

## Astrophysicists' Attitudes toward Public Outreach - Farahi Supplemental Material

### **Dark Energy Survey Scientists' Attitudes Towards STEM Engagement and Public Outreach**

The goal of this survey is to assess the general attitudes and opinions of scientists in The Dark Energy Survey (DES) towards Education & Public Outreach (EPO) in Science, Technology, Engineering, and Mathematics (STEM). Survey results will help us learn why DES scientists are/are not inclined to participate in EPO and what factors may increase EPO participation. Published results from this survey will likely be informative for the EPO efforts of future large-scale astronomy collaborations.

All information gathered in this survey will be completely anonymous and will be used for a science communication research analysis to be published in an academic journal. By participating in this survey, you give official consent that your responses may be used for research purposes.

Your participation in this study is entirely voluntary; refusal to participate will involve no penalty or loss of benefits to which the you are otherwise entitled, and you may discontinue participation at any time without penalty or loss of benefits.

The probability and magnitude of harm or discomfort anticipated by participation in this study are not greater than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.

By participating in this study, you will be contributing to the growing body of knowledge in the science communication research field. Your responses will help inform EPO practices for future large-scale astronomy surveys and help provide data necessary for evidence-based suggestions for EPO policy change.

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The survey is divided into three sections: 1) demographic information, 2) general attitudes about EPO, and 3) attitudes specifically about the DES EPO program.

Not all questions in the survey are mandatory. We expect it will take no longer than 20 minutes to complete.

Any questions regarding data collection or analysis may be sent to [des.outreach.coordinators@gmail.com](mailto:des.outreach coordinators@gmail.com)

\* Required

### **Scientists' Attitudes Towards EPO - GENERAL**

In this section, you will be asked about your general opinions about STEM education and public outreach (EPO).

In answering these questions, you should consider not only your opinions about DES EPO, but your attitudes towards EPO throughout the entirety of your career. EPO across any and all STEM disciplines, not just astronomy, should be considered.

For the purpose of this survey, we will define STEM EPO as all activities which fall under the umbrella of "science communication" as defined in Burns et al. 2012. This includes undergraduate teaching, participation in science festivals, mentoring, etc.

**SCIENCE COMMUNICATION (SciCom)** 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 (the vowel analogy)

**A**wareness, including familiarity with new aspects of science

**E**njoyment or other affective responses, e.g. appreciating science as entertainment or art

**I**nterest, as evidenced by voluntary involvement with science or its communication

**O**pinions, the forming, reforming, or confirming of science-related attitudes

**U**nderstanding of science, its content, processes, and social factors

Science communication may involve science practitioners, mediators, and other members of the general public, either peer-to-peer or between groups.

1. **Please take 30 seconds to list the first three (or more) STEM EPO activities which come to mind. These should be any activities which come to mind, not only activities in which you have participated. \***

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2. **What do you think is the general purpose of EPO? Check all that apply. \***

*Check all that apply.*

- To encourage young persons to go into STEM fields
- To educate the non-specialist public about critical thinking and the scientific method
- To increase public awareness of science and research
- To improve the status/perception of the engager/institution/collaboration
- To develop professional skills (i.e., presentation skills, writing/giving talks)
- To develop a sense of camaraderie amongst my science colleagues
- For personal enjoyment
- Other: \_\_\_\_\_

**3. Do you think engaging in EPO is part of your professional responsibility as a scientist? \***

*Mark only one oval.*

- Yes
- Yes, but only the "Education" component, i.e., teaching undergraduates, mentoring early career scientists
- Yes, but only the "Public Outreach" component, i.e., participating in science festivals, doing demonstrations in K-12 classrooms
- No
- I don't know

**4. Do you think engaging in EPO should be part of your professional responsibility as a scientist? \***

*Mark only one oval.*

- Yes
- Yes, but only the "Education" component, i.e., teaching undergraduates, mentoring early career scientists
- Yes, but only the "Public Outreach" component, i.e., participating in science festivals, doing demonstrations in K-12 classrooms
- No
- I don't know

**5. Do you think engaging in EPO should be a personal responsibility of a scientist (i.e., in the spirit of teaching others and/or advancing human knowledge)? \***

*Mark only one oval.*

- Yes
- Yes, but only the "Education" component, i.e., teaching undergraduates, mentoring early career scientists
- Yes, but only the "Public Outreach" component, i.e., participating in science festivals, doing demonstrations in K-12 classrooms
- No
- I don't know

## **Scientists' Attitudes Towards EPO - GENERAL ENGAGEMENT**

6. On a scale of 1-5, with 1 being the "Least Impactful/Valuable to the Audience" and 5 being the "Most Impactful/Valuable to the Audience," rank the following EPO activities.

Mark only one oval per row.

