STEMming the Confidence Gap: Mitigating Social Judgment and Isolation

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Support for this work was provided by the National Science Foundation’s Research on Gender in Science and Engineering under award HRD-1203164. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
EIT Project Team

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EIT Project Goal & Strategies

To help faculty create inclusive engineering learning environments, especially for women and minority men.

EIT “live” and recorded faculty professional development webinars:
• Distill research findings
• Share master-teaching advice
• Provide easy-adoption Action-checklists & resources
Presenters

**Pooja Sankar, Piazza Founder & CEO**
Pooja founded *Piazza* based on her experience as one of few women among many men studying computer science. Pooja has worked at Oracle, Kosmix and Facebook. Pooja has a MS in Computer Science, University of Maryland and an MBA, Stanford Business School.

**Jessica Gilmartin, Piazza Chief Business Officer**
Jessica brings extensive product experience to Piazza having worked with multiple startups, as well as Google prior to working with *Piazza*. She will share research on the dramatic positive engagement differences *Piazza* creates, especially for women students. Jessica holds an MBA from the Wharton School of Business, University of Pennsylvania.

**David Gries, Ph.D. Computer Science, Cornell**
David has taught Computer Science at Cornell since 1969. For the past 3-4 years, he has taught hundreds of students each semester using Piazza. He is a Stephen H. Weiss Presidential Fellow (1995) for undergraduate education and has four professional society awards for undergraduate computer science education. David holds a Ph.D. in Mathematics, Munich Institute of Technology.
Pooja’s Story:
My Hometown – Patna, India
My Class at IIT
My Work Environment
Piazza Fills A Need

1M+ enrollments | 70 countries | 1000 schools

students spend 3 hours per day on Piazza

"I'm an ardent user of Piazza and really loved the tool you created. It has given me courage to ask questions and seek answers."

- Mary S., Engineering Major, Yale
What Need Does Piazza Fill?
Poll: How do you identify struggling students?

- I rely on grades: 71.4%
- Face-to-face interaction (e.g., office hours): 78.5%
- Private message/email asking for help: 35.7%
- Learn from a TA (or other assistant): 21.4%
- Don't really have a way to identify struggling students: 0%
The Power of Anonymity

- Anonymous group discussion is more effective than face-to-face group discussion. (Jong, et al., 2013).
- 46% of questions and 28% of answers are anonymous on Piazza.

"Shy students are more prone to get engaged since they can contribute anonymously."

- Dr. Joe Nadeau, Duke University
Research Methodology

• 481,873 male and female US/Canadian student enrollments (420,389 STEM)
• Four terms: Jan 2013- Nov.10th, 2014
• >800k questions asked/answered (> 96 million views)
• Factored in different proportions of men and women in a given subject.
Poll: Do women and men differ in the number of questions ASKED?

- Yes, WOMEN ask more questions. 50%
- Yes, MEN ask more questions. 40%
- No, women and men ask a similar number of questions. 10%
Questions ASKED: Sex Differences

- Women ASK > Questions
- Women ASK > Questions Anonymously

CS vs STEM

CS

- Women ask 26% more questions
- 41% Anonymous
- 52%

STEM excluding CS

- Women ask 23% more questions
- 49% Anonymous
- 60%
Poll: Do women and men differ in the number of questions ANSWERED?

- Yes, WOMEN answer more questions. 34.7%
- Yes, MEN answer more questions. 47.8%
- No, women and men answer equal numbers of questions. 17.3%
Questions ANSWERED: Sex Differences

- Women ANSWER < Questions
- Women ANSWER > Questions Anonymously
Poll: Are the sex differences found in answering questions similar between STEM and non-STEM disciplines?

