

# BEING AN EFFECTIVE PHYSICS TA

**5 September 2018**

**CJ Woodford**

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# OUTLINE

- ▶ Part I: Role of a TA
- ▶ Part II: University Policies
- ▶ Part III: Grading
- ▶ Part IV: Teaching Tips and Tricks
- ▶ Part V: Support & Resources

# INTRODUCTIONS

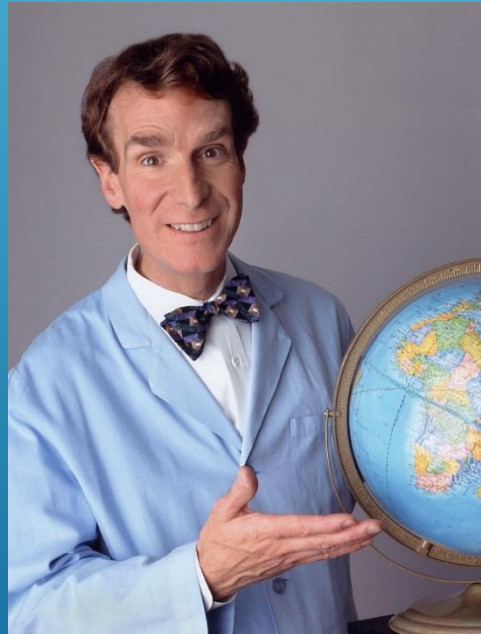
## DEEPAK CHANDAN

- ▶ PhD Physics, Sept 2018, (Geophysics, Climate Dynamics, Atmospheric Physics)  
Prof. Peltier's group
- ▶ TA in the Dept. of Physics since 2010
- ▶ TA for 9 courses across two campuses

## CJ WOODFORD (HE/HIM)

- ▶ Ph.D. candidate, Prof. Murray's research group + Gravity Group
- ▶ TA in the Dept. of Physics since 2015

# SURVEY: DO YOU ALREADY HAVE TEACHING EXPERIENCE?



# PART I: ROLE OF A TA



# WHAT IS YOUR PURPOSE AS A TA?

**Approachable  
source of help**

Share experiences

Insights

Convey the “big picture”

Still remember  
being in  
undergrad

Model professionalism

Demonstrate  
high-quality  
thinking



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# QUALITIES OF A GREAT TA

- ▶ Enthusiastic
- ▶ Knowledgeable
- ▶ Motivated
- ▶ Organized
- ▶ Patient
- ▶ Available
- ▶ Adaptable
- ▶ Trustworthy
- ▶ Empathetic
- ▶ Proactive

# TEACHERS AS **ROLE MODELS**

## **Set the tone & expectations**

- ▶ Be organized
- ▶ Be consistent and honest
- ▶ Be firm in expectations, deadlines, etc.
- ▶ Be flexible as needed (professional judgement)
- ▶ Show enthusiasm
- ▶ Strive to build a good rapport with students
- ▶ Demonstrate quality thinking



# WHAT'S IN IT FOR YOU?

- ▶ Money...
- ▶ Opportunity to really understand something well
- ▶ Career development (looks good on resume)
- ▶ Speaking skills
- ▶ Teaching skills
- ▶ Build relationships with other people, helps expand your network

Resist the temptation of being "bought out" of TA work by your supervisor in upper years if you don't want to - do what's right for you!

# COMMON TEACHING CONCERNS FOR NEW TAs

- ▶ Being effective at teaching
- ▶ Planning tutorial lessons
- ▶ Classroom management
- ▶ Maintaining personal and professional boundaries
- ▶ Grading fairly
- ▶ Not being able to answer questions
- ▶ Dealing with plagiarism and academic integrity

# COMMUNICATING WITH COURSE INSTRUCTOR

## Set (realistic) Expectations

- ▶ Determine the course focus & outcomes
- ▶ Identify your duties and responsibilities  
(& time allocated for them)
- ▶ Establish communication methods: email? Meetings?

## Mid-term Review

- ▶ Discuss time/work and job performance
- ▶ Common student issues
- ▶ Discuss midterm exam (marking scheme)

## Feedback

- ▶ Evaluations from students
- ▶ Reflect on course: what was effective? What could be improved?

# TEACHING ASSISTANT JOBS

- ▶ Traditional tutorial leader
- ▶ Demonstrator for upper year labs
- ▶ First-year practicals demonstrator
- ▶ Marker

# TUTORIALS

Interactive and participatory classroom sessions.

TAs gauge student understanding and provide feedback, in line with assessment guidelines set by the instructor.

