Syracuse University

# Tools for the STEM TA

**Michael Ammoury**

**Elise Krespan**

Syracuse University

# Tools for the STEM TA

**Michael Ammoury**

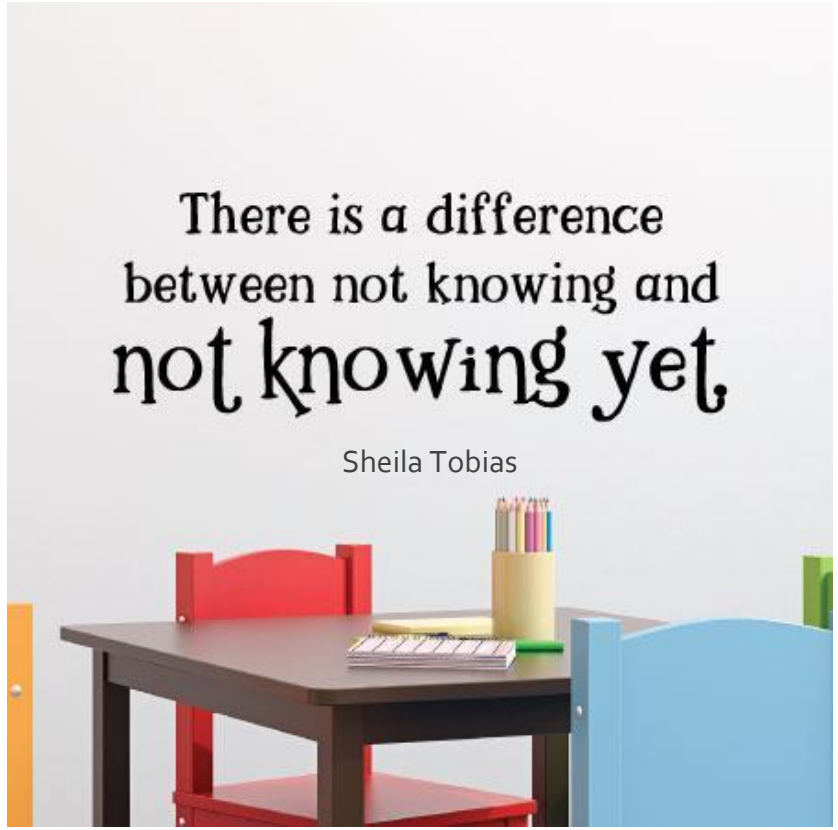
**Elise Krespan**

- https://tinyurl.com/mb97ru29

# Topics Covered

- Teaching assignments
- Duties and recommendations
- General Expectations
- Promoting learning in a classroom
- Overcoming challenges
- Additional resources

www.menti.com
Voting code **99 28 42 7**


There is a difference
between not knowing and
not knowing yet
Sheila Tobias

# TEACHING ASSIGNMENTS


## 1) Recitation TA

- Leads small class sections, assigned students from larger lecture

## 2) Lab TA

- Facilitates student laboratory sessions

## 3) Grader

- Grades laboratory or lecture assignments

## 4) Lecture TA

- Assistant to lecturer, facilitates course needs

## 5) Inst of Record

- Primary instructor of the course

# 1) The Recitation TA

## TA Duties

- Review material covered in class
- Answer questions and facilitate open discussion
- Work difficult homework problems
- Exam preparation/review
- Administrative duties


Courtesy of Google Images

# 1) The Recitation TA (Cont'd)

(DONQUXOTE, 2016)

## During Recitation

- Avoid Lecturing
- Interact with Students
- Encourage Groupwork (Example)
- Pause for Questions
- Follow-up emails (Example)

