Engineering Inclusive Teaching

Faculty Professional Development

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STEMming the Confidence Gap:

Mitigating Social Judgment and Isolation

Pooja Sankar, Piazza Founder & CEO &
Jessica Gilmartin, Piazza Chief Business Officer

David Gries, Ph.D. Prof. Comp. Sci.
Cornell University

NAPE
National Alliance for Partnerships in Equity Education Foundation

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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PI & Women in Engineering ProActive Network (WEPAN) Executive Director

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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

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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:

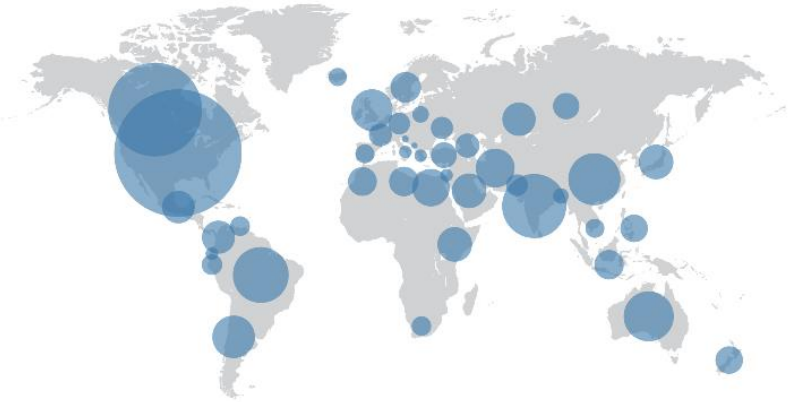
My Hometown – Patna, India

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?

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.

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Poll: Do women and men differ in the number of questions ASKED?

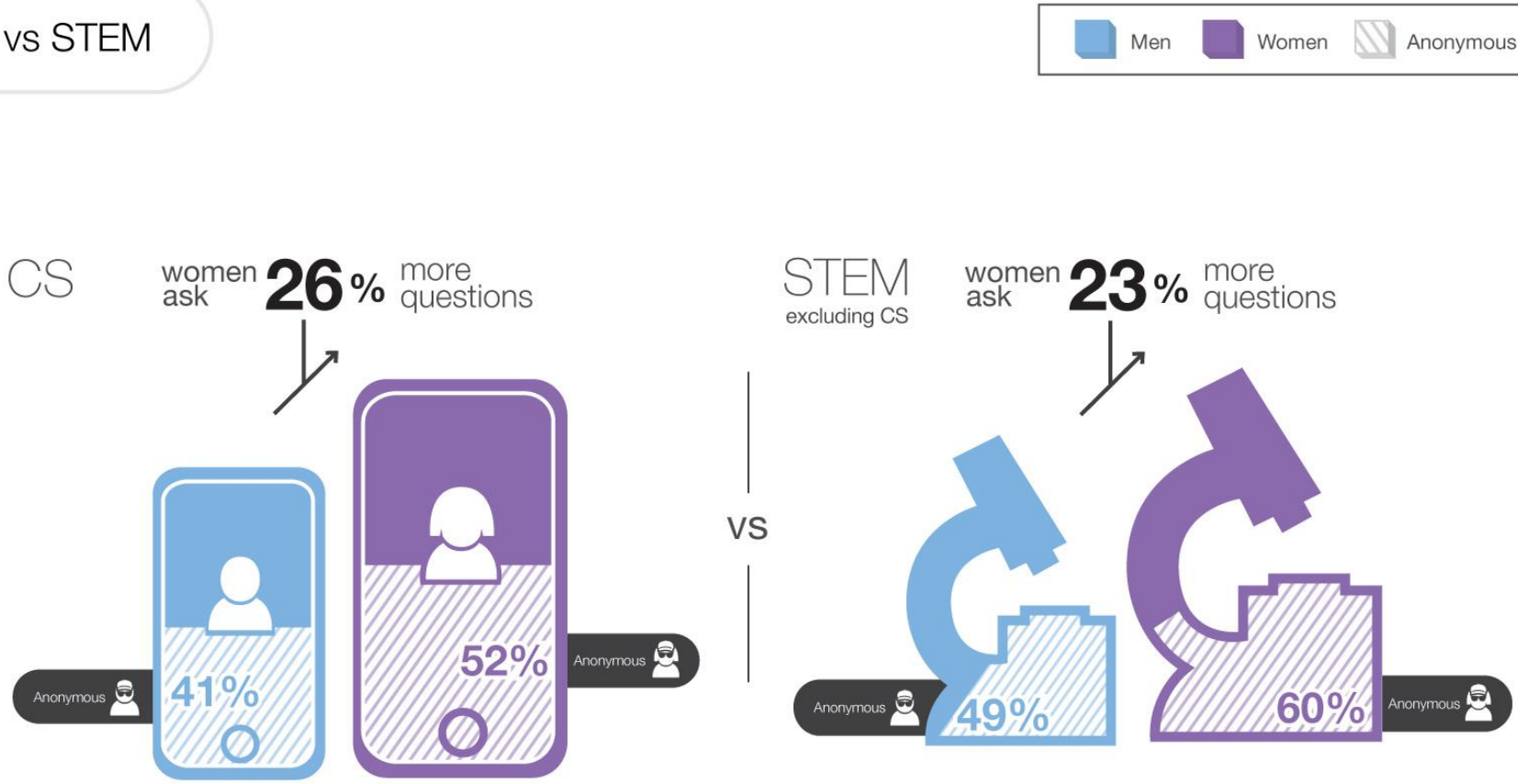
Do women and men differ in the number of questions ASKED?

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



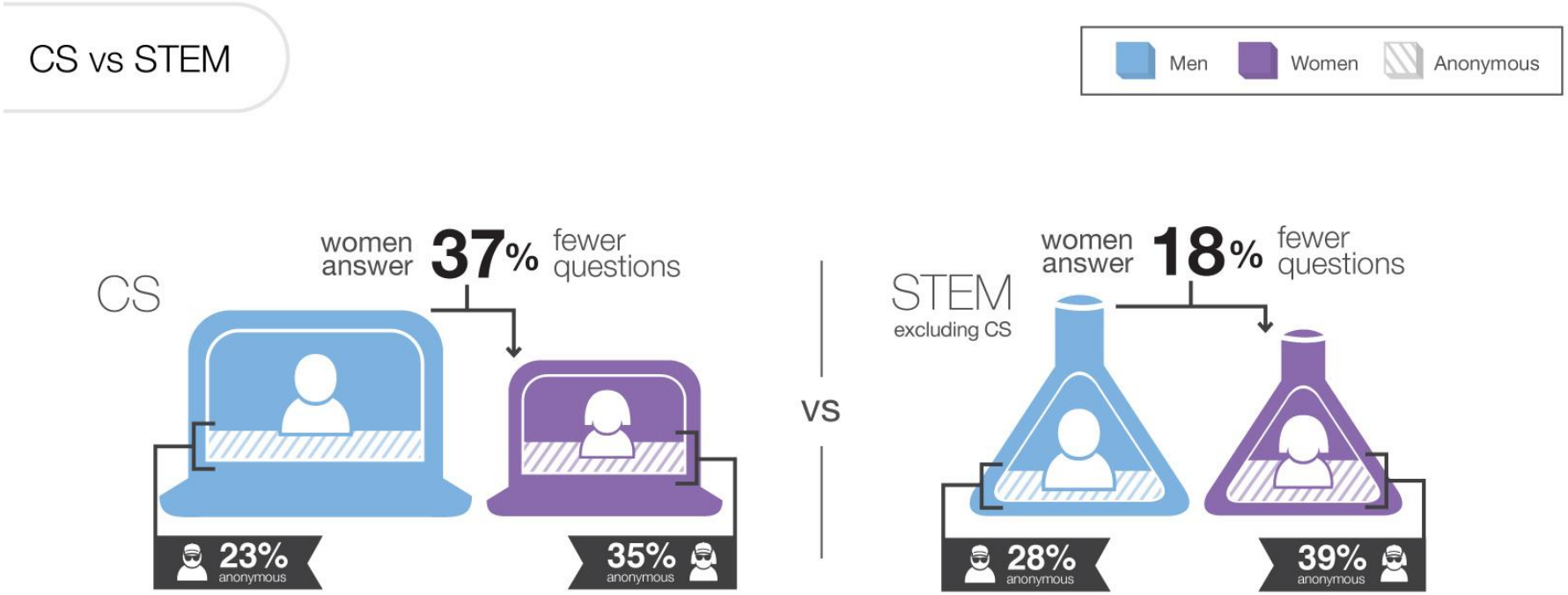
Poll: Do women and men differ in the number of questions ANSWERED?

