Putting belonging in context:

Communal affordances signal belonging in STEM

Verbatim Materials and Procedure File

**Study 1**

**Measures**

**Major affordances (Time 1)**.

1. As a student in the courses for your major, are you able to work with others?
2. As a student in the courses for your major, are you able to serve the community?
3. As a student in the courses for your major, are you able to help others?

**Belonging (Time 1)**.

1. I feel like I belong in my major
2. I feel like I fit in with the people in my major
3. I am unsure whether I belong in my major (reverse)
4. I consider myself a member of my major
5. Among people in my major, I feel like an outsider (reverse)
6. I feel included by people in my major

**Future career attitudes (Time 2)**.

1. I will enjoy my future career
2. How sure are you that this will be your future career?

**Study 2**

**Measures**

**STEM career communal goal affordances.** Participants rated agreement with six statements describing science and math as communal on scales of 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Items were as follows:

1. I believe science contributes to the well-being of society.
2. I believe that math and science helps people.
3. Science is interesting, but it does not benefit society much. (Reverse)
4. I believe scientists aid the needy through their work.
5. Scientists are loners who do not work to help others. (Reverse)
6. I believe a career in science would allow me to connect with others.

**STEM career agentic goal affordances.** Participants rated agreement with six statements describing science and math as agentic on scales of 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Items were as follows:

1. A career in science would allow me to be in a position of power.
2. I believe that scientists make a lot of money.
3. Scientists often get more recognition than people in other jobs.
4. Scientists often compete with others as part of their job.
5. I believe a career in science would allow me to be my own boss.
6. I believe a career in science would allow me to master my skills.

**STEM career interest.** Participants read brief descriptions of seven math or science careers and rated their interest in each career as “not at all,” “a little bit,” “some,” or “a lot” (coded 1 to 4). Items were as follows:

1. Scientists are people who try to figure out how the many different things in our world and our universe work using science.
2. An astronomer is someone who studies the universe and the objects within it. How much do you want to be an astronomer?
3. A physicist is someone who studies what things are made of (matter), energy, atoms, light, sound, x-rays, gravity, and many other aspects of the physical world. How much do you want to be a physicist?
4. A mathematician is someone who uses math theories and skills as well as computers to solve money, scientific, engineering, physics, and business problems and make predictions. How much do you want to be a mathematician?
5. A computer scientist is someone who studies computers and learns all about them and how they work. How much do you want to be a computer scientist?
6. A chemist is someone who studies all the materials in the world including water and plastic, and they determines what they are made of and how these things change in response to heat or cold. How much do you want to be a chemist?
7. 7. A biologist is someone who studies living things and their environments. How much do you want to be a biologist?

**Session goal affordances.** Participants evaluated each of the three breakout sessions they attended. For communal affordances, participants responded to the following item on a scale from 1= *strongly disagree* to 5=*strongly agree*: *In her career, this presenter works with other people, helps others, or serves the community.* For agentic affordances, participants responded to the following item on a scale from 1= *strongly disagree* to 5=*strongly agree*: In her career, this presenter can be in a position of power or make important decisions.

**Belonging in STEM careers.** Participants rated their agreement with the statement that “After Women and Science Day, I think I would fit in if I were in a math or science career” on a 1=*strongly disagree* to 5=*strongly agree* scale..

**Knowledge about women in STEM.** Participants rated their agreement with the statement “Women and Science Day helped me to learn about women in math and science careers” on a scale from 1=*strongly disagree* to 5=*strongly agree*.

**Study 3**

**Manipulation**

Participants were randomly assigned to read about a communal lab or an independent lab. The descriptions were as follows.

**Communal lab. Lab Manipulation**

Study 3 manipulated role by highlighting lab activities as collaborative or independent.

**Collaborative Lab.**  The collaborative lab description read as follows:

Imagine that you work as a **research assistant** in the lab of Dr. Gary Smith. Gary is a professor at a nearby university, and is currently taking a year off of teaching to focus on conducting research and writing papers.

  Gary works with numerous collaborators and is highly respected in his field. He frequently presents with his coauthors at professional conferences and talks to the general public to share his findings with society. The research he conducts with his colleagues is communicated in the top journals in his field. On top of his busy research program, Gary enjoys meaningful professional and personal relationships with his colleagues and students.

  Read about Gary’s day, and imagine what it would be like to work in his lab.

**8:15 a.m.:** Gary comes in and checks his e-mail, then plans his day. He usually has to communicate closely with his graduate students and research assistants (they run the high-throughput screens) to check on the status of ongoing experiments so they can go from primary to secondary characterizations.

**9:15 a.m.:** He goes to the lab after about an hour to check on samples left overnight (for example, to see if a drug crystallized), characterize samples from the previous afternoon to integrate the data collected the previous day, and characterize new samples that have come in that day. He meets some of his graduate students and research assistants in the lab and consults with them about the procedures.

