world. Thank you for being here or there.

I would like to open my lecture with a brief video:

Inspire her mind

<https://www.youtube.com/watch?v=QZ6XQfthvGY>

Who is my pretty girl?

Sammy sweetie, don't get your dress dirty

Sam honey, you don't want to mess with that. Let's put it down

Samantha, this project has gotten out of control

Hey, careful with that!

why don't you hand that to your brother?

Our words can have a huge impact.

Isn't it time we told her she's pretty brilliant too

to encourage her love of science and technology

and inspire her

to change the world

Verizon, Inspire her mind campaign, 2014

What did you see in this video? Did you see yourself as a parent? Past, future, imagined? Did you see yourself as a parent who says to their children in different ways, at times, unintentionally ‘science is for you’ or science is not for you? Did you see yourself as a young boy being supported by your parents to engage with science? Or perhaps, you saw yourself as a young girl whose parents said ‘science is not for you’ either through words or silence?

I chose to open my talk with this brief video because it showcases the essence of my research, which can be summarised in the following questions:

- Who is a scientist?
- Who can be a scientist?
- Who aspires to be a scientist?
- How do different people position themselves in science?
- And, perhaps more importantly: How are different people *allowed* to position themselves in science?

Through my research especially in the last ten years, I have engaged with the following questions through the construct of ‘science identity’ broadly defined as if and how people see themselves as science persons and if and how they are seen as science persons by others: their families, friends, teachers, students, colleagues and others.

Through this lecture, I aim to engage in an exploration of the questions I posed earlier through three stories: a) on time, b) on place; and, c) on self.

In doing so, I will reflect on the past, describe the present, and try to imagine the future. Despite the obvious goal of this lecture there exists one more: to share an invitation to all scientists to engage with the social, cultural, historical and dare I say political aspects of science, which is long due.

But, before I do that, I would like to briefly reflect on what's happening in the world, in order to set the context in which these questions might become meaningful.

Only 5 months ago, on May 3, the world health organization ended its declaration of the covid-19 global pandemic. As of July 25, 2023, the pandemic had caused close to 7 million confirmed deaths. By comparison, the population of Cyprus where I come from is a little over a million of people.

The mismanagement in different countries not only has not contributed toward addressing the disastrous consequences of the pandemic, but in fact, it became part of the disaster. Parallel to these challenges, we witnessed a rise of anti-science and so called “alternative facts” movement: pseudoscience, fake news, conspiracy theories and hostile fantasies that undermine

scientific evidence. Quite often we became witnesses of the inability of both politicians as well as the general public to critically utilise scientific evidence.

This is not to say that non-scientists are actually not capable of understanding or engaging with science. This is to say that we, as educators and researchers have failed to support them in doing that.

Another example of this problem is an understanding of the magnitude and urgency of climate change. Two days ago, thousands of people were killed and at least ten thousand are still missing in Libya in floods caused by a huge Mediterranean storm.

This past summer we witnessed the highest ever temperatures in the history of human kind. Southern Europe is literally on fire. And the NL, what can I say other than I do not remember ever wearing short sleeves for so many days in a row.

The thought that this was actually the coolest summer that I will experience until the rest of my life scares me. But what scares me more than that are the quick patches solutions, the mono-disciplinary research approaches, as well as the lack of engagement with our students and the public on a challenge, or more precisely a global emergency, upon which our lives depend on.

Through my work, I have argued that science education in general and science identity in particular has a crucial role to play in addressing three goals directly connected to these issues.

- a. First, science education can promote scientific literacy and active scientific citizenship, as for example, the decision to wear a mask or vaccinate to protect if not ourselves, others.
- b. Second, science education can promote goals related to policy as well as public engagement with science. An example of that is to actively support citizens, through resources and incentives in making more sustainable choices in their everyday lives: riding bicycles, driving electric cars, eating less meat, buying locally, dressing up in sustainable clothing.
- c. Third, science education can promote goals related to equality and equity especially in terms of access to educational resources and opportunities to engage with science. Why is this important? Because not everyone has access or the same access to scientific knowledge and scientific resources. Factors like the place where we happened to be born, our parents' socioeconomic background or migration history, and even our gender sometimes, determine the kinds of opportunities we have to education and scientific knowledge.

And, this is precisely why science identity is important and especially an exploration of the questions of who is a scientist, who can be a scientist, and who aspires to be a scientist.

These questions are directly connected to the title of my talk:
science is for everyone or more precisely: science *has to be* for everyone.

POSSIBLE SELVES, POSSIBLE FUTURES

In my title I also use the terms: possible selves, possible futures.