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



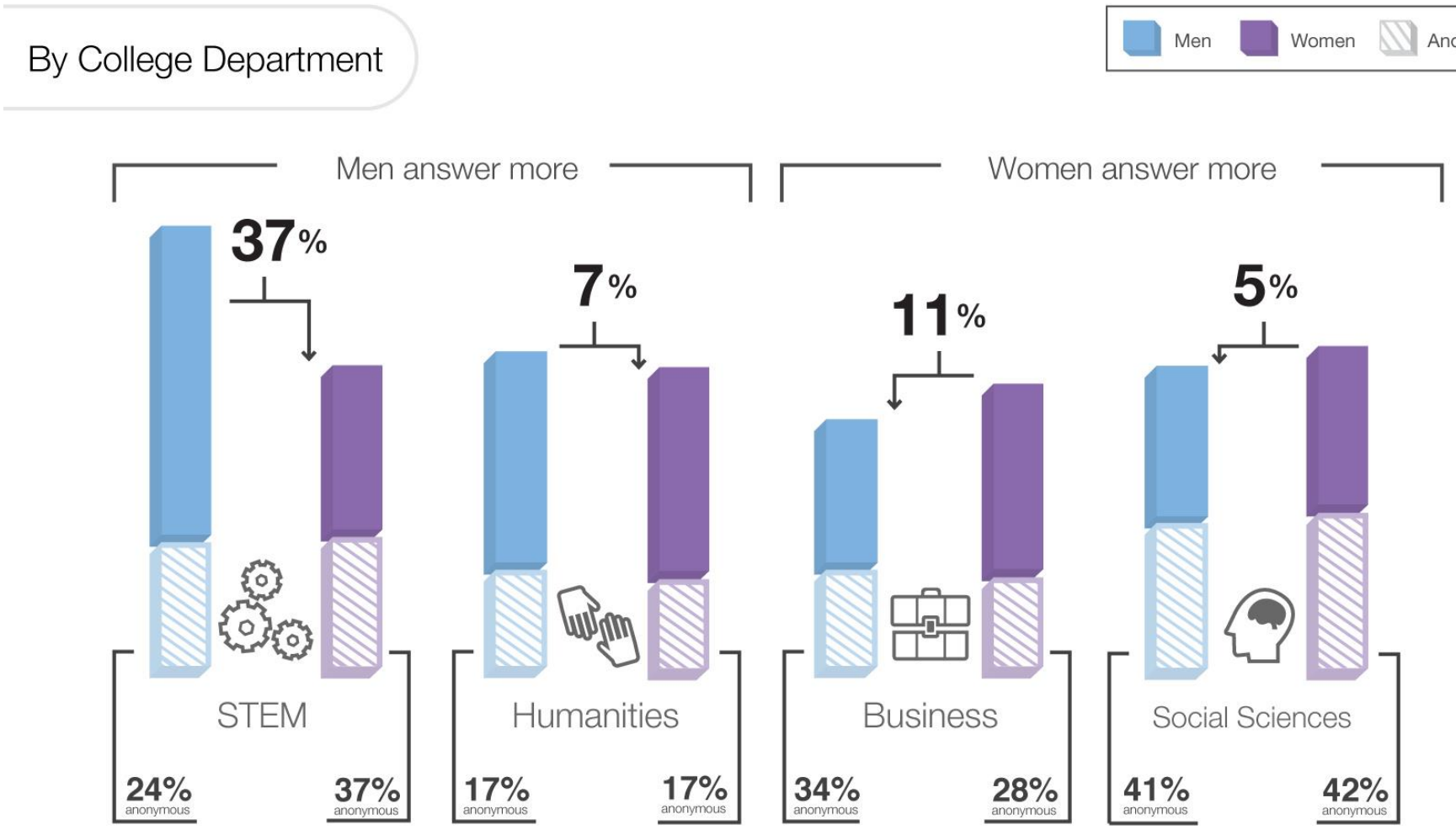
Poll: Are the sex differences found in answering questions similar between STEM and non-STEM disciplines?

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



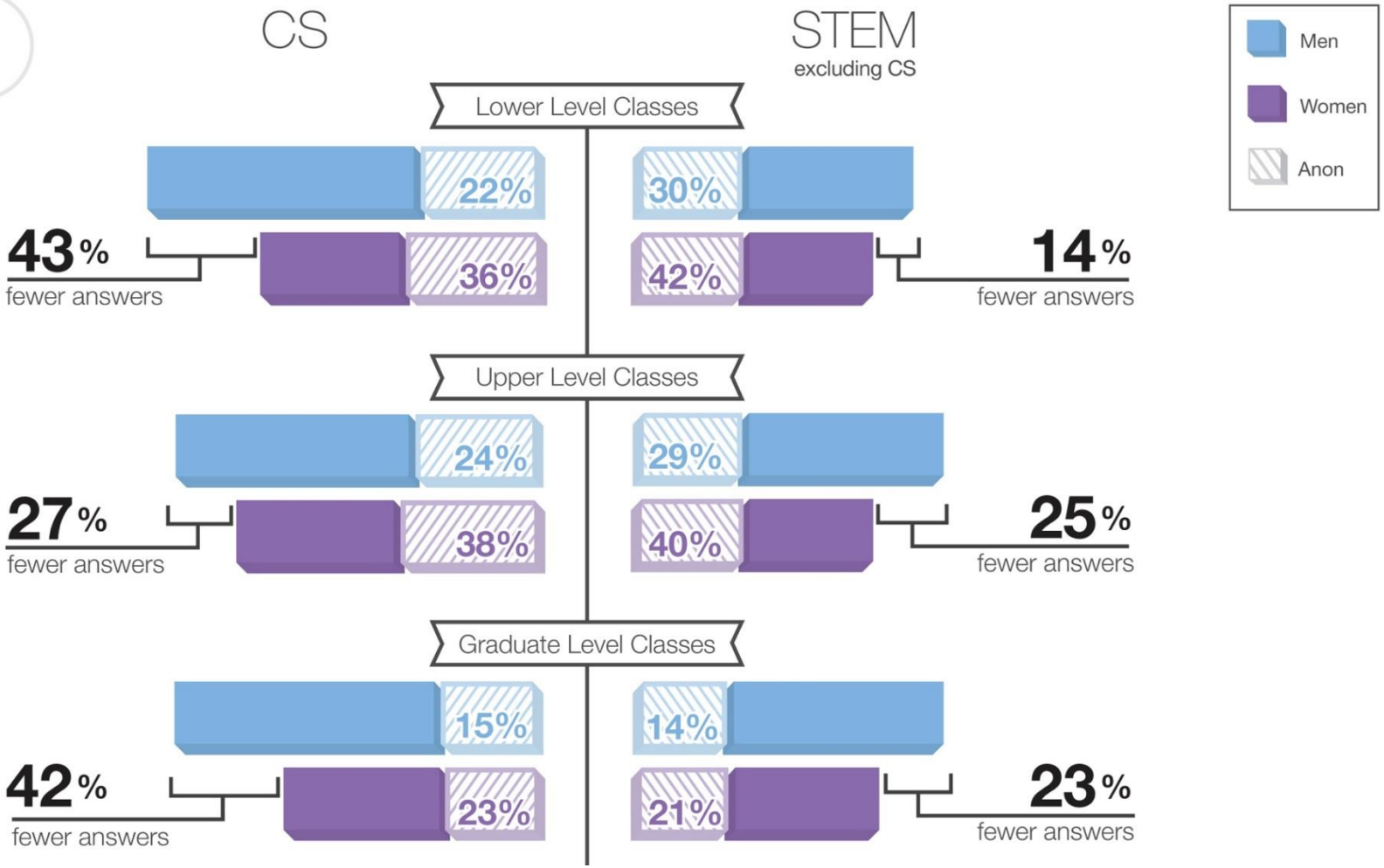
Poll: Do sex differences in answering questions persist from undergraduate to graduate classes?

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

- Yes — 72.7...
- No — 27.2...