- ▶ Answer questions on lecture topics
- ▶ Review course material
- ▶ Work on specific problems and skills
- ▶ Help with assignments
- ▶ Quizzes

**Tip:** In general, don't hand back work at the start of a class. It will consume students' attention.

# LABS

- ▶ Teaching experimental skills
- ▶ Second year and up
- ▶ Problem solving
- ▶ Tangible application and proof of theory
- ▶ Science history: re-create classic experiments
- ▶ Monitor student work
- ▶ Ensure lab safety and protocols are followed
- ▶ Provide feedback



**Tip:** investigating instrument problems can open up opportunities (“teachable moments”) for learning.

# PRACTICALS



- ▶ A mix of a tutorial and a lab
- ▶ For first year undergrads only
- ▶ Students learn theoretical concepts and experimental skills through hands-on activities
- ▶ Research shows students learn more effectively through participation
- ▶ Work in small groups

“Tell me and I forget. Show me and I remember. Involve me and I understand.” - *various attributions*

# ONE-ON-ONE TUTORING

- ▶ **Office hours:** for students to drop by and ask questions
  - ▶ Or they can make an appointment
- ▶ **Challenge:** how to start helping when a student doesn't arrive with specific questions.
  - ▶ Try to narrow down goals for a meeting to one or two key topics to cover.
  - ▶ Suggest strategies for studying & follow-up actions
- ▶ You can't charge students for private tutoring in the course you are a TA in for extra tutoring (conflict of interest, unethical)

**There are plenty of under-used opportunities for students to get help:** TA & Professors' office hours, Drop-in Centre, writing centers



# PHYSICS DROP-IN CENTRE

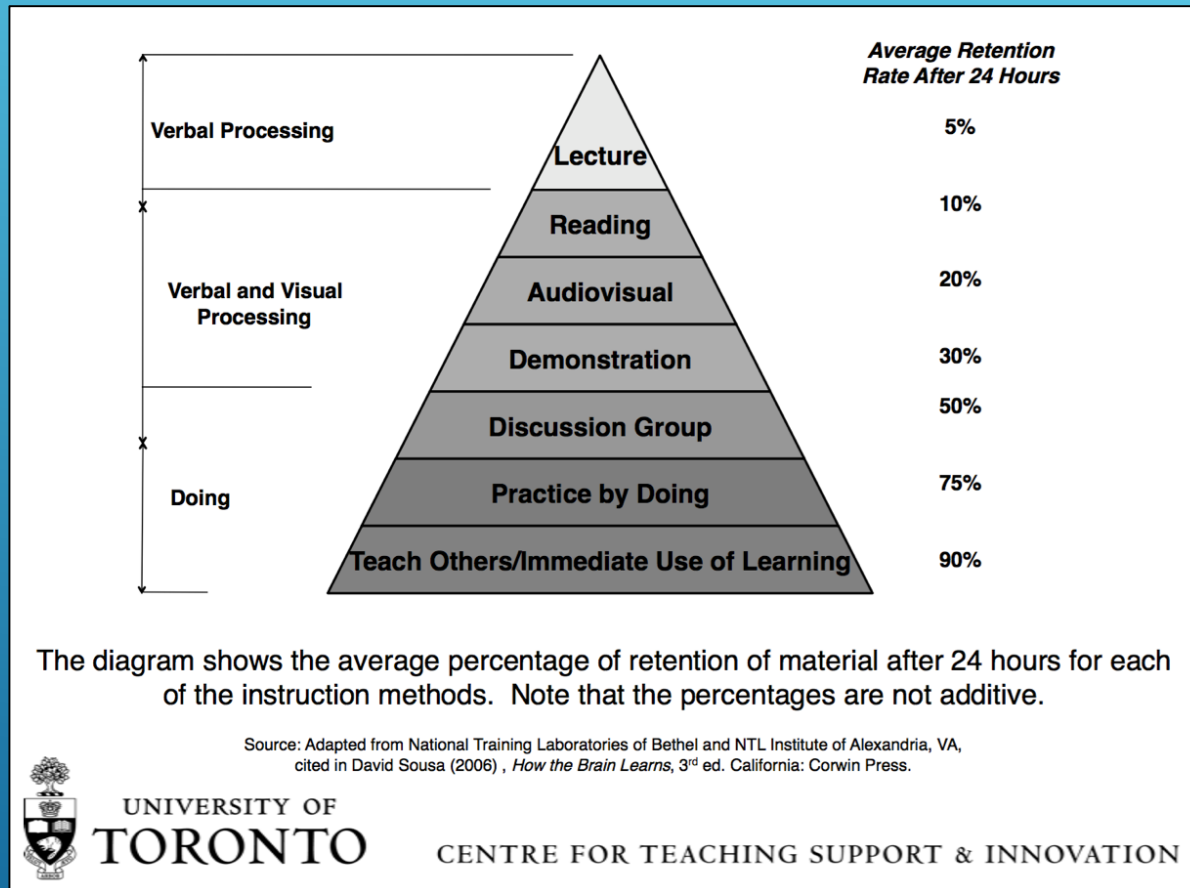
- ▶ Undergrads can stop by during Drop-In Centre hours and ask questions to a TA
- ▶ Focused on first-year classes (mostly PHY131)
- ▶ If an advanced undergrad student drops by hoping for help, and you don't know the material, that's OK.
- ▶ Encourage students to use it!