	1 (Least)	2	3	4	5 (Most)	Not impactful / Should not count as EPO	I don't know
Public presentations/lectures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Science fairs/festivals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On-air media (e.g., TV, radio)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media (Personal, i.e. from a personal Twitter account)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social Media (Organizational, i.e., on behalf of DES)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Webpage Development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Science journalism/science writing/science blogging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Elementary/High School Teacher Development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Undergraduate Teaching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Formal science curriculum development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Informal science curriculum development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visual media (e.g., photography, painting, sculpture, animations, videos)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Audio media (e.g., music, podcasts)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comedy/plays/open mic nights	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Volunteering at informal science centers (e.g., museums, community centers, public libraries)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Volunteering at schools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other formal education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Career talks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mentoring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**7. Which types of EPO activities have you been involved in?**

Mark only one oval per row.

	I did this activity once	I have done this activity 1-10 times	I engage in this EPO activity regularly (several times per month or year)	My engagement in this EPO activity is regular and ongoing (over several months/years)
Public presentations/lectures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Science fairs/festivals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
On-air media (e.g., TV, radio)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media (Personal, i.e. from a personal Twitter account)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social Media (Organizational, i.e., on behalf of DES)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Webpage Development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Science journalism/science writing/science blogging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Elementary/High School Teacher Development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Undergraduate Teaching	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Formal science curriculum development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Informal science curriculum development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visual media (e.g., photography, painting, sculpture, animations, videos)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Audio media (e.g., music, podcasts)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comedy/plays/open mic nights	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Volunteering at informal science centers (e.g., museums, community centers, public libraries)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Volunteering at schools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other formal education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Career talks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mentoring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**8. When do you primarily engage in EPO? \***

*Mark only one oval.*

- I only engage in EPO during my free time (i.e. during evenings and on weekends)
- I engage in EPO during work hours and during my free time
- I only engage in EPO during work hours
- I don't know
- I do not engage in EPO

**9. How long do you spend (on average) per week on EPO? \***

*Mark only one oval per row.*

	0-1 Hrs	1-3 Hrs	3-5 Hrs	5-10 Hrs	>10 Hrs	I don't participate in EPO
Preparing for activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engaging in activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**10. How long would you like to spend (on average) per week on EPO? \***

*Mark only one oval per row.*

	0-1 Hrs	1-3 Hrs	3-5 Hrs	5-10 Hrs	>10 Hrs	I don't want to participate in EPO
Preparing for activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engaging in activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Scientists' Attitudes Towards EPO - GENERAL VALUES,  
MOTIVES, & DETERRENTS**

**11. Are you involved in EPO activities at your local institution/in your local community? Check all that apply. \***

*Check all that apply.*

- Yes, through my local research group (e.g., your research group or colleagues within the Physics department at State University)
- Yes, through my local department (e.g., the Physics department at State University)
- Yes, through my local institution (e.g., through State University but not through the Physics department)
- Yes, though my local community (e.g., through community centers, pub nights, etc.)
- No

**12. How much do you think your local institution/your local community values EPO? \***

*Mark only one oval per row.*

	1 (Least)	2	3	4	5 (Highest)	No value	I don't know
Local Research Group (e.g., Your research group or colleagues within the Physics Department at State University)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Department (e.g., Physics Department at State University)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Institution (e.g., State University as a whole)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local Community	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**13. Are you funded by a grant which mandates EPO? Check all that apply. \***

*Check all that apply.*

- I have been funded to do EPO throughout the entirety of my career
- Currently, I am funded to do EPO; but I have not always been funded to do EPO
- I am not currently funded to do EPO, but have been in the past
- At some point in my career, my funding was contingent on my teaching undergraduates
- I am funded by multiple agencies, some of which support EPO
- I am not funded to do EPO
- I do not know

14. On a scale of 1 to 5, how much does grant funding influence your participation in EPO? \*

Mark only one oval.

	1	2	3	4	5	
Not at All	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very Much

15. In general, what are the motivating factors for your engagement in EPO? Check all that apply. \*

Check all that apply.

- I am funded to engage in EPO
- I hope that my engagement in EPO will help earn me future funding
- I am mandated to engage in EPO by my local institution/department
- I am on the job market and think EPO will boost my resume/CV
- I personally enjoy engaging with/in EPO - it's fun
- I am looking for personal growth or experience (e.g. improve communication/presentation skills)
- I want to teach science to school children and/or underserved communities
- I want to inform taxpayers about my research
- I like the creative outlet that EPO activities offer
- I want to educate the general public
- I want to be famous
- I am not interested in participating in EPO



**16. If you are not involved in EPO, or not as involved as you would like to/think you should be, what are the barriers to your engagement? Check all that apply. \***

*Check all that apply.*

- I am involved in EPO
- I don't know what counts as EPO
- I do not think I have the right skills and/or training to engage in EPO
- I am busy and do not have time to spend on EPO
- I am not funded to do EPO
- My local institution does not support (either financially or in department culture) EPO
- I am not aware of EPO opportunities
- I never thought about it
- I think it is waste of time
- I feel that there are cultural barriers which prohibit my engagement
- I feel that there are language barriers which prohibit my engagement
- I feel that there are ethnic barriers which prohibit my engagement
- Other: \_\_\_\_\_