Sex Differences Persist

By Level

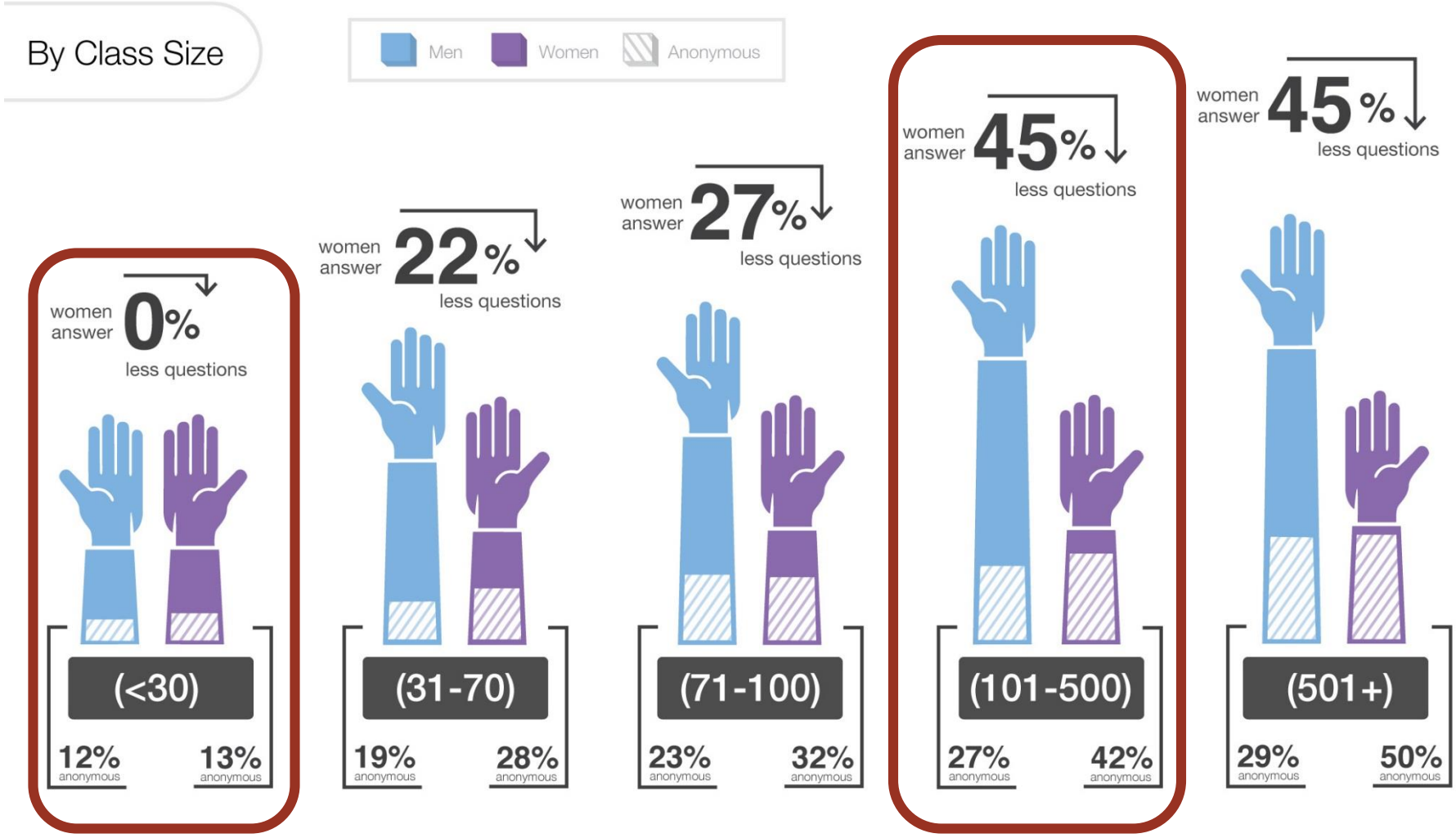


Poll: Does class size influence sex differences in answering questions?

Does class size influence sex differences in answering questions?

Yes	87.5...
No	12.5...

Class Size: Sex Differences



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)

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Underrepresented Men Concur

Cody Coleman
CS major
MIT, class of 2013

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

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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.

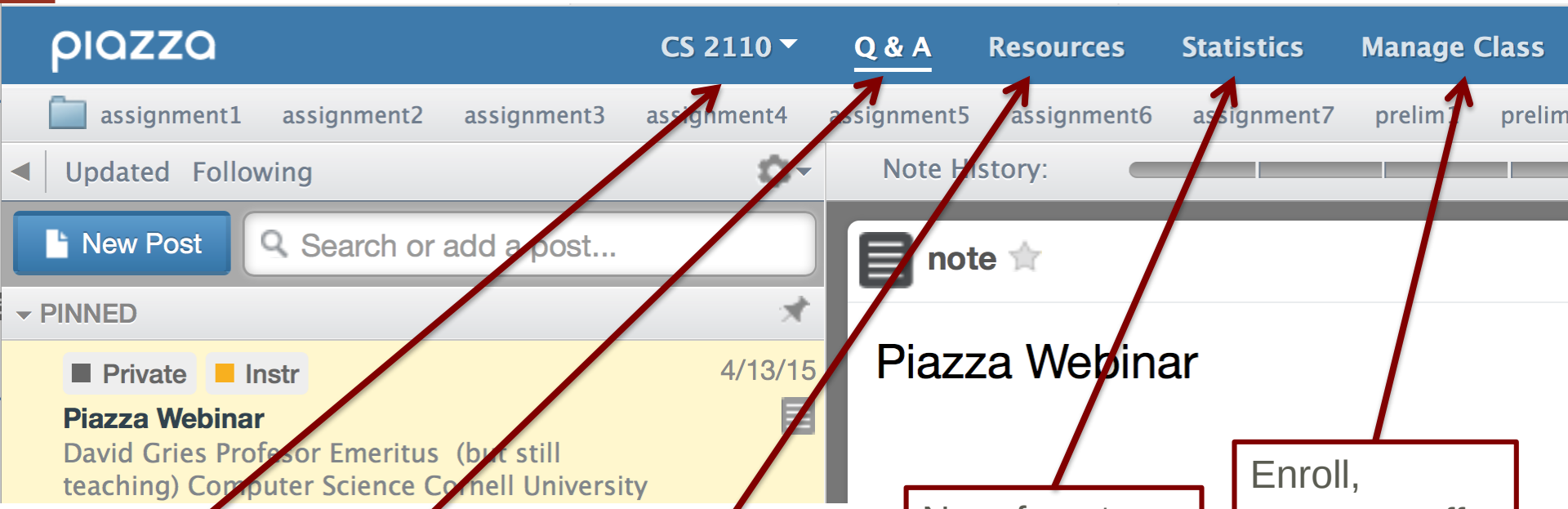
Pooja went to an all-girls high school in India and was then admitted to IIT Kanpur, India. There, she was one of a handful of girls in the midst of many boys. Too shy to talk much, she studied alone, while the boys worked together, benefitting tremendously from the collaboration. Piazza is Pooja's way 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, in-active ones