# PROACTIVELY CHECK STUDENT UNDERSTANDING



- ▶ Avoid the temptation to think silence & nods indicate students understand.
- ▶ During practicals & labs, engage student groups. Sometimes, students \*think\* they're fine when they aren't.
- ▶ Don't be afraid to be nosy!

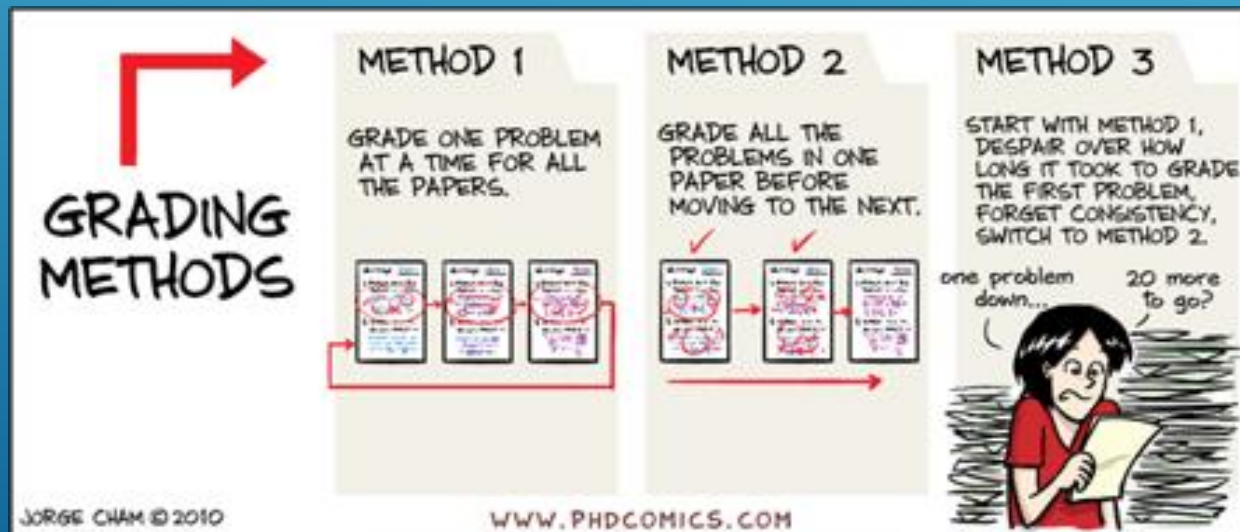
# WILL STUDENTS REMEMBER?



# GRADING

- ▶ Evaluation informs students and TAs what they understand
- ▶ Keep a personal record of grades (e.g. in addition to Quercus – never too safe!)

Marking is more than assessment and formal evaluation: it's a critical opportunity for feedback that guides learning



# QUERCUS

**A tool for communication between instructors, teaching assistants and students**

- ▶ Send emails to groups of students
- ▶ Course announcements are posted
- ▶ Online discussion board
- ▶ Access to uploaded course documents
- ▶ Grade book recording and tabulation
- ▶ Online testing and assignment submission

Quercus: Latin for oak tree. Continues UofT's obsession with oak

# PREPARATION

**“Before anything else, preparation is the key to success.”**

**– Alexander Graham Bell**

- ▶ Give thought to each session:
  - What should students specifically learn?
  - Where might students have difficulty?
  - How will you help students build understanding?
- ▶ Labs and practicals challenge students in both theoretical knowledge and experimental skills:  
**perform experiments yourself before guiding students**
- ▶ Find a lesson planning format that works for you – it doesn't have to be formal!

# YOUR FIRST CLASS

- ▶ Arrive early & check room for any complications
- ▶ Write your contact information on the board/slide
- ▶ Introduce yourself
- ▶ Use an icebreaker to get students talking to you and each other
- ▶ Explain how the sessions will run
- ▶ Leave time for questions

# SET EXPECTATIONS ON THE FIRST DAY

- ▶ Be clear about how students should communicate with you: email? In person? Blackboard?
- ▶ How long it will take you to respond.
- ▶ How students submit work.
- ▶ Explain the reasons for how you do things...

