November 18, 2021

Joint response from early career voices to the OSTP ideation challenge: "The Time is Now: Advancing Equity in Science and Technology"

1. Title: Engaging early career voices in shaping a more equitable future for science and technology

2. Brief description: In order for your entry to be eligible you will need to include at least one of these topic codes in this field. Choose as many of them that apply to your idea!

This entry is focused on underrepresented racial and ethnic groups [URG]; institutional and academic settings [IAS] and community centered research, participation, and engagement [CPE] and details the views of early career voices on shaping a more equitable future for science and technology based on their published ideas.

3. Description:

Stating the problems: There are a number of barriers to equitable science and technology. In this response, we are covering findings from three independent, winning studies published in the *Journal of Science Policy & Governance (JSPG)* in 2021, focused on: the lack of access to science innovations by rural communities; the lack of access to scientific knowledge due to limited publications in non-English languages; and the lack of connection between S&T researchers and research funders and the stakeholders who are ultimately affected by the results of the research. Published issue: https://www.sciencepolicyjournal.org/jspgvol18iss03.html

Keywords (up to 3): Rural America; non-English publications; evaluation of science

Outlining the solutions: In a broad sense, to address the first issue, OSTP should develop a more coordinated federal investment to rural communities, and invest in inclusive approaches to science policy. To address the second issue, OSTP should create resources to keep track of diversity in publishing, and add a question to federal grants asking about languages other than English. To address the third issue, OSTP should draw up a framework by bringing stakeholders to evaluate particular research areas, including the general public and journalists, and provide them with online courses to evaluate research in different disciplines.

<u>Publication 1 background:</u> Inclusive Science Policy and Economic Development in the 21st Century: The Case for Rural America. The publication captures inclusive science policy and economic development, with a focus on rural America. Scientific research over the 20th century brought many benefits for society. But this innovation ecosystem is not accessible to everyone in the United States. (https://doi.org/10.38126/JSPG180302)

Problems: The overarching problem is the lack of access to science innovations by rural communities. This is manifested by difficulty for K-12 schools to administer or solicit grant funds, and the fact that rural-serving institutions have less administrative support to solicit and administer competitive federal grants.

Proposals: Suggestions for how these problems could be addressed include a more sustained federal investment in rural communities, greater coordination of rural developments at the federal level, simplified funding mechanisms for rural K-12 and higher education, and policy incentives to attract science and technology start-ups to rural communities.

Possible solutions:

- Creation of a centralized federal hub or training center for K-12 and colleges to receive more support with pursuing grant funds, and we could also reimagine grant requirements to make them more accessible for institutions/schools of varying types.
- Such a grant initiative could focus on sustained research and investment in particular based on a specific geography, which includes basic science but also research spin-offs, technology transfer, and development of a start-up ecosystem.
- Policy initiatives focused around mentorship and research culture could also be valuable, even in K-12 settings, and this would be a way to cultivate more social capital around research and grant funding for rural stakeholders.
- Focus on diversifying rural economies through efforts to link research funding to venture capital with a focus on rural locales. This would further support the full cycle of basic research all the way to commercialization, and would require further efforts to cultivate partnerships between different types of institutions with varying levels of resources, which could also drive networks of innovation.
- Design a research funding system that particularly focuses on science with a "community benefit," which requires a clear statement of project outcomes, transferability or scalability, and a connection to local or regional need in grant proposals.
- Overall shifts in competitive grant processes are required in order to foster more access from rural communities. One question to ask in this regard would be: in a competitive process, what traits are valued and how might these criteria inherently disadvantage certain communities?

Call to action: There should be a more coordinated federal investment to rural communities. It would be really interesting for OSTP to step into that space and invest more in inclusive approaches to science policy. Rural development could, in many ways, be reconceptualized, as science policy, or science policy, being an important facet of rural development could be really interesting. OSTP could link these threads together, and help deliver innovations that come from this investment into various geographic corners of the country.

Evaluating success: Success would be developing funding mechanisms for rural communities and evaluating their impact on increasing access to science.

Publication 2 background: A Call to Diversify the Lingua Franca of Academic STEM Communities. Science is better when more people can participate. In STEM academia, there is an enormous burden on individuals who do not speak English as their first language, including a financial burden to translate their works into other languages, if they are going a bilingual route. (https://doi.org/10.38126/JSPG180303)

Problems: The overarching problem is the lack of access to scientific knowledge due to limited publications in non-English languages. This problem causes quite a bit of homogeneity in science. But it is also detrimental to U.S. science, because not all of the world in science can publish in English.

Proposals: Suggestions for how these problems could be addressed include creating resources from OSTP to keep track of diversity in publishing, and add a question to federal grants asking about languages other than English. There should be structure from a top down level for hosting and translating science into different languages. Some of the specifics to consider include, how to choose which languages to translate into. There is also a critical point at which it becomes detrimental to be publishing in too many languages, and we cover this balance in the paper.