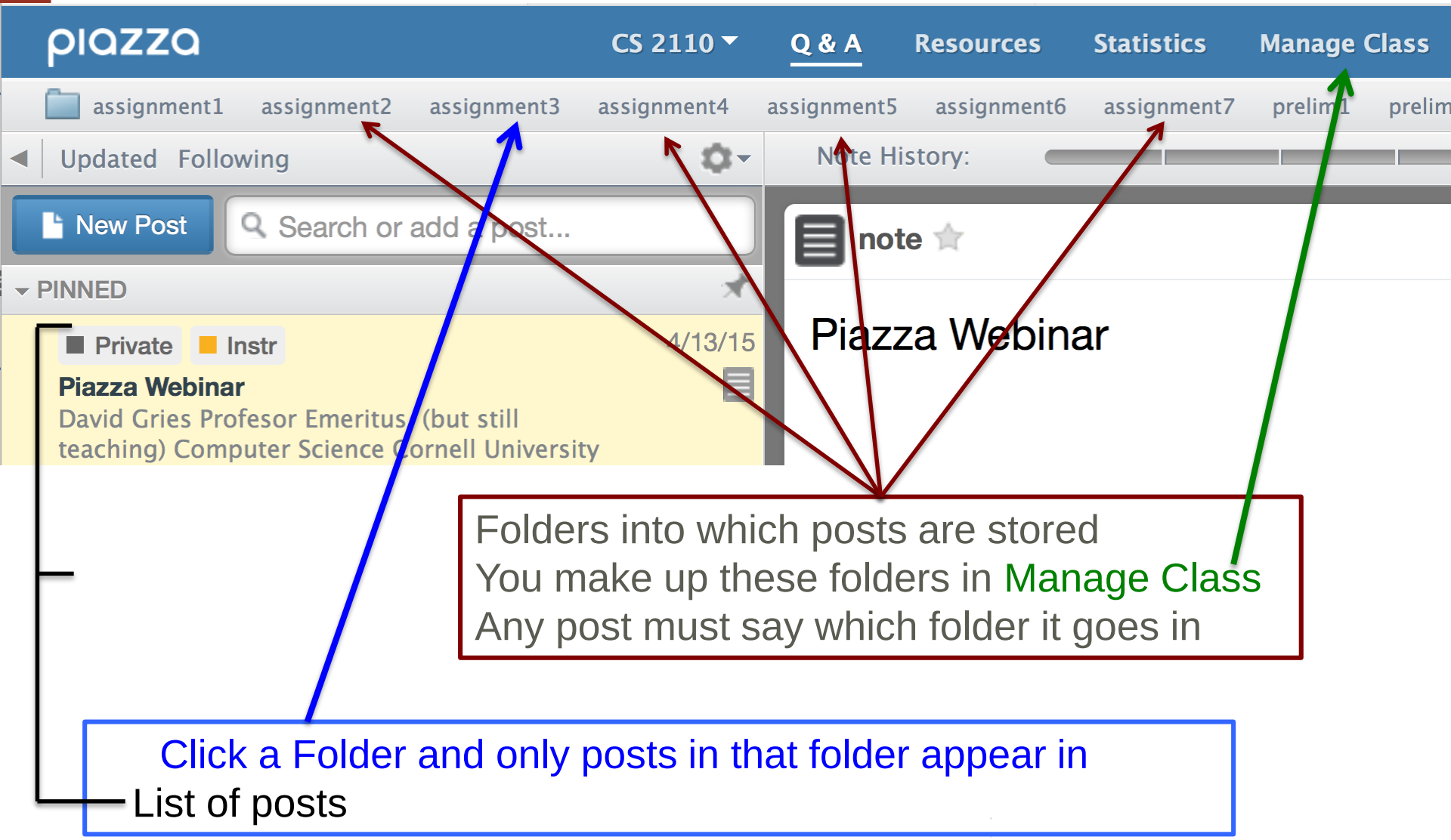
Main pane, list of posts on left and post being viewed on right

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)

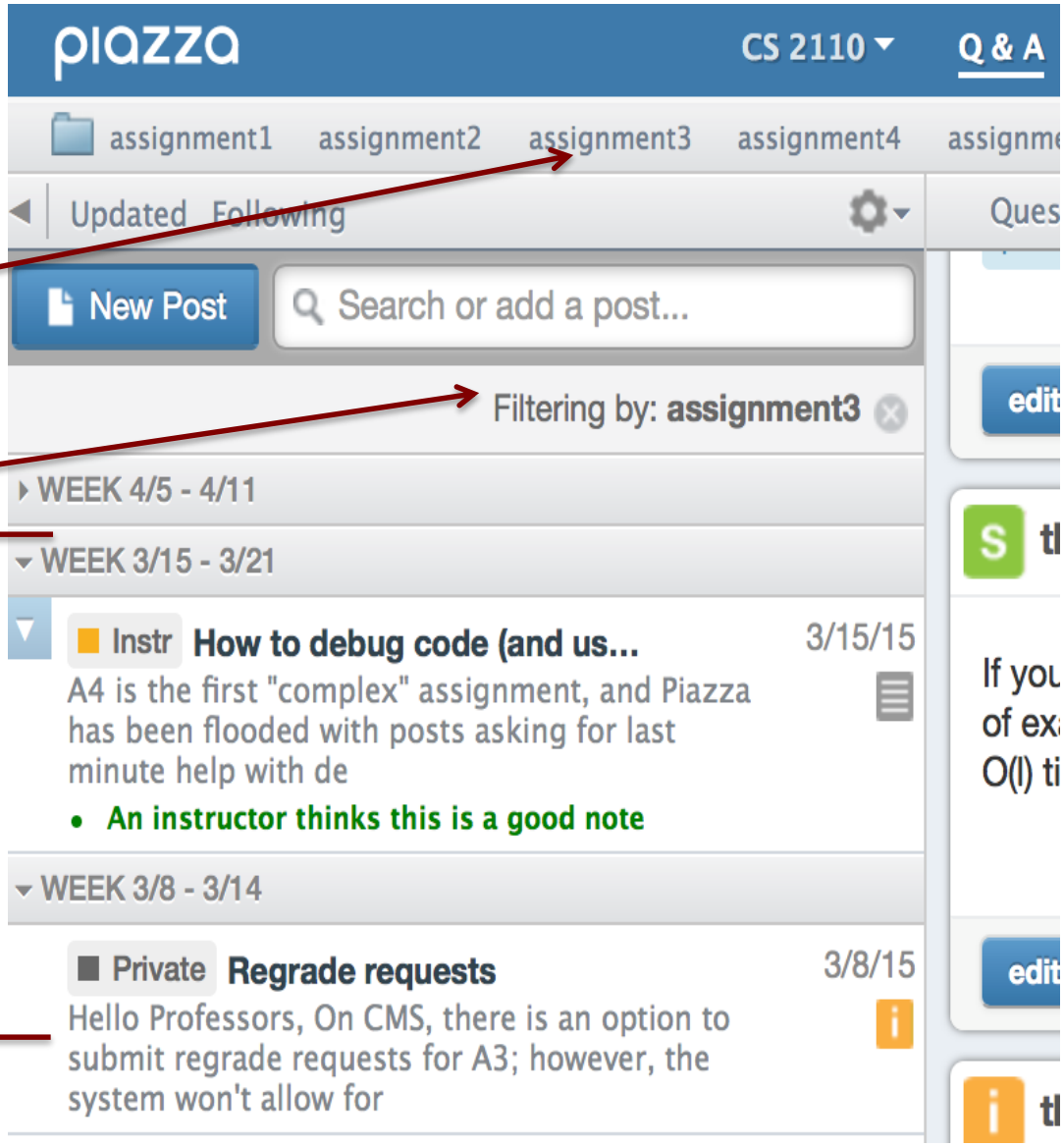
Folders


piazza
CS 2110
Q & A
Resources
Statistics
Manage Class
assignment1
assignment2
assignment3
assignment4
assignment5
assignment6
assignment7
Updated
Following
Note History:
New Post
Search or add a post...
PINNED
Private
Instr
4/13/15
Piazza Webinar
David Gries Profesor Emeritus (but still teaching) Computer Science Cornell University
note
Piazza Webinar
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
List of posts