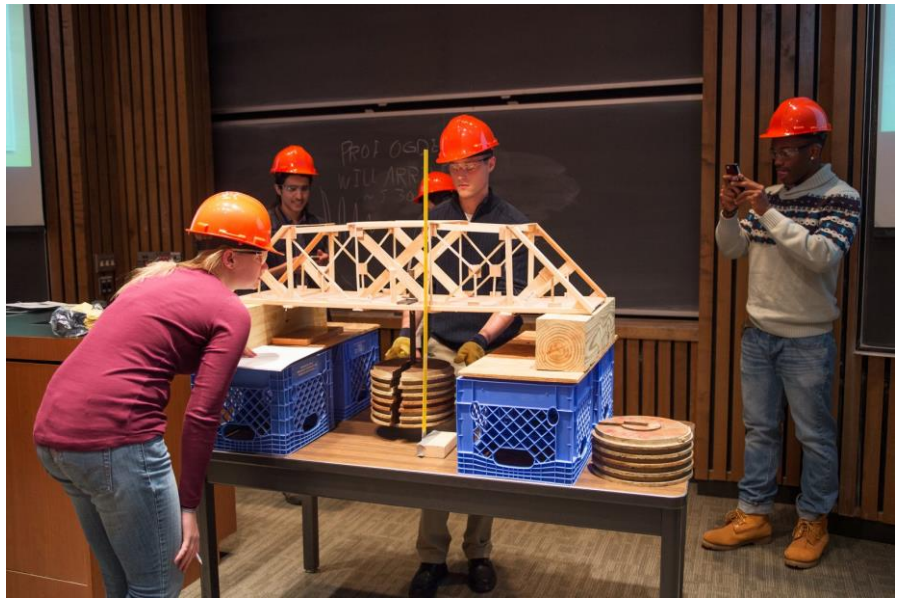
# 2) The Lab TA

Wikipedia

# 2) The Lab TA

**Purpose of lab:**

- Make practical connections to theoretical principles
- Explore concepts from lecture
- Understand and apply new methods



Courtesy of Google Images

**TA Duties**

- Overview procedures
- Lab preparation and clean-up
- Lab Demon-strations
- Time manage-ment
- Safety monitoring
- Attendance tracking
- Data analysis

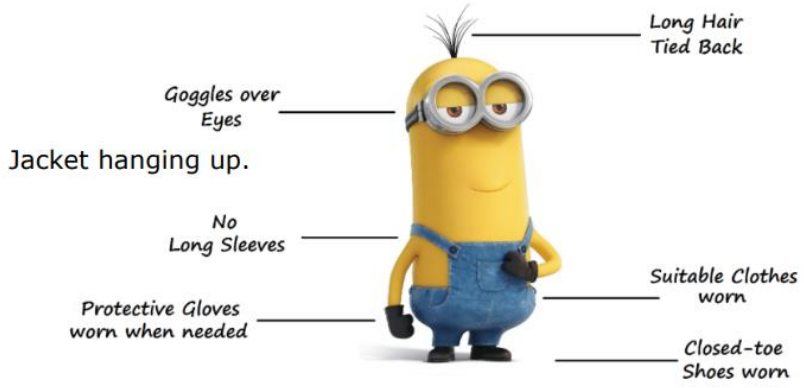
# 2) The Lab TA (Cont'd)

## Before the Lab

Courtesy of Google Images

- Familiarize yourself with lab space
- Conduct lab in advance
- Practice unfamiliar techniques

- Review safety protocols
- Be flexible (Example)
- Outline student expectations

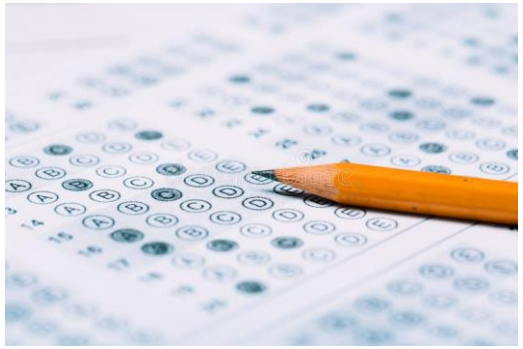



https://penicuik.mgfl.net/

# 3) The Grader

**Duties:**

- Create answer keys
- Grade assignments, quizzes, exams
- Grade record keeping and reporting
- Provide feedback