- Yes, sex differences found in answering questions persist across STEM and non-STEM disciplines. 19.0%
- No, sex differences in answering questions are different in STEM than in non-STEM disciplines. 80.9%
Discipline Differences

- STEM Women ANSWER < Questions
- STEM Women ANSWER > Questions Anonymously

By College Department

- STEM
  - Men: 37%
  - Women: 24%
  - Anonymous: 37%

- Humanities
  - Men: 7%
  - Women: 17%
  - Anonymous: 17%

- Business
  - Men: 11%
  - Women: 34%
  - Anonymous: 28%

- Social Sciences
  - Men: 5%
  - Women: 41%
  - Anonymous: 42%
Poll: Do sex differences in answering questions persist from undergraduate to graduate classes?

Do sex differences in answering questions persist from undergraduate to graduate classes?

- Yes: 72.7%
- No: 27.2%
Sex Differences Persist

By Level

CS

Lower Level Classes

- Men: 43% fewer answers
- Women: 36%
- Anon: 22%

STEM excluding CS

- Men: 30%
- Women: 42%
- Anon: 14%

Upper Level Classes

- Men: 24%
- Women: 38%
- Anon: 29%

Graduate Level Classes

- Men: 15%
- Women: 23%
- Anon: 14%

- Men: 42%
- Women: 21%
- Anon: 23%
Poll: Does class size influence sex differences in answering questions?

Yes: 87.5%
No: 12.5%
Class Size: Sex Differences

By Class Size

- Women answer 0% less questions in class sizes (<30).
- Women answer 22% less questions in class sizes (31-70).
- Women answer 27% less questions in class sizes (71-100).
- Women answer 45% less questions in class sizes (101-500).
- Women answer 45% less questions in class sizes (501+).

Anonymous percentages:
- Class sizes (<30): 12% anonymous, 13% anonymous.
- Class sizes (31-70): 19% anonymous, 28% anonymous.
- Class sizes (71-100): 23% anonymous, 32% anonymous.
- Class sizes (101-500): 27% anonymous, 42% anonymous.
- Class sizes (501+): 29% anonymous, 50% anonymous.
WHAT IS GOING ON?
Confidence Gap

• Women underestimate their capability; self-limit science engagement. (Ehrlinger & Dunning, 2003)

• Women self-limit promotion applications unless they meet 100% of criteria. (Shipman & Kay, 2009)

• Gender differences in salary negotiation (Babcock et al., 2003):
  • Men initiate salary negotiations 4x more often than women;
  • Negotiating women ask for 30% < money than men.
Unconscious Bias

• Women experience negative consequences from men for negotiating. (Vedantam, 2007).

• Men are more likely to speak, and be heard, than women in the classroom (from elementary through grad school) (Krupnick, 1985), (Neufeld, 2004), Sadker & Sadker (1994).

• Women are more likely to be interrupted (by both men and women). (Hancock & Rubin, 2014)
Professors scared me. None of them looked like me, so I was afraid that they wouldn't understand me. I was always on guard and tried to avoid interacting with them directly outside of class.

Piazza helped me get over that because I could see that my questions/responses were valuable through instructor feedback without risk of embarrassment.
Dr. David Gries: Faculty Case Example

- David Gries, Professor Emeritus (but still teaching)
- Computer Science, Cornell University
- Using Piazza since 2011, Pooja demoed at Cornell
- **CS2110. Object-Oriented Programming and Data Structures** — second course on computer programming

- ~600 students
- 2 instructors
- 18 grad, undergrad TAs with weekly sections
- 30 undergrad consultants: grade, staff consulting, room 8 hrs per day

- ~1700 posts this semester
- Response time average: 9 minutes
- Total contributions: > 7,000
- Instructor responses: ~2,000
- Student responses: ~650
I have used Pooja as a role model for women and men alike since fall 2011.

Image to the right is from course website in 2011

Read especially the last paragraph

CEO Pooja Sankar of Piazza

Pooja Nath Sankar is the founder and CEO of Piazza. Her story illustrates what can happen when someone with a passion works hard to translate it into reality.