Folder Assignment 3

Assignment 3 was clicked,

So you see only posts that are in that folder

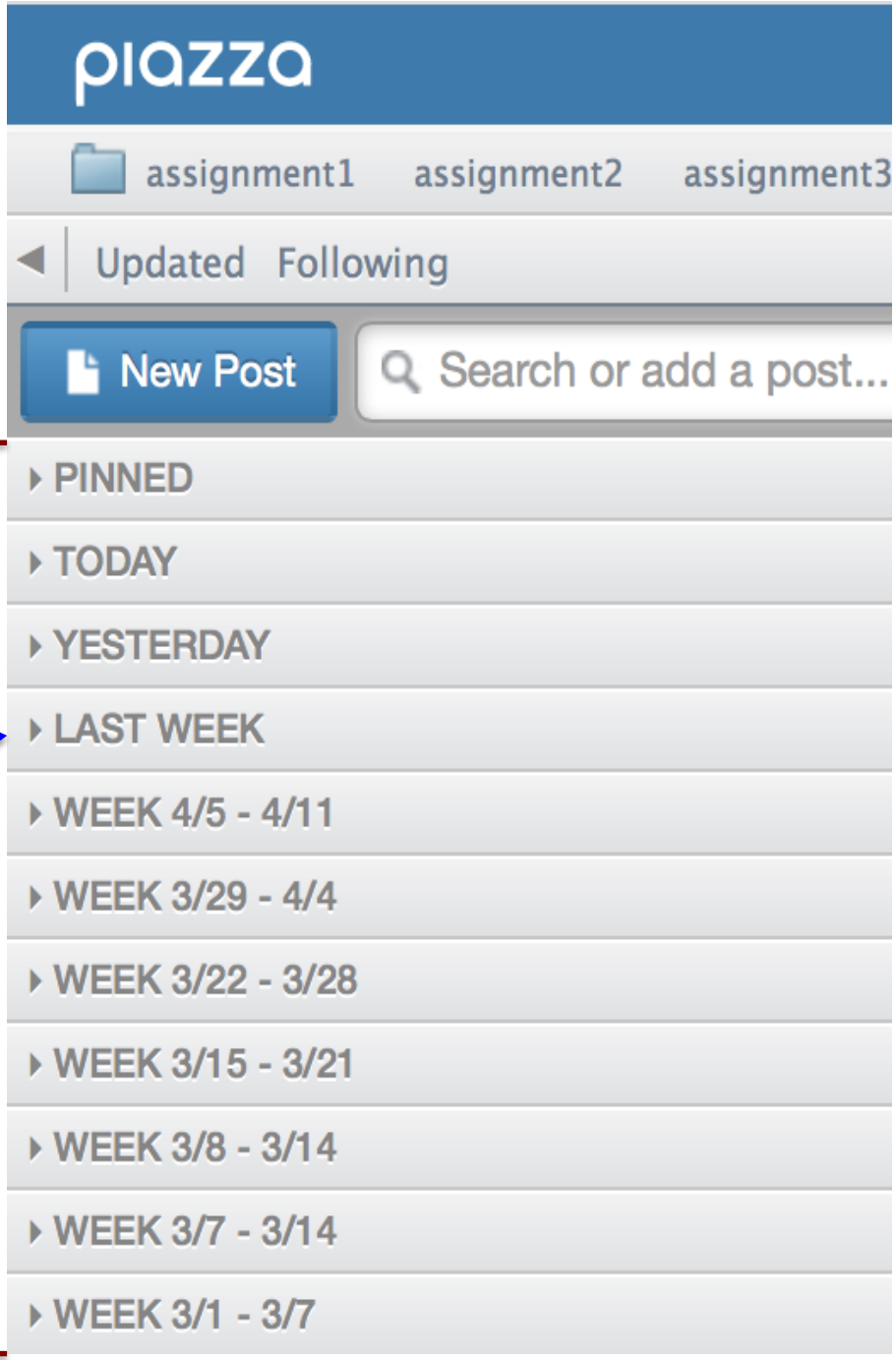


Left Column Closed

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

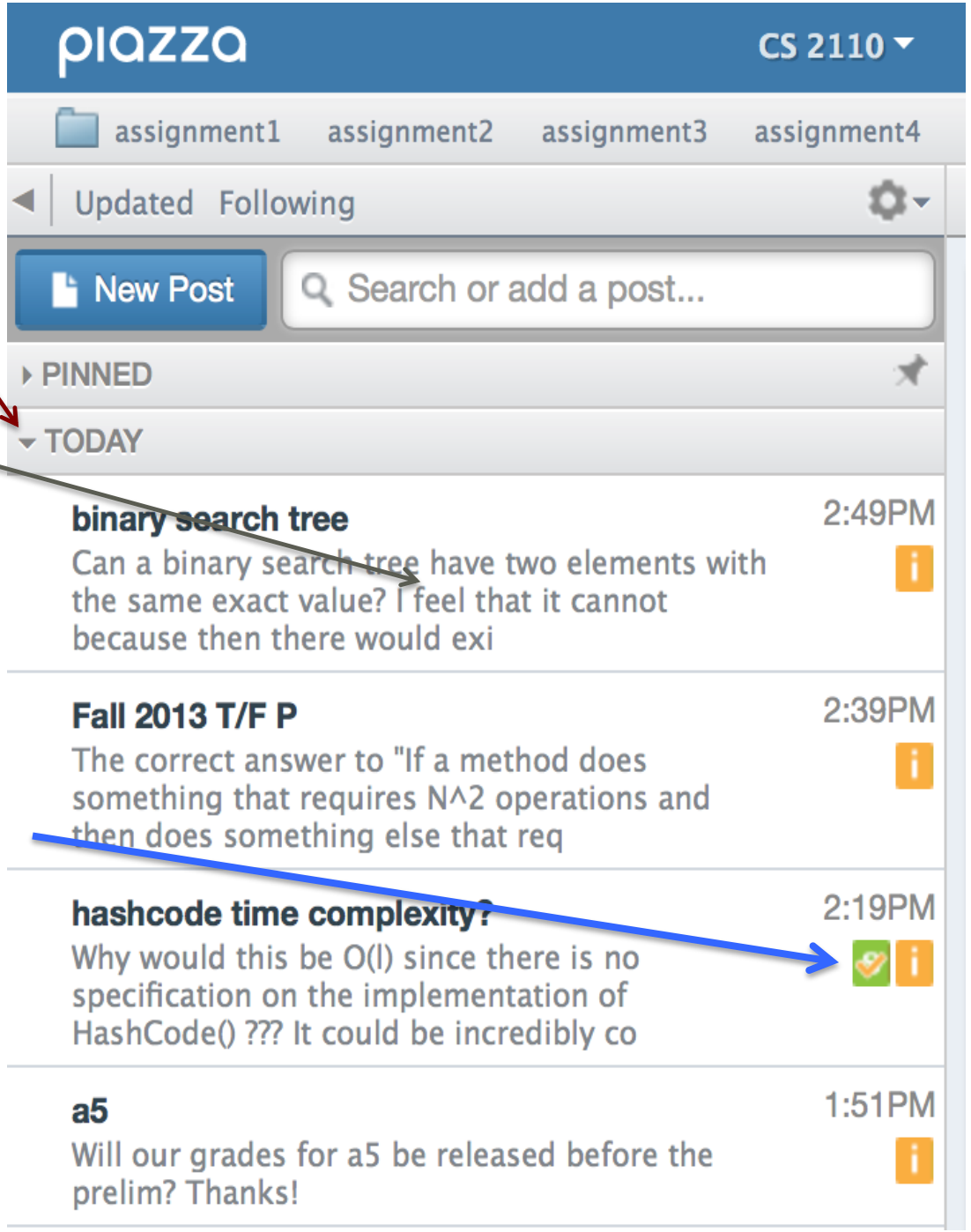
Pinned posts are extremely useful. They are posts that you want at the top no matter how old they are. We show uses of them later.



A Left Column Period is Open

Click anywhere in the summary of a post and it will open in the right column.