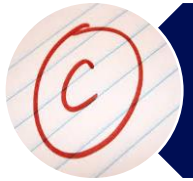


Courtesy of Google Images

## Tips for Grading


**Be fair and consistent (Example)**


**Create a rubric**

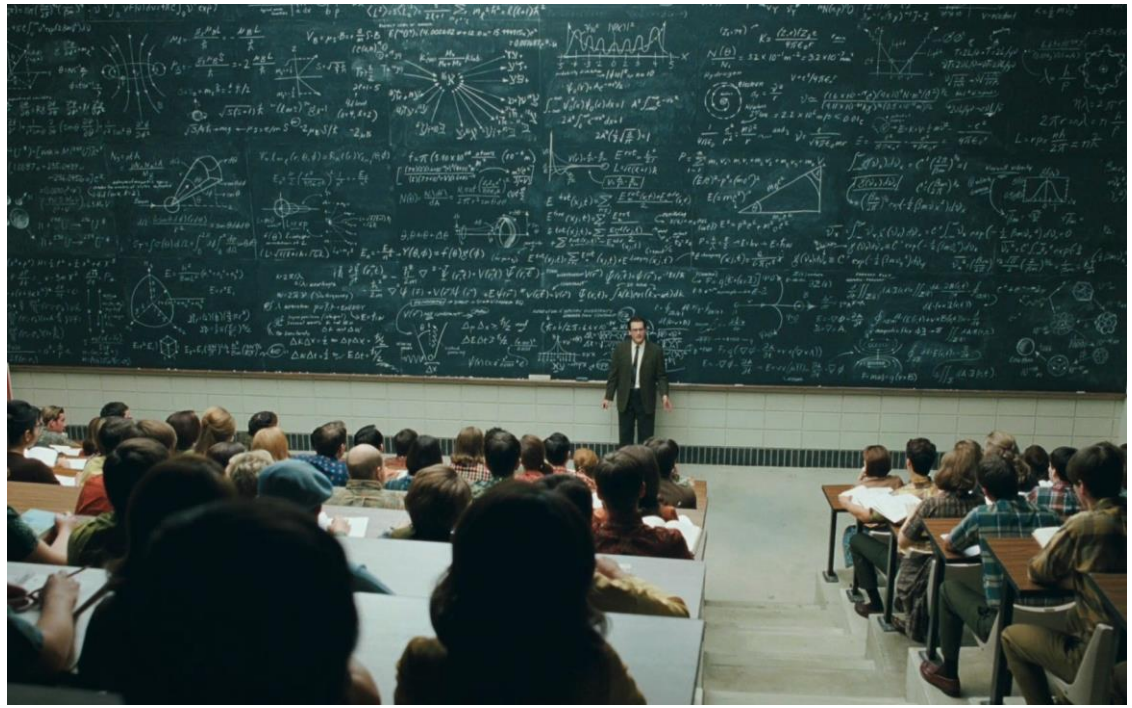



**Communicate with course instructor**

# 4) The Lecture TA

**Duties:**

- Teach a section in your area of focus
- Create a Syllabus
- Create a Grading Rubric
- Take attendance
- Lead few sessions
- Coordinate with other instructors