**12:00 p.m.:**Gary joins other faculty members from other labs at lunch. The department runs presentations during lunch, where Gary, his colleagues (including research assistants), and students are welcome to attend and learn what else is going on both within the department and with the Big Pharma companies who supply them with compounds. Speakers might be a group member from a different research lab giving an update, a patent lawyer briefing them on legal issues in patent protection, and a member of another lab describing ongoing product development work. Lunch is a good chance for Gary to catch up on the progress that other labs are making, and for coworkers to share ideas and feedback.

**1:00 p.m.:** Gary mentors new research assistants in doing data entry and preparation, and then mentors new graduate students in doing data analysis (e.g., powder X-ray diffraction, differential scanning calorimetry, thermal gravimetric analysis).

**3:00 p.m.:** Gary leads a lab meeting with his 6 collaborators, 3 graduate students, and 10 research assistants to plan the next month’s tasks. Each collaborator and graduate student updates Gary and the rest of the lab group on the status of their projects, which are typically larger projects that have several team members. Research assistants update Gary and the rest of the lab group on any ongoing problems with data collection and entry. Gary asks questions and gives advice on running further experiments or collecting additional data points. Gary also gives the group a heads-up on what compounds are coming in during the next few weeks. This gives them an idea of the workload of the group in the coming month.

**4:00 p.m.:**He updates the lab notebook with either data collected that day or experiments started. He then gets started on experiments that can be set up and run overnight.

**5:00 p.m.:**He prepares for the monthly presentation the lab group gives at local schools to inform interested students about their research. Typically, he makes a PowerPoint presentation using tables and charts of data, a summary, and discussion points.   
 **5:30 p.m.:**Gary commutes home.

**Gary's Summary of His Career:** I like that so much of my work involves working closely with other people and helping them solve problems. The interactions we have are really fun, and I get the sense that I am contributing a great deal to their projects. I like having a variety of tasks, gathering data through multiple methods, and trying to interpret data from both high-throughput experiments as well as from bench-top experiments. I like the sense of contributing to understanding drug candidates that are likely to get into clinical trials. I like being exposed to industry and to the various issues in the pharmaceutical industry, both within my field and outside -- largely from presentations -- from the senior scientists and other experts.

**Independent Lab.** The independent lab description read as follows:

Imagine that you work as a **research assistant**in the lab of Dr. Gary Smith. Gary is a professor at a nearby university, and is currently taking a year off of teaching to focus on conducting research and writing papers.

Gary is very successful and well-known in his discipline. He most often works independently on projects, and he publishes in the top journals in his field. He has recently been recognized by several professional organizations for his immense contributions to the field. Gary is also widely respected at your university and maintains an active research program even after recently being appointed department chair.

  Read about Gary’s day, and imagine what it would be like to work in his lab and have his as a role model.

**8:15 a.m.:** Gary comes in and checks his e-mail, then plans his day. He usually has to check a database maintained by his graduate students and research assistants (they run the high-throughput screens) to check on the status of ongoing experiments so he can go from primary to secondary characterizations.

**9:15 a.m.:** He goes to the lab after about an hour to check on samples left overnight (for example, to see if a drug crystallized), characterize samples from the previous afternoon to integrate the data collected the previous day, and characterize new samples that have come in that day. He looks up relevant past research to consult about the procedure.

**12:00 p.m.:** The department runs presentations during lunch, where Gary, his colleagues (including research assistants), and students learn what else is going on both within the department and with the Big Pharma companies who supply them with compounds. He watches video feed of these presentations at his desk while he eats. Speakers might be a group member from a different research lab giving an update, a patent lawyer briefing them on legal issues in patent protection, and a member of another lab describing ongoing product development work.

**1:00 p.m.:** Gary does data entry, preparation, and analysis (e.g., powder X-ray diffraction, differential scanning calorimetry, thermal gravimetric analysis) and troubleshoots any problems that come up by herself.

**3:00 p.m.:** Gary seeks email updates from his lab manager on the status of data collection on his projects. Gary’s projects are typically independent, in that he does not have any other faculty collaborators. However, Gary prefers to not collect simpler types of data or perform simpler types of experiments herself. He thus employs a lab manager to organize the team of research assistants who collect simpler types of data and conduct simpler experiments for her. The lab manager reports on the research assistants' progress on data collection and data entry.

Gary tells the lab manager what further experiments to run or additional data points to collect. He also gives his lab manager a heads-up on what compounds are coming in during the next few weeks. Touching base with the lab manager gives Gary an idea of what his own workload will be like in the coming month.

**4:00 p.m.:** He updates the lab notebook with either data collected that day or experiments started. He then gets started on experiments that can be set up and run overnight.

**5:00 p.m.:** He prepares for weekly meetings with the entire Solid State Chemistry Group (15 members). Typically, he makes a PowerPoint presentation using tables and charts of data, a summary, and discussion points.

**5:30 p.m.:** Gary commutes home.

**Gary’s Summary of His Career:**I like that so much of my work involves working by myself and solving problems. The solitary nature of my work really lets me advance at a quick pace, and I get the sense that I am achieving a great deal through my projects. I like having a variety of tasks, gathering data through multiple methods, and trying to interpret data from both high-throughput experiments as well as from bench-top experiments. I like the sense of contributing to understanding drug candidates that are likely to get into clinical trials. I like being exposed to industry and to the various issues in the pharmaceutical industry, both within my field and outside -- largely from presentations -- from the senior scientists and other experts.