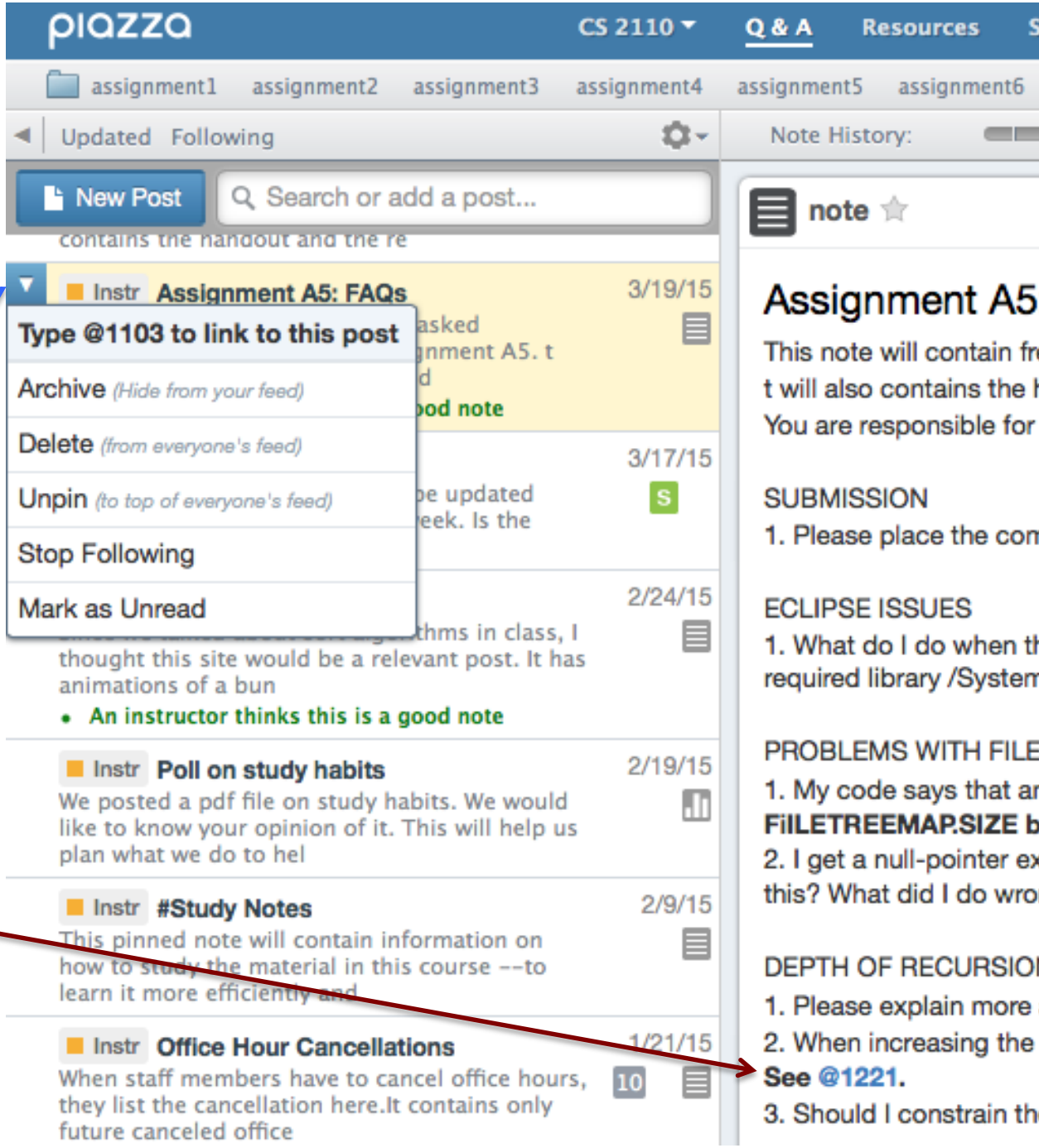
Piazza has lots of bells and whistles, but they are very user-friendly. Example: hover your mouse over one of these icons and a pop-up window will explain it to you.



Hyperlinks

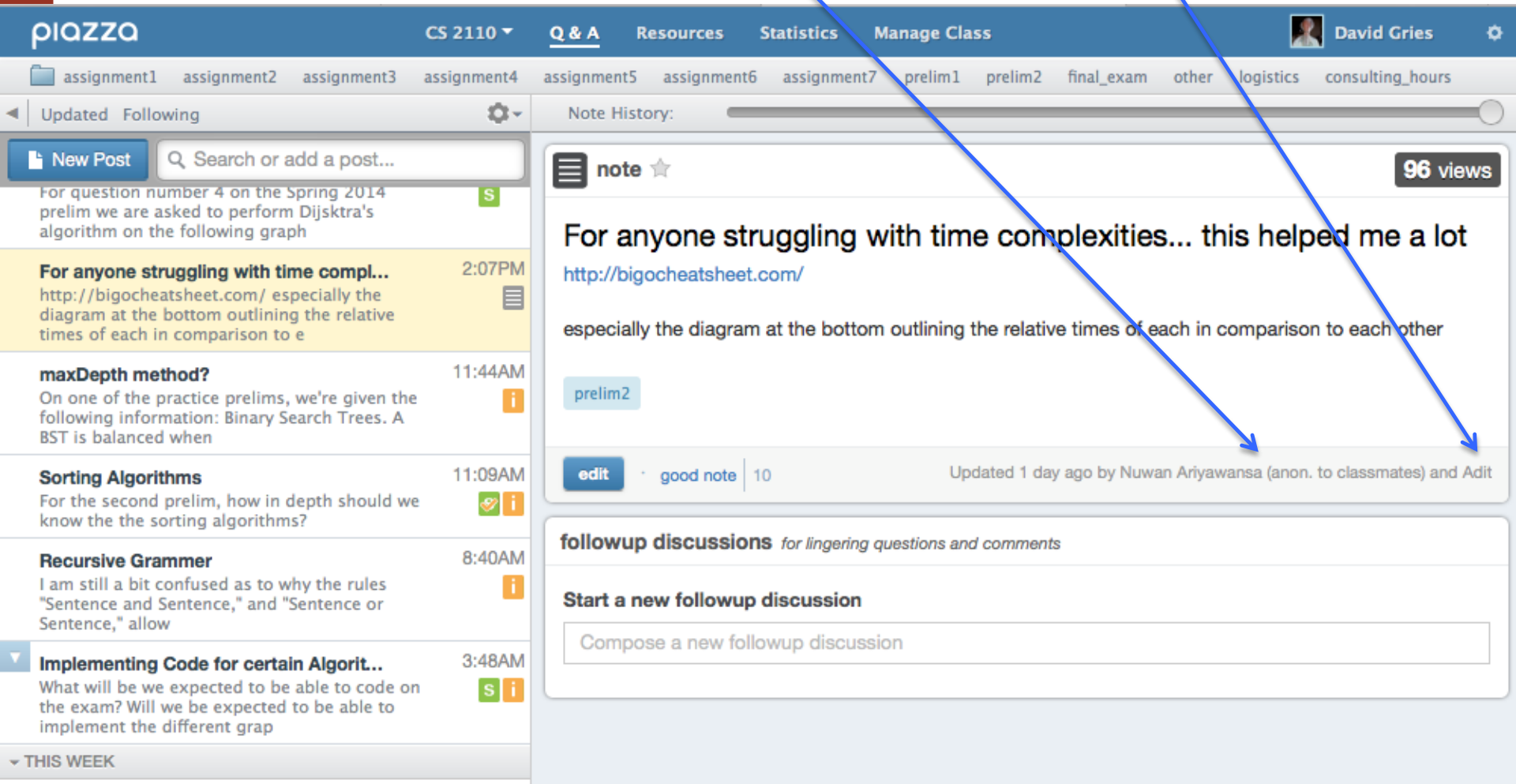
Hover mouse over arrow, see that this is post number @1103.
(Look what else you can do.)

@1103 is a hyperlink. Click on a hyperlink in a post and it goes to that post. Awesome!



Updated Student Note (Not Question)

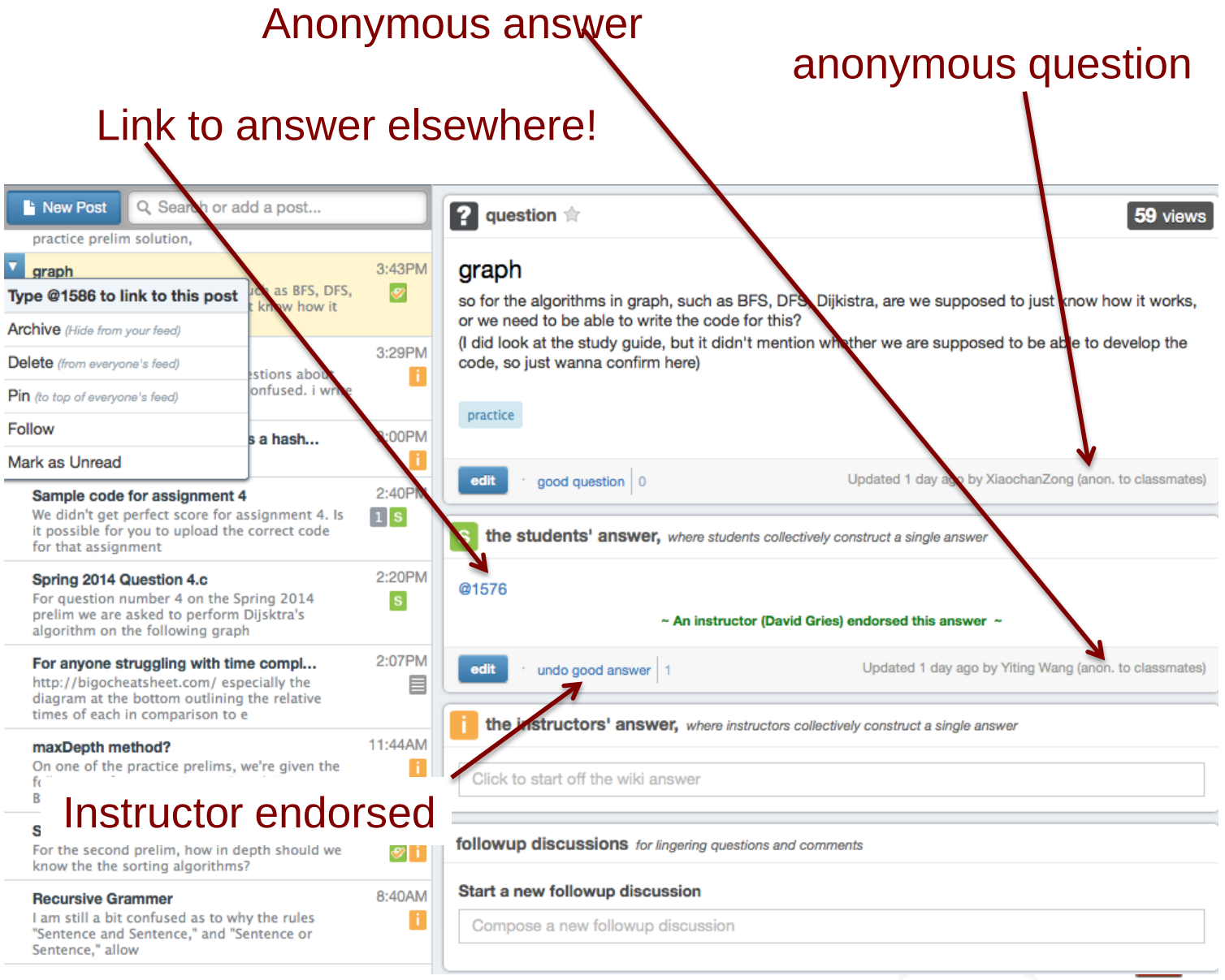
Students do post notes to help others. The original poster gave his name, the updater did not