Courtesy of Google Images

# 5) Instructor of Record

https://www.istockphoto.com/

# Expectations

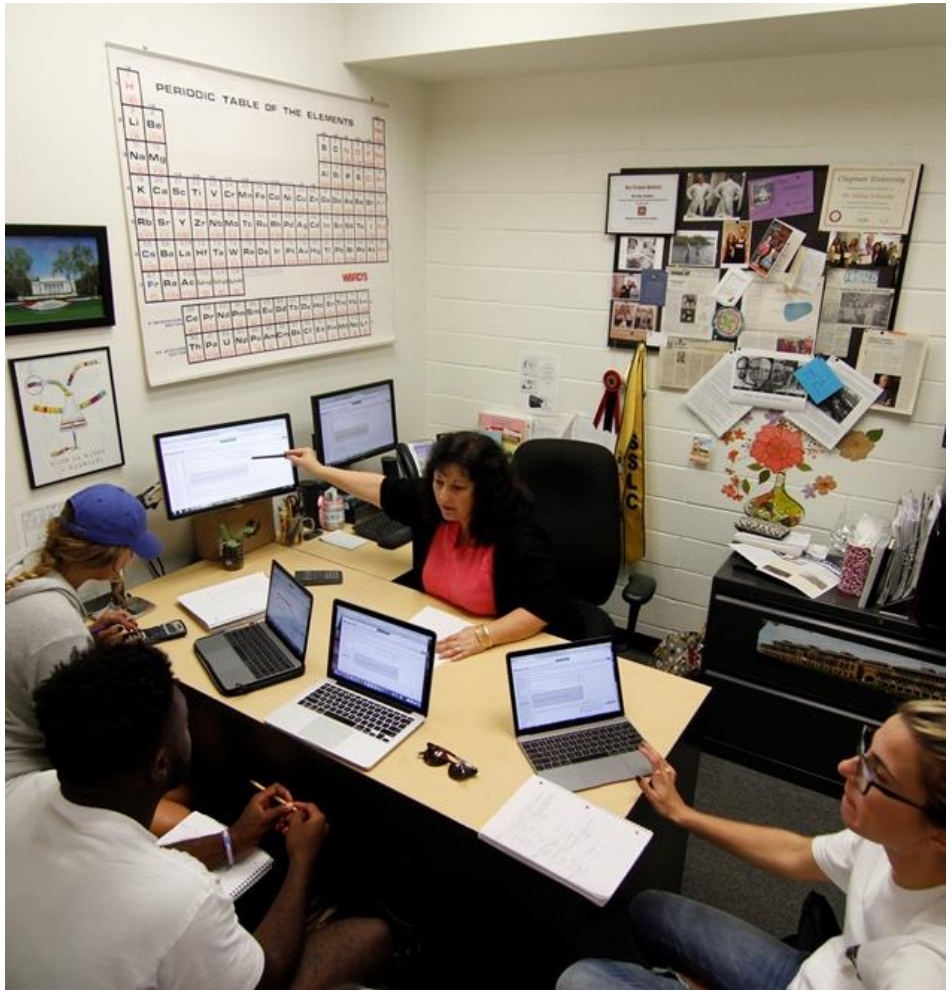
# Office Hours

**Duties:**

- Answer student questions
- Help in difficult homework problems
- Discuss lecture material
- Teach, do not simply provide answers
- Be flexible

**Before office hours:**

- Check syllabus
- Review current assignments
- Prepare for student questions
- Create/discuss answer keys with course instructor