**17. Which of the following would encourage you to get involved (or more involved) in EPO activities? Check all that apply. \***

*Check all that apply.*

- If EPO helped with my career development
- If EPO were encouraged by my supervisor or the managers of my department/institution/collaboration
- If EPO were an explicit and official part of my job description (and hence part of what I would be getting paid to do)
- If EPO were more highly regarded among my peers
- If I saw more evidence that EPO makes a positive impact on society
- If it were easier to obtain funds for EPO activities
- If I felt that I could allocate time during the work week toward EPO
- If the necessary EPO infrastructure already existed and someone else told me how I could help
- If I knew how to efficiently communicate the technical aspects of my work to the public
- If I shared the same culture as my local community
- If I shared the same language as my local community
- If I shared the same ethnicity as my local community
- None of the above
- Other: \_\_\_\_\_

## Scientists' Attitudes Towards EPO - DES

In this section, you will be asked about your opinions towards EPO specific to the Dark Energy Survey (DES EPO) and your involvement as a scientist in DES.

**18. Rank how much you think the following DES groups value EPO. \***

*Mark only one oval per row.*

	1 (Not at all)	2	3	4	5 (Very Much)	I don't know
DES Collaboration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DES Management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your DES Working Group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DES Members at your Institution	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**19. Do you think that DES EPO activities should be organized (creating new ideas, handling logistics) and implemented by hired EPO professionals? \***

*Mark only one oval.*

- Yes
- Activities should be organized by professionals but implemented by scientists
- Activities should be organized by scientists but implemented by professionals
- Activities should be organized and implemented by both scientists and professionals working together
- No, scientists should be in charge of organization and implementation of DES EPO activities
- I don't know

**20. In which of the following DES EPO initiatives have you been involved? Check all that apply. \***

*Check all that apply.*

- I've never participated in a DES EPO initiative
- DES Thought for the Day (#DEST4TD)
- Dark Bites
- From the DArchive
- Dark Energy Detectives
- DEScientist of the Week
- DES EPO Reporting
- DES Monthly Newsletter
- DES Adler After Dark (October 2015)
- DES Flickr Photo Gallery
- DES Astrophotography
- DES in Many Languages (e.g., translating website content, translating other posts)
- DES Website Content (e.g. writing science summaries for your working group)
- DES EPO events at collaboration meetings
- The DES Book
- The DES Movie
- I think I participated in something, but I'm not sure

**21. If you have never participated in a DES EPO initiative, why not? Check all that apply. \***

*Check all that apply.*

- I have participated in a DES EPO initiative
- I don't do EPO in general
- I forgot to respond to a DES EPO initiative request
- I prefer to participate in programming organized by my local institution/community
- I prefer to participate in independent programming I organized myself
- I did not know about the existing DES EPO programs
- I do not see value in the DES EPO programs
- The DES EPO Committee did not have time to support my involvement
- The DES EPO Committee did not have funds to support my involvement
- The DES EPO Committee did not have resources (e.g., slides, content) to support my involvement
- Other: \_\_\_\_\_

**22. How could DES (and other large collaborations) best support your engagement in collaboration-wide EPO? Check all that apply. \***

*Check all that apply.*

- Collaborations could allocate funding towards EPO
- Collaborations could hire dedicated EPO staff
- Collaborations could provide communication training for scientists
- Collaborations could regularly inform members about various collaboration-wide EPO opportunities
- Collaborations could consider EPO as contribution towards infrastructure (data rights, rights to authorship, etc.)
- Collaborations could build and maintain a central repository to store slides, images, plots, and etc, to support my involvement and the media I create
- Nothing would really inspire me
- I don't know
- Other: \_\_\_\_\_

**23. If you have never participated in a DES EPO initiative, what could have motivated you to become more involved?**

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**24. Do you see value in centralizing EPO for large astronomy (physics) collaborations? Why or why not?**

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## **Respondent Identity Information**

The questions below are required, but may be submitted with the option "Prefer not to answer."

Such demographic information is useful to study correlations between scientist age, gender, and geography and engagement in Education & Public Outreach.

**25. DES Status \***

*Mark only one oval.*

- Active Member
- Former Member
- Other: \_\_\_\_\_

**26. Gender \***

*Mark only one oval.*

- Male
- Female
- Other
- Prefer not to answer

**27. Age \***

*Mark only one oval.*

- 18-30
- 31-40
- 41-50
- 51-60
- 61+
- Prefer not to answer

**28. Ethnicity \***

*Mark only one oval.*

- Black or African American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Other Pacific Islander
- White
- Hispanic or Latino
- Prefer not to answer

**29. Current Position \***

*Mark only one oval.*

- Undergraduate Student
- Graduate Student
- Post-doc
- Faculty/Professor
- Staff Scientist
- Prefer not to answer
- Other: \_\_\_\_\_

**30. Institution (full name) -- If you do not wish to include your institution, please write "N/A" \***

\_\_\_\_\_

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