Student Answer to a Question

Shows main panes:

- Question
- Students' answer
- Instructors' answer
- Follow up

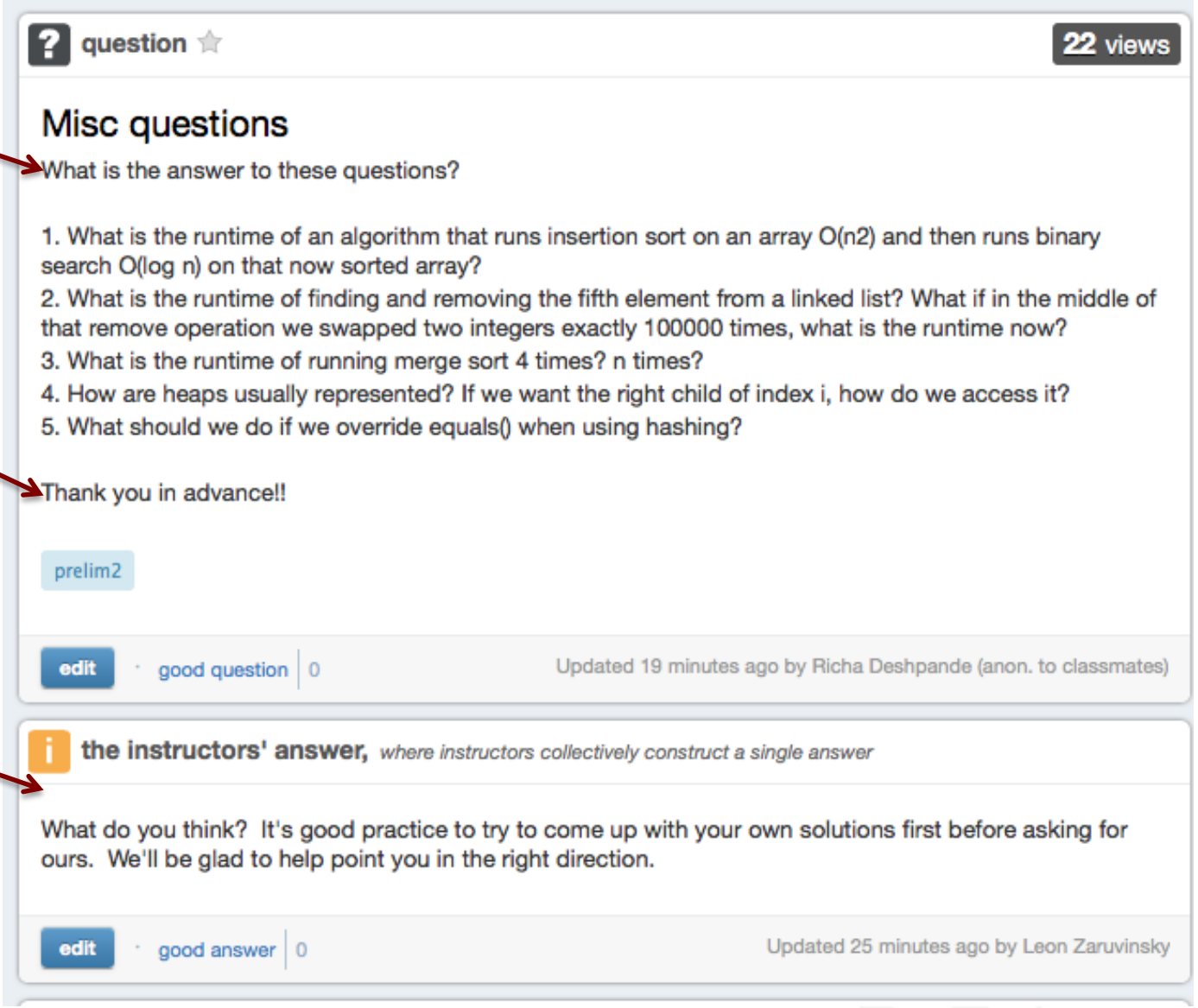


Question that Needs Follow Up

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.