Courtesy of Google Images

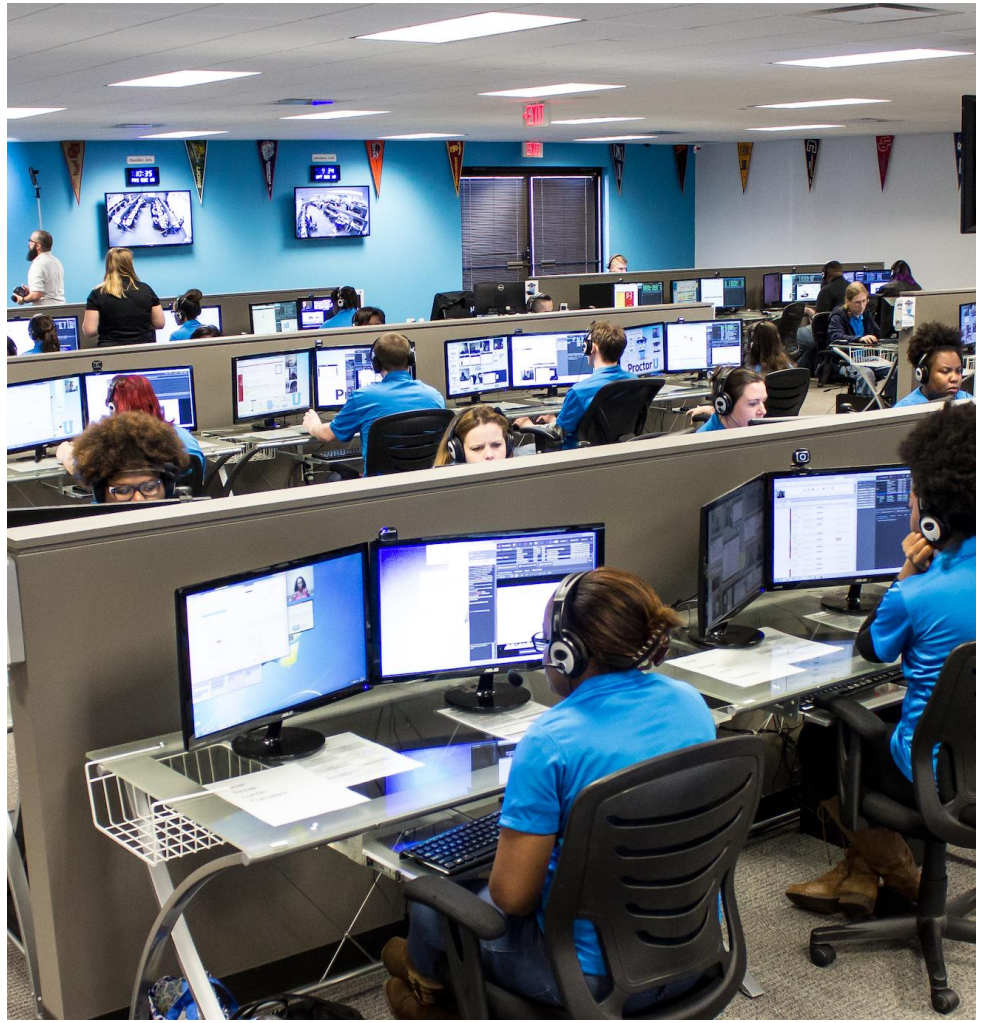
# Proctoring

**Duties:**

- Administrative duties
- Clarify questions
- Ensure academic integrity standards are upheld
- Verify student identity

**Before the exam:**

- Review the exam beforehand



Courtesy of Google Images

# Academic Integrity

## Duties:

- Report any suspected academic integrity issues to the course instructor


Courtesy of Google Images

# Promoting Learning in a Classroom

# How to Promote Learning in a Classroom? **Active Learning**

Problem:

- 90% of students who switched out of STEM fields cited **poor teaching** as a concern (AAU report, 2017).
- Students in classes with traditional lectures are **1.5 times more likely to fail** than students in classes that use active learning methods. (AAU Report, 2017; PCAST, 2012)

Solution:

- Active learning is any approach to instruction in which all students are asked to **engage in the learning process**.
- Problem-solving, discussions, *flipped classroom*, class polls, group work etc.

More info on flipped classrooms:
https://bokcenter.harvard.edu/flipped-classrooms

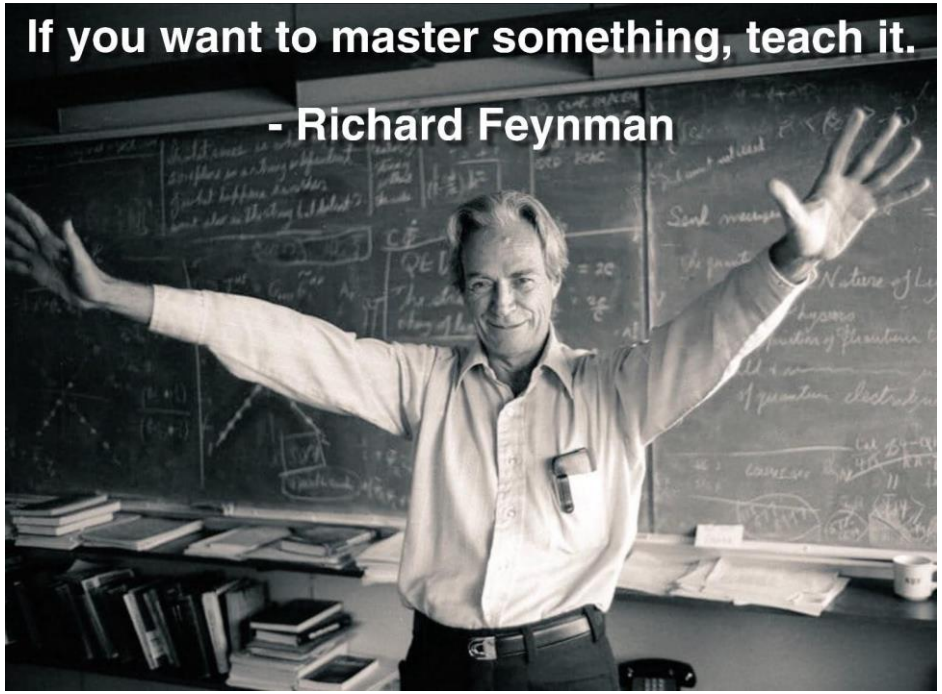
# Different Types of Active Learning with Feedback