When I use the term **possible selves**, I refer to the possibility of becoming scientifically literate and critical in ways that enable us to utilise scientific knowledge in our everyday lives and essentially improve the quality of our lives as well as the planet. What do we eat? What do we wear? What we do with our bodies? What do we do with animals? What we do with plants? What we do with water? What we do with land?



Possible selves

- What do we eat?
 - What do we wear?
 - What do we do with our bodies?
 - What do we do with our animals?
 - What do we do with plants?
 - What do we do with water?
 - What do we do with land?
-

When I use the term **possible futures**, I refer to more sustainable and socially just futures. When I think about the future, I think about developments in science, technology, and society as well as interactions between humans, non-humans, and more-than-humans. People, animals, plants, machines, and robots.

When I imagine the future, I imagine of healthier and more balanced relationships with our natural habitat as well as social environments. And when I think about how possible futures can be imagined and shaped, I think about the crucial role that science education has to play.



Eagle with a drone,
Politie Nederland, 2016.

Possible futures

Healthier and more sustainable relationships with our natural habitat and social environments

With this as a basis, I will now move forward to narrating three stories. In sharing these three stories, I am hoping to showcase not only what kinds of questions I explore throughout my research, but also how I position myself in my work, and how different people, places, and events have shaped and will continue to shape my research.

On TIME

On PLACE

On SELF

STORY 1: ON TIME

When we talk about time we talk either about conventional time or psychological time. The conventional time is measured by physical clocks. It can be measured in seconds, minutes and hours. But, perhaps most importantly, it can be measured in stories or experiences. It is precisely these stories and experiences in relation to science, science engagement, science teaching and learning, that I have explored through my work.

However, there is also a more psychological kind of time, as when we refer to the phrases such as “time flew by” or “that seemed like forever”. Indeed, the past 20 years have flown by. I went from being a PhD student in Pennsylvania in the US working with the most amazing mentor, a postdoc researcher in London, a teacher educator in Cyprus and in the past 7 years a research team leader and director of the Center for Learning and Teaching in Groningen.

While a lot of things changed throughout this time, for example, more and more grey hair and tattoos, a few things have remained constant: specific past experiences continue to shape my own science identity as well as my research: a childhood that focused on free play outdoors and experimentation with things like lemons, bicycles, and frogs as pets where my interest in science started to develop.

Schooling that provided various opportunities to engage with science as well as to interact with people that without even realising served as role models, helping me in imagining a possible self as a scientist. People who said: *you can do it, why not, and why not you?*

Through my work I've been interested in finding out how different experiences and events that we have experienced as well as people that we have come across our lives, from childhood to adulthood, shape our interest in science, study choices, career choices and research choices: our science identities.

And one of the main findings of my work is that our interest, study and career choices in relation to science are determined at a very young age: starting at the age 6, we start forming ideas of what science is, who can be a scientist, and most importantly whether we could be scientists.

Through these research findings, **time serves to illustrate the historicity and continuity of science identity.** Or, how the past, the present and the future are not linear but intertwined. How past experiences have shaped who we are in relation to science, if science is for us, how we engage (or not) with science in the present, but also how we see ourselves in the future: as citizens, as parents, as teachers, as researchers.



Experimenting
with science,
age 5.

Time

Time serves to illustrate the historicity and continuity of science identity.

- How the past, the present and the future are not linear but are intertwined
 - How past experiences have shaped who we are in relationship to science in the present, but also how we see ourselves in the future: as citizens, as parents, as teachers, as researchers.
-

STORY 2: ON PLACE

For me, the construct of place, both geographical and cultural, has been central in the making of my multiple identities, through different geographical movements and various border crossings, both literal and metaphorical.

I come from a refugee family in Cyprus and the border in Nicosia is something I've been trying to understand throughout my life. Why does it exist? What purpose does it serve? Why can I cross it but others cannot?

So, the concepts of mobility, migration, identity, and place are central to who I am and they also feature centrally in my current work: I am interested in the mobilities as well as the border crossing that people have to make in order to engage with science.

As illustrated in my work, becoming a scientist is dependent on the complex mixture of political, social, cultural, and personal relationships which are influenced by the demographics, the politics, and the overlapping of different power structures within a specific landscape. Put simply: a lot of good or bad luck of being born in specific geographies.

For example, in some places of the world, laboratories are not open to women, in other places of the world, laboratories are not accessible by people using wheelchairs or education is not accessible to students who are visually impaired.

For higher education, a sense of place becomes of value when designing programs of studies as it focuses on the importance of students building relationships with their surrounding communities and local natural resources. Place-based pedagogies bring to the forefront local histories, knowledge, stories, and languages and highlight the importance of cultural diversity in both science and education.