Possible solutions:

- There is already a precedent set by universities that allow dissertations in languages other than English, therefore other universities should follow suit.
- Create an interagency group at the government level that is synthesizing grant demographics and linguistic data, and further expand this type of analysis to accepting grant proposals in other languages. This measure would lower the barrier for ESL researchers to acquire federal funding. This is currently a barrier due to the lack of options to speak in conferences in different languages, subtitles or other methods could be added to increase this diversity.
- Requiring global communication and cooperation across countries can only be done with an inclusive conversation, therefore more efforts should be put into this idea.

Call to action: A proportion of federal grants that are given to researchers could go towards paying for translation services. Government agencies could negotiate better rates for people who are seeking translations for their papers. Translations are quite expensive, sometimes up to $10,000. Standardization for translations would be really excellent, in terms of ways to maximize resources and increase transparency. Demographics of science and language diversity in science is not well documented, and not well known. It would be really nice if there were dedicated resources to keeping track of this type of diversity. We propose adding a question to federal grants that asks about the language that researchers speak other than English. This would allow for evaluating this diversity over a longer period of time.

Evaluating success: Success on the second issue would be to include diversity language data in federal grants that we could track on a long term basis.

Publication 3 background: Ensuring Social Impact at Every Stage of Technology Research & Development. Publications are the fundamental backbone of science. As graduate students, we read a lot of papers, and recognize the value that some publications can provide to science advancement and society on a high level. Many of us want to have some kind of meaningful impact on the world, but often the results of research can seem somewhat divorced from the long term impact of science and technology. A large number of publications sit on the proverbial shelf after they're published, and never influence any kind of real-world developments. As such, when the average person thinks about the development of science and technology, they rarely consider the research process. (https://doi.org/10.38126/JSPG180305)

Problems: The overarching problem is the lack of connection between S&T researchers and research funders and the stakeholders who are ultimately affected by the results of the research. This is manifested in the lack of thorough evaluation of scientific knowledge due to exclusion of non-scientists in the process.

Proposals: My hope in the long term would be that by bringing different public stakeholders into judging research, that they'll be more aware of what it takes to actually produce some kind of science and technology innovation from the very beginning. And so doing, they'll understand and evaluate research better, and that research will be more responsive and attentive to their particular concerns. OSTP can draw up a framework by bringinging stakeholders together for particular research areas, such as the general public, journalists. Then also developing some online courses for these stakeholders to evaluate research in different disciplines.

Possible solutions:

- Science needs to do better to justify the funds that scientists receive. The broader impact section of grants may not be sufficient, and it is also read by other scientists and grant-reviewers who are not policy makers. As a consequence, ways in which the research will have a social impact is not often seen.
- Grant proposals should be evaluated by citizens and through other community-based participatory mechanisms, followed by surveys to assess whether the stakeholders had a good experience reviewing the proposals.
- Potential concerns may arise for particular types of research, or framing of a certain proposal that could have unintended ramifications. One such example is the intention of an armed robotic device is to protect the military, but this could also be used by police as a use of unwarranted force. This example illustrates how different groups can look at a proposal and see different things. For example, guns on robots may be seen as life-saving by the military, but black Americans may see them as a technology that police will use against them.
- Connect science research back to the human experience in some way. Scientists also should be encouraged to relate the long-term implications of their research to broader audiences.
- Create a mechanism by which Americans and their representatives can see the benefits and social impacts of scientific research, and require scientists to show public outreach in order to obtain these funds. This could be part of the proposal (a section after the broader impacts statement), which would describe their plan to engage with communities and the public to showcase the usefulness and benefits of their research to society.
- This type of statement would give researchers the authority to state the intended use or

application of their research rather than unintended consequences. Overtime, this may result in a positive public perception of scientific research and the need to fund it.

Example related to Publication 3:

A useful example to illustrate different points of view could be looking at robotics research with different stakeholders, and improving the capability of legged robots to run on sand. If looking at this from the researcher's point of view (their stated application), these might be geoscientists who want to study erosion and desertification using robotic field assistants. They would also consider the possibility of people living in parts of the country affected by dust storms and how their farmland is affected, in addition to food shortages.

Stakeholders from the government's point of view (who might fund further research in this area) might be the military, which might want the robots to operate in sandy areas, for example in the Middle East. Stakeholders in industry such as companies that need to perform routine inspections of oil rigs in sandy places, who want to use robots so that their workers can patrol remotely instead of in person, saving the company money.

Stakeholders from the public's point of view (who might object to the project being funded) are people concerned about the automation of warfare, and therefore any technology that improves robot mobility. In this case, individuals may also be concerned about police access to military tech on the after-market. Stakeholders from the public's point of view (who might favor further research in this area) might be members of the military and their civilian family members, or supporters of military expansion who want to protect American lives at any cost.

In this case, most people in the general public do not want to serve on a jury, it is an obligation rather than an opportunity to get involved in justice. Juries have the reputation of being manipulated by sleazy lawyers -- this is not the image we want to paint for how the public is getting involved. We already have several good examples (listed above) that are directly related to the ethics of science.

Call to action: OSTP should draw up a framework by bringing stakeholders to evaluate particular research areas, including the general public and journalists, and provide them with online courses to evaluate research in different disciplines.

Evaluating success: Success would be to involve non-scientists in these processes, and to track the kinds of stakeholders involved.

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**JSPG* published authors and competition winners