- **Small group discussion**
- Testing
- One-minute papers
- Clickers
- **Problem-based learning**
- Case studies
- Analytical challenges before lecture
- Group evaluation
- **Problem set in groups**
- Concept mapping

(PCAST, 2012)

- Writing with peer review
- Computer simulations and games

**Combination of active learning methods**



# Group Work Benefits

- **Support**-SU has a collaborative, encouraging culture
- **Comfort**-Students are more comfortable talking with their classmates/friends than the teacher
- **Communication**-Learn to explain ideas, not just write equations
- "**Two heads are better than one**"-What one student knows another may not
- **Student teaching**-Teaching is often the best learning
- **Different perspectives**-There are *many* ways to solve a problem
- **Interaction** - Enjoyable learning!

For more information:

https://www.yc.edu/v6/learning-center/docs/study-group-student-benefits.pdf

# Active Learning-**example class**

**Concept Questions**

- **Start easy and quick** - General concept questions
- **Group discussion** - Wakes everyone up, gets everyone engaged
- **Use online poll or hold up fingers to get everyone's response** - Quick way to gauge understanding of the material
- **Ask students to defend their thoughts (right or wrong)**-Encourages communication

**Problem Solving**

- **Move on to core work** - Problem solving time/lab activities using the groups they already formed
- Repeat process above!
- **Check in -** Every 5-10 minutes, see how they are doing-offer guidance
- **Present the solution**-Reviewing the solution is just review

# Tips for running an active class

❑ **Problem selection**

For more information:
https://bokcenter.harvard.edu/problem-solving-stem

- Similar to homework/problem set
- Not too hard!-only have ~15-20 minutes to solve
- Use questions students had during office hours/lecture
- **Writing your own solution is VERY IMPORTANT!**-Identify sources of confusion/difficulty

❑ **Teaching vs. telling answers**

- Let them struggle for ~5 minutes (often best if this is individual work)
- Tell them to break out into groups-answer each other's questions
- If the group couldn't find the answer, have them call you over for assistance

# More tips for running an active class

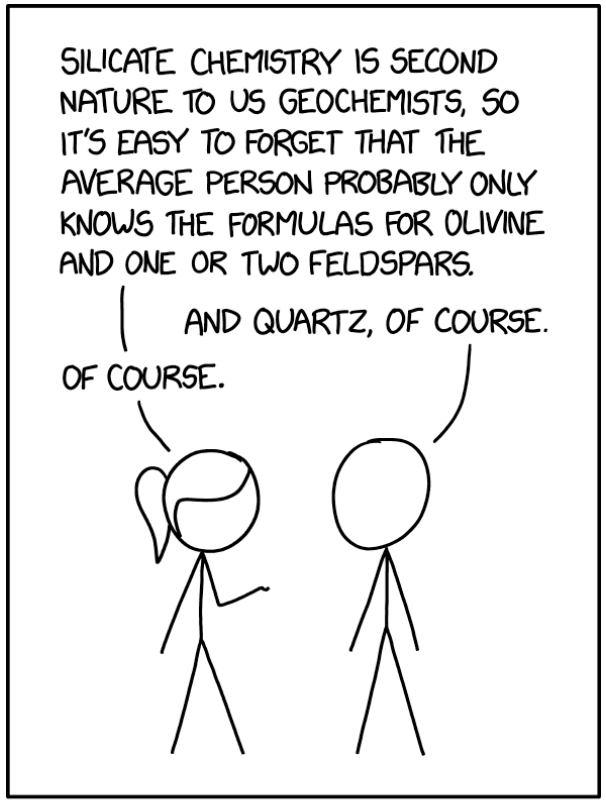
For more information: https://www.lifescied.org/doi/full/10.1187/cbe.13-06-0115?sid=a5b34723-713f-4ea4-83da-ba972f29b5e6

## ❑ How to hint

- Setup the problem on the board-*draw a figure*
- Put answers to questions you were asked on the board
- Point students to external sources for helpful guidance

## ❑ How do I include *everyone?*

- Group poll questions are friendlier than individual cold-calling
- Interaction with small groups can get shy students to speak up
- Many wrong answers have correct elements in them
- Learn names
- **Be honest about your own mistakes! We all make them!**