However, despite this potential of place for higher education, place-based pedagogies currently remain at least in this part of the world, largely unexplored and absent from the higher education discourse. Instead, the current higher education system and programs of studies place a strong emphasis on standardization and follow an “anywhere and anytime” general approach by establishing standards that would enable students to compete for a global economy. The problem with this is that the diversity of cultural places is lost and students’ relationship with local communities and environments is marginal, uninteresting, and unimportant.

In my research, **place serves to illustrate the importance of the sense of belongingness in science and how different localities and cultural environments shape science identity.**



Tulips in Cyprus in January.

Place

Place serves to illustrate the importance of the sense of belongingness in science and how different localities and cultural environments shape science identity.

STORY 3: ON SELF

As you probably all know, we, humans are very self-centered, and our infatuation with our self begins from birth. Throughout our lives we devote lots of energy and time to the question of “who am I” and “who I want to be”. This is precisely what the construct of identity has been used to refer to: Who someone is and the ways in which they present themselves in everyday life in relation to science.

As shown in many studies, including mine, beginning in childhood, we start forming our science identities, which are shaped and re-shaped in different ways throughout our lives and filtered through our unique life stories.

But, the most important question for me is whether we are ever able to divorce our science identities from our other multiple identities? Is someone ever *just* a science person and not a science person, a mother, a grandfather, a working class, a transgender person, a Muslim, a Dutch, a Dutch Caribbean, a refugee, and so on and so forth?

Through my research, I have argued that it is important that we examine science identity not in isolation but in conjunction with our other multiple identities for the purpose of extrapolating a more comprehensive and intersectional image of a *whole self*. The experience that a Dutch male professor has when working

in the Netherlands or an Italian male professor working in Italy, is very different than the experience that an international female professor has, especially in the sciences, which remain male-dominated.

Now, this experience is even more different for Muslim women, for women with more complex migration backgrounds, for women of colour, for single mothers and so on. The science is the same, many would argue. Maybe. Though I would argue that science is never disconnected from the person, even if science is the same, the experience is never the same, and experiences do matter.

Experiences matter because they shape our sense of belongingness in science and consequently the process of becoming or unbecoming scientists or science persons.

The process of becoming a science person is fundamentally a negotiation between our desired identities and the ones assigned by others. An example of such negotiation is when I, as a student, say I love physics, but my failing grades and my teachers say: no, physics is not for you.

These negotiations are more prevalent for groups that are underrepresented in science as for example, women, ethnic and religious minorities or even people from lower socioeconomic

backgrounds. For under-represented groups, these identities are sometimes in conflict with each other due to existing systems of oppression, inequalities, systemic barriers, as well as social stereotypes, for example that boys are good in science and girls are good in language.

In my research, **science identity is explored through an intersectionality lens to examine how it intersects with other identities, as for example, gender, ethnicity, religion, migration and socioeconomic background.**



Military zone in Cyprus: displaced self

Self

Science identity is explored through an intersectionality lens to examine how it intersects with other identities, as for example, gender, ethnicity, religion, migration and socio-economic background.

CONCLUSION

There is still much to be understood about science education and how might an exploration of the social and cultural issues of science through the lens of science identity be used to promote goals related to inclusivity. We may never be able to fully understand the complexity and multiplicity of science identity and how it develops, but we can begin to challenge deficit understandings of how science is done, by whom, and for whom, which have contributed to producing exclusionary narratives about science as well as determining the kinds of identities that are allowed in science. Why? Because science is for everyone.

But, to actually make science for everyone, we must engage with the social, cultural, historical, and dare I say, again, political aspects of science, that have been long neglected in science education research.

And for higher education especially, in order to contribute towards imagining more sustainable and socially just futures, I think the first step is to redefine what educational success means with a focus on pedagogies of care and resistance instead of pedagogies for the economy. And to do that, we need to stop obsessing with neoliberal paradigms and rankings and instead invest in bringing about social change.

science (education) for social change:
teaching to change the world

As a final note: as most of you here know, in academia, there are no individual achievements: for some of us it takes a village to stand here. Thank you to everyone who supported me or challenged me in this journey, so far: students, teachers, colleagues, lifetime mentors, friends and multiple families: biological and chosen ones. I am very grateful.

Ik heb gezegd

Lucy Avraamidou is the the Director of the Center for Learning and Teaching and the Head of the Institute for Science Education and Communication at the Faculty of Science and Engineering. She received her Ph.D. in Science Education from the Pennsylvania State University in the USA. Upon its completion, she worked at King's College London and the University of Nicosia in Cyprus, where she was born and raised, before joining RUG in 2016.

Her research is associated with theoretical and empirical explorations of what it means to widen and diversify STEM participation in school and out-of-school settings through the lens of intersectionality. At the heart of the account of her work is an exploration of underrepresented groups' science identity trajectories and negotiations with the use of narrative and life-history methods.