**Measures**

**Communal goal endorsement.** Participants were instructed: People vary in how much they value different goals. Please rate how important each of the following goals is to you personally. Participants then rated on a scale from 1 (*not at all*) to 7 (*extremely*), “Please rate how important each of the following kind of goal is to you personally.”

The goals were:

1. Working with other people
2. Helping others
3. Connection with others
4. Attending to others’ needs
5. Altruism
6. Intimacy
7. Caring for others
8. Spiritual rewards
9. Serving humanitarian needs
10. Serving the community

**Goal affordances.** The main question was, “If you worked with Dr. Gary Smith as a research assistant, how much would this allow you to do the following?” Participants then responded on a scale from 1 (*not at all*) to 7 (*extremely*) to the following items.

*Communal goal affordances.*

1. Work with or collaborate with others
2. Conduct or contribute to work that benefits others
3. Form connections with others
4. Increase your affiliation with her field

*Agentic goal affordances.*

1. Gain competence
2. Develop new skills
3. Gain a deeper understanding of science or research materials
4. Gain success

**Belonging.** Participants responded on a scale from 1 (*not at all*) to 7 (*extremely*).

1. If you worked as a research assistant in Dr. Smith's lab, would you fit in in the lab?
2. If you worked as a research assistant in Dr. Smith's lab, would you feel like you belong in the lab?
3. If you worked as a research assistant in Dr. Smith's lab, would you feel accepted in the lab?

**Self-Efficacy.** Participants received the following instructions: Indicate the extent to which you would be confident of your ability to successfully complete the following tasks on a regular basis, if you received some training for the tasks.Participants responded to the following items on a scale from 1 (*not at all*) to 7 (*extremely*).

1. Understand research presentations
2. Data entry
3. Conduct simple experiments
4. Analyze data
5. Communicate research findings

**Role interest.** On a scale from 1 (*not at all*) to 7 (*extremely*), participants responded to the following:

1. If you were looking for a job, how likely would it be for you to apply to be a research assistant in Dr. Smith's lab?
2. If you were looking for a job, how interested would you be in becoming a research assistant in Dr. Smith's lab?
3. If you were looking for a job, how likely would it be for you to accept a position as a research assistant in Dr. Smith's lab?

**Study 4**

**Manipulations**

**Rejection prompt.** Below, please describe an experience in a Science, Technology, Engineering, or Math class, lab, or activity during which you felt rejected or excluded. Try to remember sensory details and also how you felt. Please type out as detailed a memory as you can, describing the event and how it made you feel. Spend 3-5 minutes on this task (the next button will appear after 3 minutes).

**Role manipulations.**

*Communal STEM prompt.* Imagine that you are a scientist who is part of a lab group that researches genetic mutations to help people who have heart disease. As part of your job, you work with others to conduct experiments, use a microscope, analyze data, mentor younger scientists, and share your findings with others. You are completing a survey that asks you what you do, how you feel about the work you are doing, and whether or not you like your job. Take about 4 minutes to respond (in first person).

*Noncommunal STEM control prompt*. Imagine you are a scientist who works alone to research genetic mutations to understand the causes of biological processes. As part of your job, you conduct experiments alone, use a microscope, analyze data, and share your findings with others. You are completing a survey that asks you what you do, how you feel about the work you are doing, and whether or not you like your job. Take about 4 minutes to respond (in first person).

*Communal nonSTEM control prompt.* Imagine you are part of the club, Volunteers United. As part of Volunteers United, you work with other members to help people in the community. As part of your role, you volunteer at a soup kitchen, mentor a child, and play games with people at a local nursing home. You are completing a survey about clubs that asks you what you do in Volunteers United, how you feel about the club, and whether or not you like the club. Take about 4 minutes to respond (in first person).

**Measures**

**STEM** **belonging.** Participants were instructed: For each question, please use the following scale to indicate how you feel in Science, Technology, Engineering, and Math (STEM). Participants responded to the following items on a scale from 1 (*not at all true*) to 9 (*completely true*):

1. In STEM, I feel "disconnected."
2. In STEM, I feel rejected.
3. In STEM, I feel like an outsider.
4. In STEM, I feel like I belong to a group.

**General belonging.** Participants were instructed: For each question, please use the following scale to indicate how you feel in general. Participants responded to the following items on a scale from 1 (*not at all true*) to 9 (*completely true*):

1. I feel "disconnected."
2. I feel rejected.
3. I feel like an outsider.
4. I feel like I belong to a group.

**Mood.** Participants were instructed to: Select how you feel right now. They received 3 9-point scales. One ranged from 1 (*Bad*) to 9 (*Good*), another from 1 (*Sad*) to 9 (*Happy*), and the third from 1 (*Tense*) to 9 (*Relaxed*).