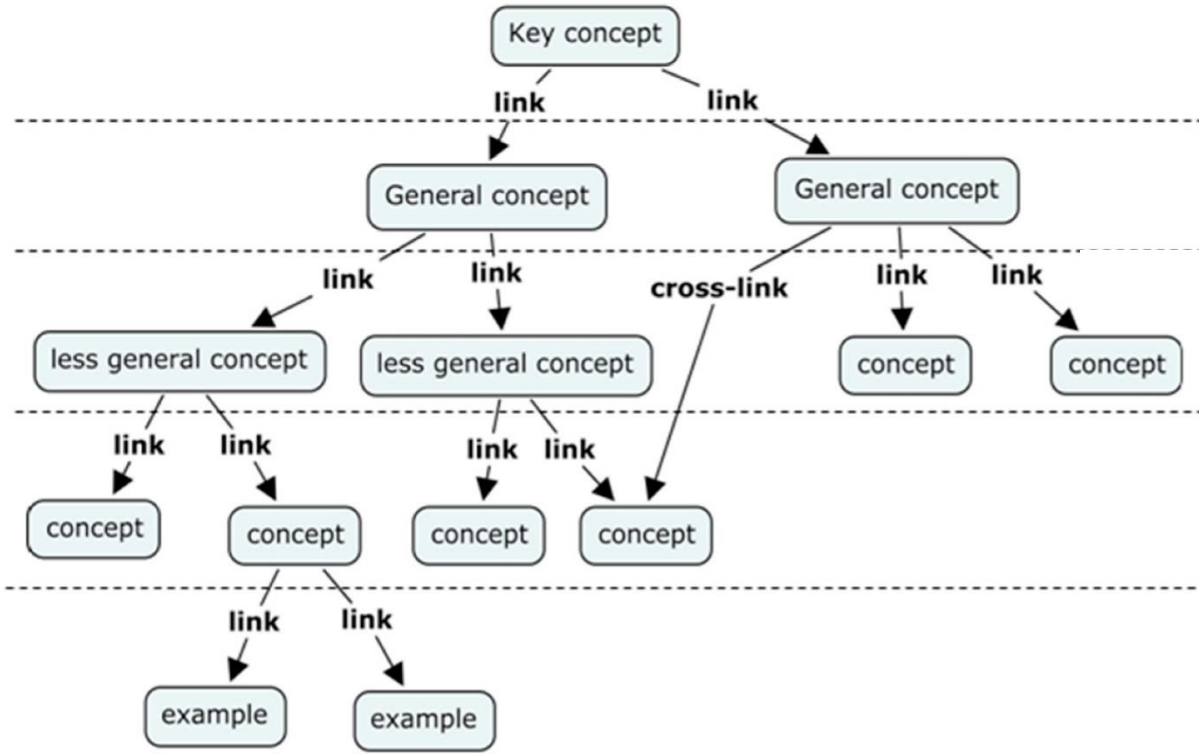

EVEN WHEN THEY'RE TRYING TO COMPENSATE FOR IT, EXPERTS IN ANYTHING WILDLY OVERESTIMATE THE AVERAGE PERSON'S FAMILIARITY WITH THEIR FIELD.

xkcd.com

# The big challenge: **problem solving**

For more information:
https://ir.library.illinoisstate.edu/cgi/viewcontent.cgi?article=1435&context=jste

- **Most common question: "How do I start this?"**
- Use effective problem-solving approaches
- Evaluate reasonable approaches to a problem regardless of final answer
- Metacognition- what works best for the student
- **Organization-Read/translate the problem and collect relevant information**
- List what you know – concept mapping
- Highlight unknowns
- Try working backwards from the answer
- **Teach the concept, not the problem**
- Identify the key concept and how it's applied
- Teach beyond the problem – ask follow-up questions