Pooja went to an all-girls high school in India and was then admitted to IIT Kanpur, India. There, she was one of a handful of girls in the midst of many boys. Too shy to talk much, she studied alone, while the boys worked together, benefitting tremendously from the collaboration. Piazza is Pooja's way of providing a collaboration tool that all can use, whether they are shy or not, whether they are male or female. It fills a niche; it is far better than the wikis and threads that are in use for such discussion groups. She saw a need, figured out a way to fill the need in a really innovative way, and then used her entrepreneurship skills to make it a reality.

Pooja conceived of Piazza in in 2009 --just two years ago-- in a class during her first year at the Stanford Graduate School of Business.

Pooja has degrees from IIT Kanpur (India), the University of Maryland College Park, and Stanford. She has worked at Oracle, Kosmix, and Facebook. Read more here: www.piazza.com/story.

So, what will be your Piazza in a few years? You are a Cornell student. Soon, you will have the knowledge and experience and skill to make your contribution to society. The sky's the limit.
Platform Introduction

Switch to different course, including old, inactive ones.

Main pane, list of posts on left and post being viewed on right.

Course description, announcements, staff, other resources.

No. of posts, responses by students, staff, etc. Can download complete statistics.

Enroll, remove staff and students. Set preferences (e.g. whether posts can be completely anonymous).
Folders

Folders into which posts are stored. You make up these folders in Manage Class. Any post must say which folder it goes in.

Click a Folder and only posts in that folder appear in the List of posts.

Piazza Webinar

David Gries Professor Emeritus (but still teaching) Computer Science Cornell University
Folder Assignment 3

Assignment 3 was clicked,
So you see only posts that are in that folder
Left Column Closed

Left column contains list of pinned posts, then lists of posts in chronological order.

Click a small right arrow to open the posts in that period.

Pinned posts are extremely useful. They are posts that you want at the top no matter how old they are. We show uses of them later.
Click anywhere in the summary of a post and it will open in the right column.

Piazza has lots of bells and whistles, but they are very user-friendly. Example: hover your mouse over one of these icons and a pop-up window will explain it to you.
Hyperlinks

Hover mouse over arrow, see that this is post number @1103. (Look what else you can do.)

@1103 is a hyperlink. Click on a hyperlink in a post and it goes to that post. Awesome!
Updated Student Note (Not Question)

Students do post notes to help others. The original poster gave his name, the updater did not.
Student Answer to a Question

Anonymous answer

Instructor endorsed

Link to answer elsewhere!

Anonymous question

 Shows main panes:

• Question
• Students’ answer
• Instructors’ answer
• Follow up
Question that Needs Follow Up

Student asks for answers.

Look, they are polite!

We tell them to try to answer the questions. We’ll help if wrong.
Student and Instructor Respond to Follow Up

Student answers.

Another student responds.

At the same time that instructor answers.

Student answers.

Another student responds.

At the same time that instructor answers.
Pinned notes to collect assignment FAQs

With so many students (almost 600) we get lots of questions on programming assignments. Many duplicates questions. Hard for students to search. Solution: Pin a note for the assignment. Put in it the assignment handout. Make a list of FAQs. See a question other students could be interested in? Put it in the FAQ list, perhaps with hyperlink to answer.
Office Hour Cancellations

The staff maintains a google calendar, which students look at often. When a staff member has to cancel an office hour, they indicate it in the pinned office-hour-cancelation post.
Conclusions

1. “Pooja’s” Story—Reflection
   - How do you demonstrate sensitivity to your students, especially “different” students?