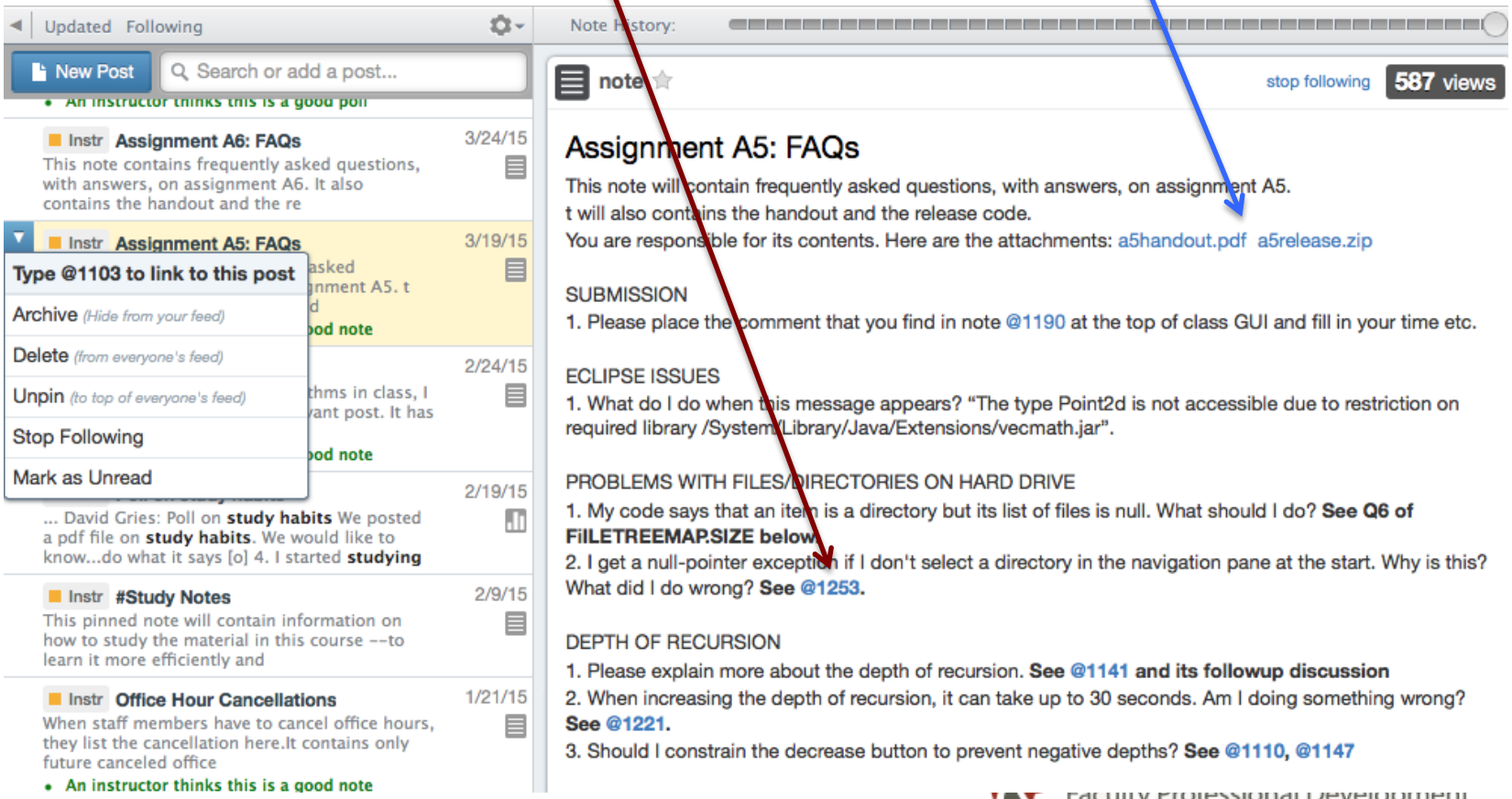
Another student responds

At the same time that instructor answers

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.



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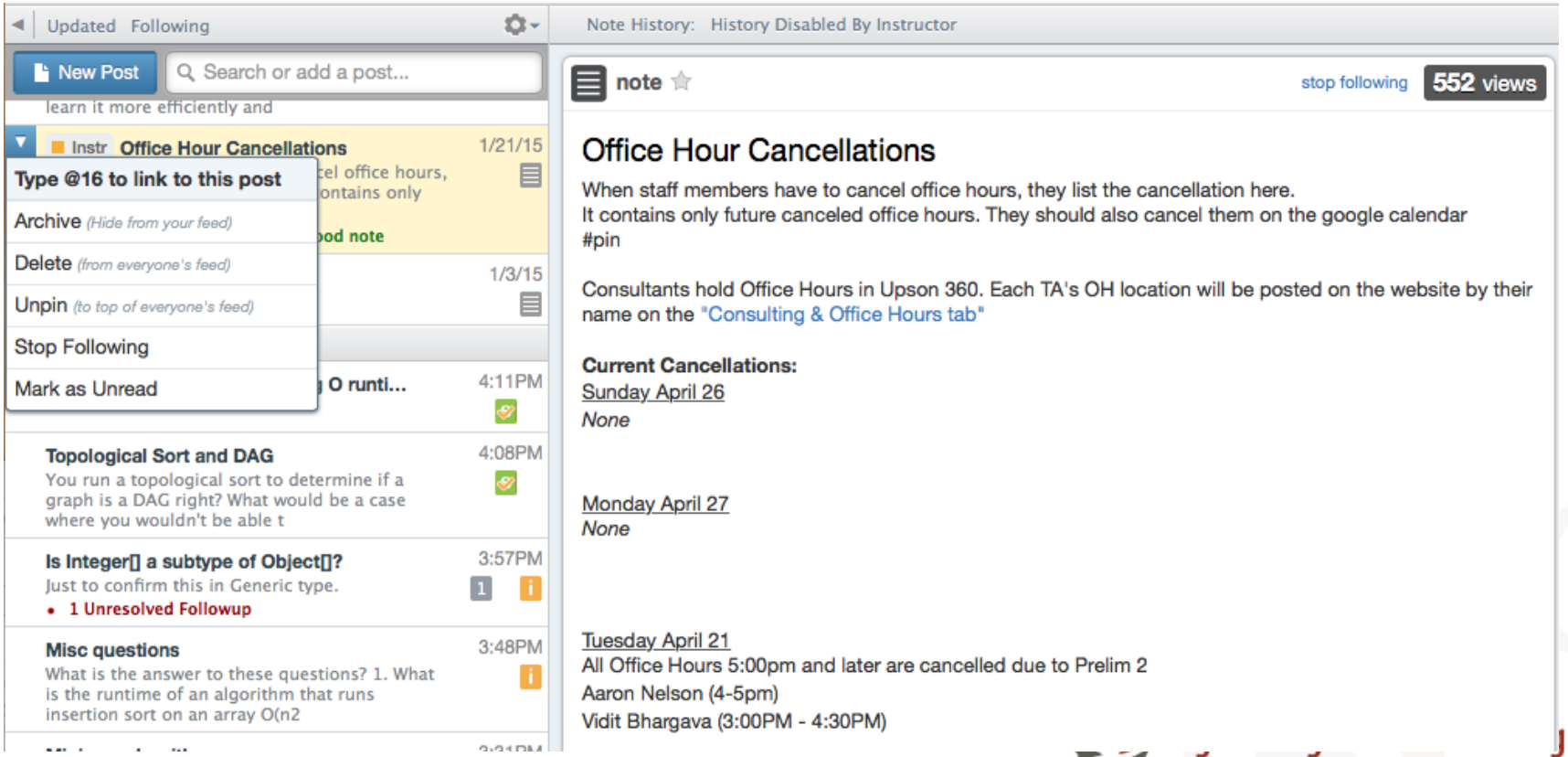
Office Hour Cancellations

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.



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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

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HOW TO APPLY TO YOUR TEACHING CONTEXT!

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Citations: Recommended Reading

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2. Ehrlinger, J. & Dunning, D. (2003). *How chronic self-views influence (and potentially mislead) estimates of performance.* Journal of Personality and Social Psychology, Vol 84(1) 5-17.

3. Hancock, A. & Rubin, B. (2014). *Influence of Communication Partner's Gender on Language*. Journal of Language and Social Psychology

4. Jong, B., Lai, C., Hsia, Y., Lin, T. (2013). *Effects of Anonymity in Group Discussion on Peer Interaction and Learning Achievement.* IEEE Transactions on Education, Vol 56, No. 3.

5. Krupnick, C. (1985). *Women and Men in the Classroom: Inequality and Its Remedies*. On Teaching and Learning, Vol 1. http://isites.harvard.edu/fs/html/icb.topic58474/krupnick.html

6. Neufeld, Adam (2004). *Study on Women's Experiences at Harvard Law School.* http://www.law.harvard.edu/students/experiences/ExecutiveSummary.pdf

7. Sadker, M. & Sadker, D. (1994). http://www.aauw.org/files/2013/02/how-schools-shortchange-girls-executive-summary.pdf

8. Shipman, C. & Kay, K. (2009) *Womenomics*. Harper Collins Publishers, NY. (Online review: http://www.theatlantic.com/features/archive/2014/04/the-confidence-gap/359815/)

9. Vedantam, S. (2007). *Salary, Gender and the Cost of Haggling*. Washington Post. http://tinyurl.com/WPNegotiationCosts

Action Checklist

STEMming the Confidence Gap—Mitigating Social Judgement and Social Isolation

April 22nd, 2015 Webinar with P. Sankar, J. Gilmartin & D. Gries

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:

Influence	Reflections
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 pummeled. If you allow students to choose their teammates, they will choose students like themselves, so choose for them—at least some of the time.

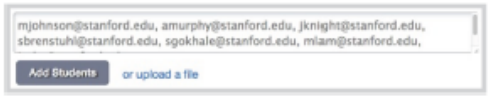
Try Piazza: 6 Easy Steps

1. Add your class

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

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

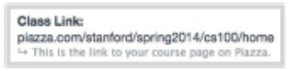
Create custom folders to tag and organize the posts in your class

4. Set your class up for success

Determine anonymity/privacy settings and establish response expectations with TAs

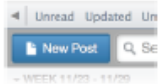
5. Introduce your students to Piazza

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



6. Make your first post

Encourage your students to start posting in the Q&A forum, instead of sending emails with questions



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Downloads, Links & Resources!

- ✓ Download recommended files (e.g., PPT, Articles)
- ✓ Website Links:
  - Go to the EIT website: 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
- ✓ 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?

What are your next steps in creating an inclusive learning context for your students? (check all that apply)

☐ 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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Together we can engage all minds in engineering the future!

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