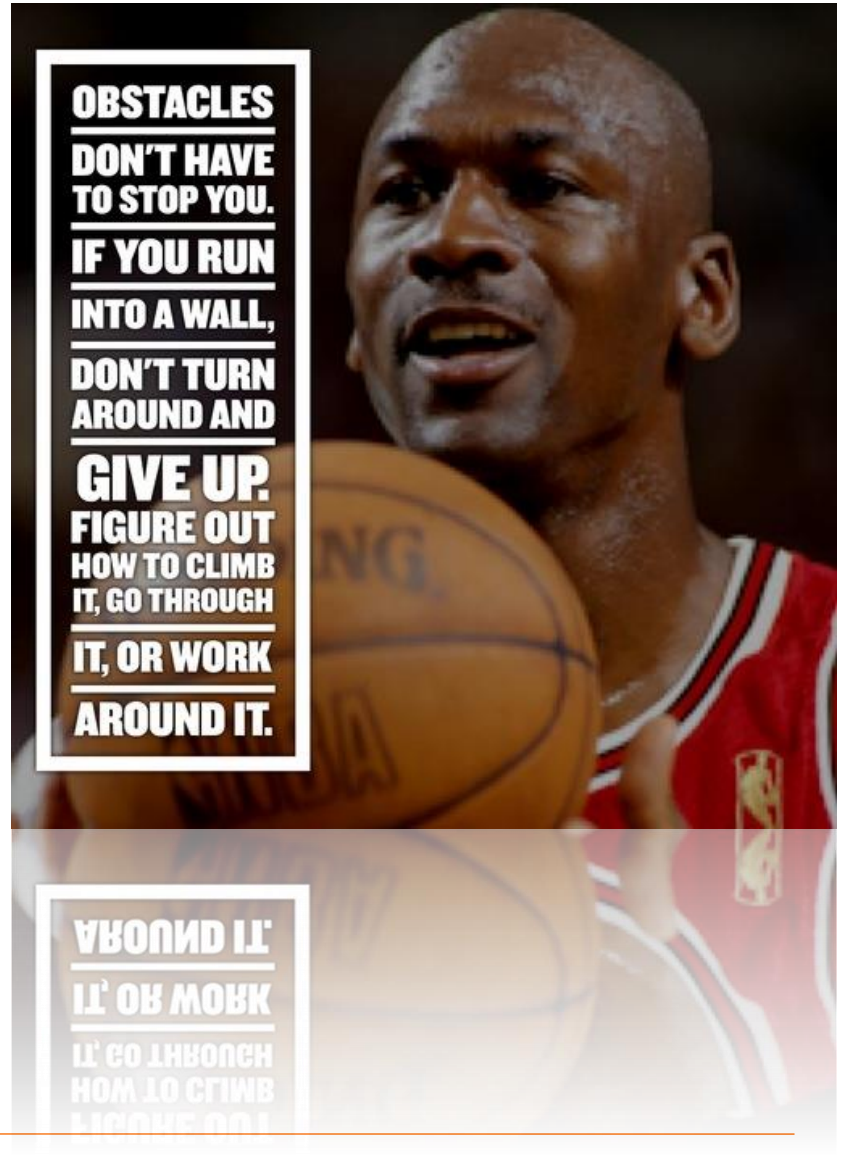



Miro is a great (and free) app for concept mapping that includes templates

# Overcoming Challenges

# Challenges

- What should I do if a student asked me a question that I don’t know the answer to?
- What should I do if I suddenly realized that I made a silly algebra mistake on the blackboard while lecturing?
- What should I do if all my students were confused and they looked like this: ☹
- What should I do to master public speaking?
- What should I do if I made a mistake while grading?
- TA vs. my own grades.
- Your own health. (https://ese.syr.edu/bewell/)



# Additional Resources

# Additional Resources

- SCI 544 College Science Teaching by Assoc. Prof. John W. Tillotson
- Center for Teaching and Learning Excellence (CTLE) at SU
- Center for Educational Innovation at Uni of Minnesota https://cei.umn.edu/active-learning
- Teaching + Learning Lab at MIT https://tll.mit.edu/guidelines/active-learning
- Center for Teaching at Vanderbilt https://cft.vanderbilt.edu/guides-sub-pages/active-learning/
- Report to the President Engage to Excel: Producing one million additional college graduates with degrees in STEM https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-final_2-25-12.pdf
- PhET Simulations for Science Courses https://phet.colorado.edu/

All pictures are from Google images.

Syracuse University

# Thank you!


- Michael Ammoury
- Ph.D. student, Department of Civil and Environmental Engineering
- mfammour@syr.edu

- Elise Krespan
- Ph.D. student, Department of Biology
- emkrespa@syr.edu