How Perceptions Shape Participation in Virtual Citizen Science

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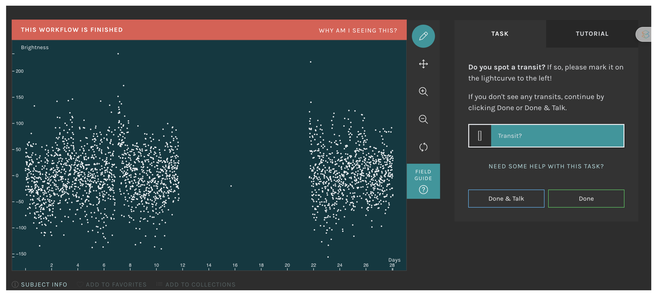
Introduction

Citizen science describes efforts to engage the public in scientific research through data collection, analysis, and problem-solving activities.

Citizen science projects are a powerful tool to **democratize participation in scientific research**, allowing non-experts to play an active role in knowledge creation.



Citizen science projects face **disparities in** demographic representation and levels of participation

- **citizen science demographics are often skewed**, with participants predominantly being white, male, and highly educated [1]
- women and individuals from lower socioeconomic backgrounds, participate less frequently or at lower levels of contribution [2]

Understanding community perceptions may help identify barriers to participation. We asked:

How do community perceptions differ across demographic identities? And **How do perceptions impact participation?**

Methods

Peers...

have an opportunity to succeed **Succeed (Peers)**

treat each other with respect **Respected (Peers)**

I...

feel like I am a part of the Zooniverse community **Member (Self)**

feel that my opinions, ideas, and contributions are respected **Respected (Self)**

feel that I can voice a contrary opinion without fear of negative consequences. **Contributions (Self)**

Figure 2. Survey questions.

Data. **Survey responses** (Fig 2) from Zooniverse participants (N = 6,030) and **contribution data** (Fig. 3) from Zooniverse was linked to survey responses for a subset of participants (N = 2,605) to analyze how perceptions influence contribution behaviors.

Analysis. We used group means testing (ANOVA and t-tests) to compare perceptions across demographics and contribution.

classifications

username	project_id	created_at	response
zoo_user	3454	2016-10-12 18:09:42	classify
zoo_user	3454	2016-10-12 18:09:59	classify
zoo_user	3454	2017-03-22 06:10:03	classify
glitchesee	8743	2016-08-22 04:04:34	classify
glitchesee	3454	2016-09-12 04:23:14	classify
explorer1	8743	2016-10-12 18:10:42	classify
explorer1	8743	2016-10-12 18:11:30	classify

survey_response

user_name	gender	education
glitchesee	male	bachelors
explorer1	female	masters
zoo_user	female	doctorate
gravity_sky	male	masters

comments

username	discussion_id	created_at	comment
glitchesee	91.177.183	2016-10-12 18:09:42	Wow, the detection of gravitatio...
glitchesee	91.177.183	2016-10-12 18:09:59	The recent discovery of mergi
glitchesee	203.232.2	2017-03-22 06:10:03	I've always been fascinated by...
glitchesee	102.232.409	2016-08-22 04:04:34	The Hubble Space Telescope has
glitchesee	92.439.234	2016-09-12 04:23:14	Watching a pack of wolves work t
explorer1	91.177.183	2016-10-12 18:10:42	The diversity of life on each never
explorer1	91.177.183	2016-10-12 18:11:30	Can we examine the data using th

Figure 3. Contribution data.

Demographics and Perceptions

Most citizen science projects are concerned about gender and racial/ethnic diversity within their populations. We found:

- **Gender** → **peers' success** with women being more likely to perceive that their peers had opportunities to succeed.
- **Racial and ethnic** → **perceptions of diversity** with Black participants reporting lower perceptions of diversity compared to White and Hispanic participants.

Other differences we observed:

- Differences in participants' **sense of community** based on **age**, **education**, and **income**, with older participants and those with lower education levels reporting stronger perceptions of community.
- **Education level** → **voice contrary opinions** those holding advanced degrees feeling more confident in expressing differing views.
- **Employment status** → **sense of belonging** in the community, with retired individuals reporting a stronger sense of membership compared to students.

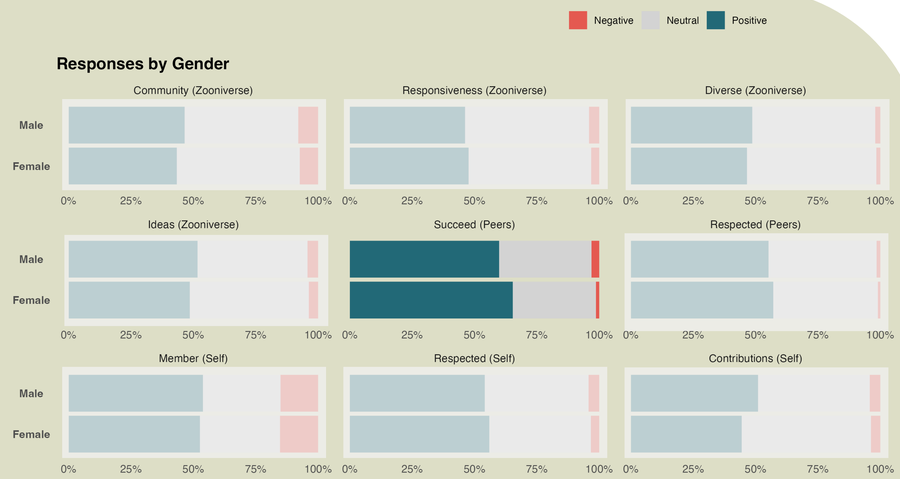


Figure 4. Perceptions based on gender. Blurred figures indicate non-significant results.