2. Piazza Research—Results
   - Anonymity w/in respectful, controlled environment creates risk-free, inclusive learning environments

3. Piazza Platform—Faculty Case Example
   - An easy-to-adopt, flexible, free, option for faculty to help create a “safe,” inclusive learning environment for ALL students
HOW TO APPLY TO YOUR TEACHING CONTEXT!
Citations: Recommended Reading


Computer science classes are highly collaborative, or rather they should be. It’s tough to master computer science material without collaborating with others. And it’s tough to collaborate with others when you look and feel so different from your peers. We see this in studies^{[1]} of women leaving STEM careers: isolation is a key factor leading women to leave. What are some techniques professors can use to mitigate feelings of isolation among women and minorities in their engineering classes? Hopefully many academics will explore this very topic, but here are five starting tips:

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<th>Influence</th>
<th>Reflections</th>
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| Modify the lecture. Make Learning active.     | ✓ A recent study^{[2]} has shown that modifying course structures beyond the traditional lecture format can significantly improve student outcomes for some under-represented groups, and specifically for black and first-generation students taking biology courses. The study implemented course structures that encouraged ongoing study and skills practice and collaboration, or active learning, while decreasing the reliance on material from lectures, or passive, solitary learning. The result: the achievement gap between black students, and their white and Asian peers was almost halved, and the gap between first-generation students, and their white and Asian peers was almost eliminated.
|                                               | ✓ Check out the EIT website^{[3]}, specifically the EIT Active Learning webinar^{[4]} to familiarize yourself with options for creating an inclusive, learning context.                                                                                                                       |
| Assign Project Groups.                        | ✓ Research has found that small group work can help create a more collaborative and comfortable environment for learning, but students who feel different won’t always have an easy time finding project teammates. Allowing students to self-select their project groups is akin to allowing the popular “jocks” to self-select their dodgeball teammates: the “non-jocks” will be isolated and then humiliated. If you allow students to choose their teammates, they will choose students like themselves, so choose for them—at least some of the time. |
Try Piazza: 6 Easy Steps

1. Add your class
   Click the big blue button on Piazza.com to create your class – it takes just 2 minutes

   Professors and TAs Get Started

2. Enroll your students
   Log in and paste your roster in the Manage Class tab to enroll your students with one click

3. Prep for the first day
   Create custom folders to tag and organize the posts in your class

4. Set your class up for success
   Determine anonymity/privacy settings and establish response expectations with TAs

5. Introduce your students to Piazza
   Share your Piazza class link (in the Manage Class tab) with your students via email and on your course website

   Class Link:
   piazza.com/standford/spring2014/cs103/home
   → This is the link to your course page on Piazza.

6. Make your first post
   Encourage your students to start posting in the Q&A forum, instead of sending emails with questions
Downloads, Links & Resources!

- Download recommended files (e.g., PPT, Articles)
- Website Links:
  - Go to the EIT website: [www.WSKC.org/EIT](http://www.WSKC.org/EIT)
  - Use the *Action Checklists & Other Resources*
  - Apply for the *Inclusive Educator Award* (May 1st deadline)
  - Listen to previously recorded webinars
  - Sign up to participate in future live webinars
  - Register for “Creating a Positive Climate for Learning: Dealing with Incivility and Conflict in the Classroom” (May 19, 2015; 2-3:00pm ET)
  - Go to the Piazza website: [https://piazza.com](https://piazza.com)
- Provide us feedback!
  - Personalized “Certificate of Participation” upon completion!
Poll 8: What are YOUR next steps?

Based on what you have learned, what are YOUR next steps to creating an inclusive learning context for your students?

- Read research citations provided: 56.2%
- Review the Action Checklist: 56.2%
- Use 6 Easy Steps to try Piazza for the first time: 25%
- Upload the webinar PowerPoint presentation PDF file: 12.5%
- Download information links provided: 56.2%
- Review the recorded EIT webinar: 18.7%
- Explore the EIT website: www.WSKC.org/EIT: 25%
- Peruse the Piazza website: www.piazza.com/product/overview: 37.5%
- Explore new Piazza (established Piazza users): 0%
- Share this information with colleagues: 62.5%
- I don't know: 0%
- I am not planning on doing anything more: 0%
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