CosmoQuest

Building communications, collaboration, and perhaps a Skinner Box for Science
Astronomy Cast: A - Adrian Q.
What about Citizen Science?

Science Problem
+ Volunteers from the Public
  New Knowledge
<table>
<thead>
<tr>
<th>Location</th>
<th>Antennas</th>
<th>Range</th>
<th>Round-Trip Light Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>MADRID</td>
<td>63, 65</td>
<td>171.85 thousand km</td>
<td>1.15 sec</td>
</tr>
<tr>
<td>GOLDSTONE</td>
<td>14, 15, 24, 25, 26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CANBERRA</td>
<td>43, 45, 34, 35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Humphreys and Revelle (1984)

Motivation results from a mixture of one’s desires and needs and involves a component of arousal and effort.

Theories usually center on questions of expectancy, need, learning, and role.
<table>
<thead>
<tr>
<th><strong>Galaxy Zoo</strong></th>
<th><strong>Moon Zoo</strong></th>
<th><strong>Description (to be used in survey)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contribute</strong></td>
<td><strong>Contribute</strong></td>
<td>I am excited to contribute to original scientific research.</td>
</tr>
<tr>
<td><strong>Astronomy</strong></td>
<td><strong>Lunar Science</strong></td>
<td>Lunar science is important for future exploration.</td>
</tr>
<tr>
<td><strong>Discovery</strong></td>
<td><strong>Discovery</strong></td>
<td>I might discover something scientifically interesting.</td>
</tr>
<tr>
<td><strong>Beauty</strong></td>
<td><strong>Images</strong></td>
<td>The wonderful LRO images are amazing to see.</td>
</tr>
<tr>
<td><strong>Vastness</strong></td>
<td><strong>Nearness</strong></td>
<td>I am in love with the nearby Moon.</td>
</tr>
<tr>
<td><strong>Science</strong></td>
<td><strong>Science</strong></td>
<td>I am interested in science.</td>
</tr>
<tr>
<td><strong>Zoo</strong></td>
<td><strong>Zooiverse</strong></td>
<td>I’m interested in everything the Zooniverse does.</td>
</tr>
<tr>
<td><strong>Project</strong></td>
<td></td>
<td>I want to see how the project works.</td>
</tr>
<tr>
<td><strong>Help</strong></td>
<td><strong>Help</strong></td>
<td>I am happy to help.</td>
</tr>
<tr>
<td><strong>Fun</strong></td>
<td></td>
<td>I had a lot of fun categorizing the galaxies.</td>
</tr>
<tr>
<td><strong>Learning</strong></td>
<td><strong>Learning</strong></td>
<td>I was looking for ways to learn about the moon.</td>
</tr>
<tr>
<td><strong>Teaching</strong></td>
<td></td>
<td>I find Galaxy Zoo to be a useful resource for teaching others.</td>
</tr>
<tr>
<td><strong>Community</strong></td>
<td><strong>Community</strong></td>
<td>It is fun to make friends from all around the world.</td>
</tr>
<tr>
<td><strong>Apollo</strong></td>
<td></td>
<td>I am a child of the 1960's and have a personal interest.</td>
</tr>
</tbody>
</table>
Yeung’s octagon model of volunteer motivation

• **Getting / Giving**
  - Contribute
  - Help
  - Learning / Teaching

• **Action / Thought**

• **Proximity / Distance (typically emotional)**
  - Nearness of the Moon /
    Vastness of the Universe

• **Newness / Continuity**
  - Zooniverse /
    This Project
  - Discovery /
    Science, Astronomy, Lunar Sci,
    Child of Apollo
Improving on engagement

• Users feel lost  
  -> Need instructions and in-your-face tutorials

• Leave due to lack of feedback (afraid to give false data)  
  -> Provide feedback when others confirm their results

• Don’t feel like they are part of an active community (forums)  
  -> harder to fix ...
Astronomy Cast: A - Adrian Q.
Astronomy Cast Episode 246 - What If Something Was Different?

Live Telescope Observing - the Moon
Clustering Code
Huang, Lehan, Gay + Richardson

Input:
X, Y, D, confidence

Parameters:
reachability, \( \varepsilon_1 \) & \( \varepsilon_2 \)

Based on 2-dimensional DBSCAN (Density-Based Spatial Clustering of Applications with Noise) code developed by Ester et al. (1996).

\[
\text{if( (distance}(p_i,p_j)<\varepsilon_1*(D_i+D_j)/2) \text{ and ( | } D_i-D_j | <\varepsilon_2*\min(D_i,D_j) \text{ ) ) }
\]
Comparing Individuals

- experts
  - 5-10% scatter in location
  - 5-10% scatter in diameter
  - preservation effects error

- volunteers
  - 10% scatter in location
  - 20% scatter in diameter
  - preservation has no effect

Aggregate Results

There is a 1:1 relationship between experts and volunteers
Tutorial

Do Activity

Comparison Images, Feedback

Research Published
Peer-reviewed research produced by:
- MoonMappers - demonstrated accurate crater mapping
- Ice Investigators - Aided discovery of KBOs for NH

**Discovered problem:** Researchers require funding in order to meaningfully participate.
Current

A few upcoming examples

- Image Detective, Earth
- Planet Builder, Astrobiology
- Dark Energy Explorer, Astrophysics
- Asteroid Mappers: Bennu, Planetary

Timeline

- May, RFP announced
- Sep, proposals due
- Jan, announce new programs
Partner Institutions
- The STEM Center @SIUE, lead
- Astronomical Society of the Pacific
- DeAnza College
- InsightSTEM
- Interface Guru
- Lawrence Hall of Science @UC-Berkeley
- McREL International
- Planetary Science Institute
- McDonald Observatory @UT-Austin
- Ward-Beecher Planetarium @YSU

Community Partners
- Astronomers without Borders
- Astrosephere New Media Association
- Galileo Teacher Training Program
- International Sci. & Eng. Festival
- NASA Museum Alliance
- NASA Night Sky Network
- NASA Solar System Ambassadors
- St Louis Science Center
- S. Arizona Research, Sci. & Eng. Festival
- SETI Institute
- Universe Today
- WGBH, PBS Learning

Mission & Facility Partners
- CADC
- Dawn
- Hobby-Eberly Telescope
- Lunar Reconnaissance Orbiter
- New Horizons
- MESSENGER
- OSIRIS-REx
- WFIRST

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