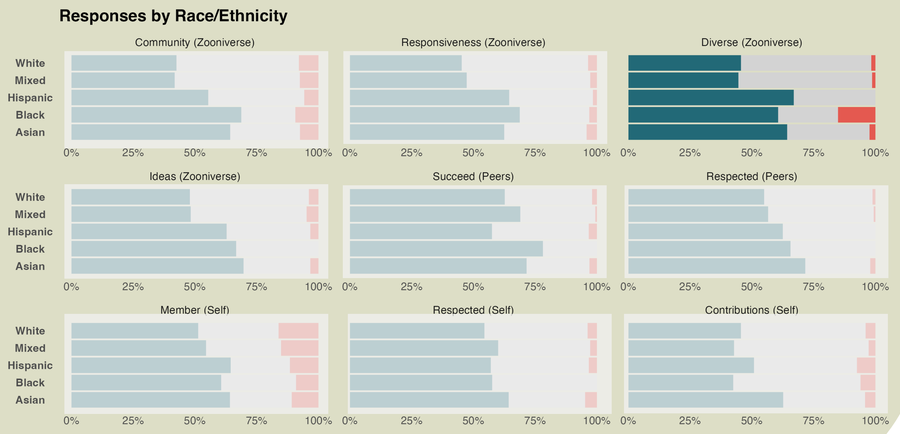


Figure 5. Perceptions based on race/ethnicity. Blurred figures indicate non-significant results.

Perceptions and Participation

Next, we wanted to investigate how perceptions shape participation in Zooniverse. We found:

- **Positive perceptions of Zooniverse as a strong community** → **more classifications** than those with neutral or negative perceptions.
- **Positive perceptions of diversity** → **higher classifications** and **comment** contributions, with those viewing the community as diverse contributing more.
- **Feeling respected** and the **ability to voice opinions** → more **classifications** and **comment**
- **A strong sense of belonging** to the Zooniverse community → more **classifications** and **comment** contributions, with those feeling part of the community contributing the most.

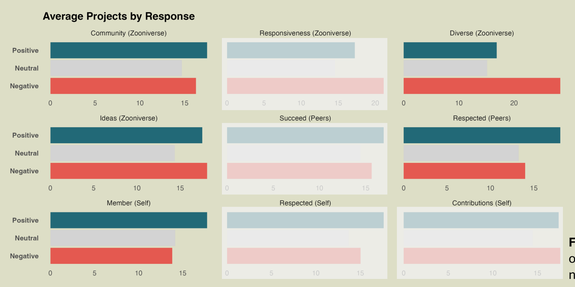


Figure 7. Projects contributed to based on perceptions. Blurred figures indicate non-significant results.

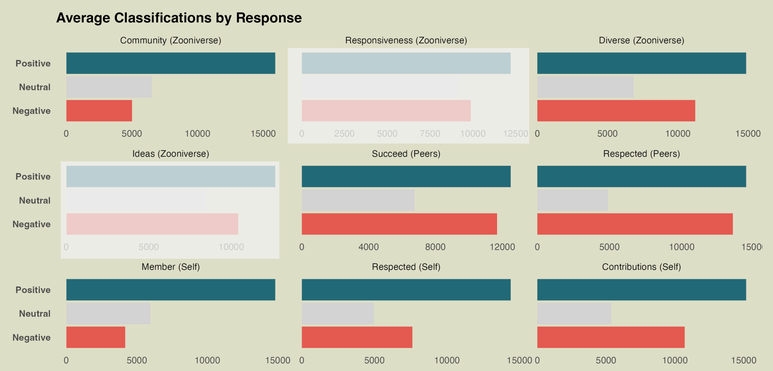


Figure 6. Classifications contributed based on perceptions. Blurred figures indicate non-significant results.

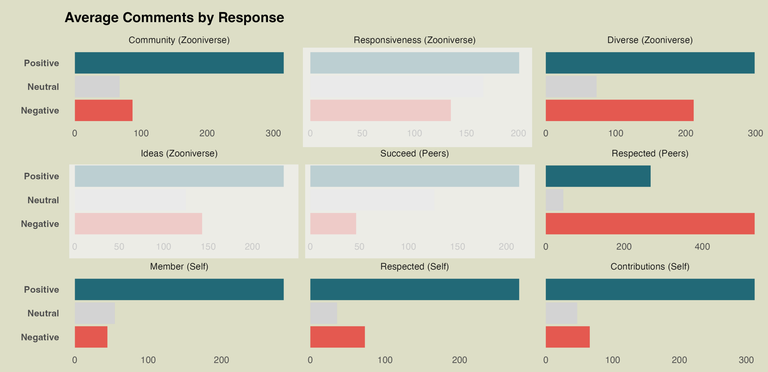


Figure 7. Comments made based on perceptions. Blurred figures indicate non-significant results.

Increasing Diversity in Virtual Citizen Science

- Tailor recruitment efforts to underrepresented groups.
- Increase access to technology and resources
- Promote inclusive project design
- Foster a strong sense of community and belonging

References

[1] West, S., & Pateman, R. (2016). Recruiting and retaining participants in citizen science: What can be learned from the volunteering literature?. *Citizen Science: Theory and Practice*, 1(2), 15.

[2] Soleri, D., Long, J., Ramirez-Andreotta, M. D., Eitemiller, R., & Pandya, R. (2016). Finding pathways to more equitable and meaningful public-scientist partnerships. *Citizen Science: Theory and Practice*, 1(1), 9.