“I do not respond to emails the night before a mid-term because...”



# PART II: UNIVERSITY POLICIES



# TA POLICIES:

## **Code of Behaviour on Academic Matters**

- ▶ <http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>

## **Code of Student Conduct**

- ▶ <http://www.governingcouncil.utoronto.ca/Asset4733.aspx?method=1>

## **Freedom of Information and Protection of Privacy**

- ▶ <http://www.provost.utoronto.ca/policy/fippa.htm>

# AREAS OF RESPONSIBILITY

Respecting  
confidentiality

Avoiding  
conflict of  
interest

Safeguarding  
the learning  
environment

Upholding  
academic  
integrity

# RESPECTING CONFIDENTIALITY

- ▶ You have access to sensitive information
- ▶ **As an education professional, you are trusted** to keep student information confidential
- ▶ Avoid putting grades on front page where it is easy for others to see
- ▶ Don't identify individual students when discussing challenges or strategies with others (for example, when discussing mistakes in assignments in front of a classroom)
- ▶ Don't leave marked tests and assignments out – not on your desk, not in the hallway! This goes for labbooks too.
- ▶ Encrypt your documents that have sensitive info

# SAFEGUARDING THE LEARNING ENVIRONMENT

## Policies:

- ▶ Code of Student Conduct
- ▶ Ontario Human Rights Code
- ▶ Policy on Sexual Harassment
- ▶ Policy on Appropriate Use of Information Technology
- ▶ Accessibility for Ontarians with Disabilities Act

## Where to go and what to do:

- ▶ Campus police: (416) 978-2222
- ▶ Student crisis response: (416) 946-7111
- ▶ Equity offices on campus:  
Community Safety; Anti-racism and Cultural Diversity;  
Sexual and Gender Diversity; Sexual Harassment Office

# ACADEMIC INTEGRITY

## Intellectual honesty

- ▶ Appropriate use of information
- ▶ Accurate citation and referencing (a problem for essay-type questions)
- ▶ Awareness of and adherence to strict academic principles and values

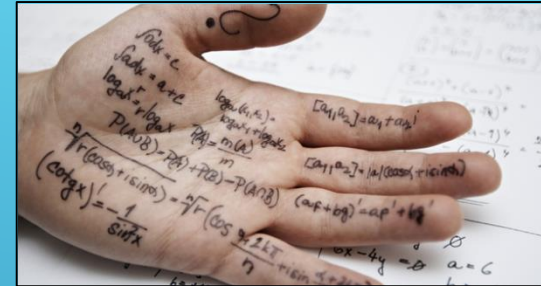
# VIOLATIONS

- ▶ Plagiarism
- ▶ Impersonation
- ▶ Copying
- ▶ Cheating
- ▶ Purchased essays
- ▶ Reusing materials from other courses
- ▶ Misuse of digital sources

[www.utoronto.ca/academicintegrity](http://www.utoronto.ca/academicintegrity)

[www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize](http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize)

# ACADEMIC INTEGRITY (cheating)



- ▶ Do not take action independently
- ▶ Do not tell the student you suspect plagiarism
- ▶ Do not return any papers
- ▶ Stop marking once you realize there might be an academic offense
- ▶ Refer the problem to the instructor, who will follow U of T protocols
- ▶ Assist the instructor by investigating if asked

**It is an academic offence to not report cheating**

# IDENTIFYING CHEATING

You'll get to know your student's style and quality of work.

- ▶ Watch for abrupt change in quality: of a single answer or an entire assignment
- ▶ Out of place sentences/passages that appear copied from another source (try Googling it)
- ▶ Exact or very close wording to other students
- ▶ Exact same typos and mistakes



# PART III: MARKING



# FAIRNESS IN GRADING

- ▶ Cover or ignore names before/while grading to guard against bias
- ▶ Avoid grading while in a tired/negative emotional state
- ▶ Be consistent, mark all the students in the same way
  - ▶ Rubrics help with this
  - ▶ Helps to mark one question for all students, then move to next question
  - ▶ When done one question, review the first few papers you marked to make sure you were consistent
- ▶ Consistency is very important in multi-TA courses (ask other TAs how they approached difficult situations and reach consensus)
- ▶ Read a few (~10) papers first to get a feeling for how students approached the problem (this “temperature check” helps “normalizing” the grading scheme if need be)

# RUBRICS

## **Method of marking which:**

- ▶ Increases efficiency since you know what you're looking for and how much it's worth
- ▶ Ensures consistency and fairness
- ▶ Justifies grade decisions
- ▶ Helps students understand expectations and evaluate their own work

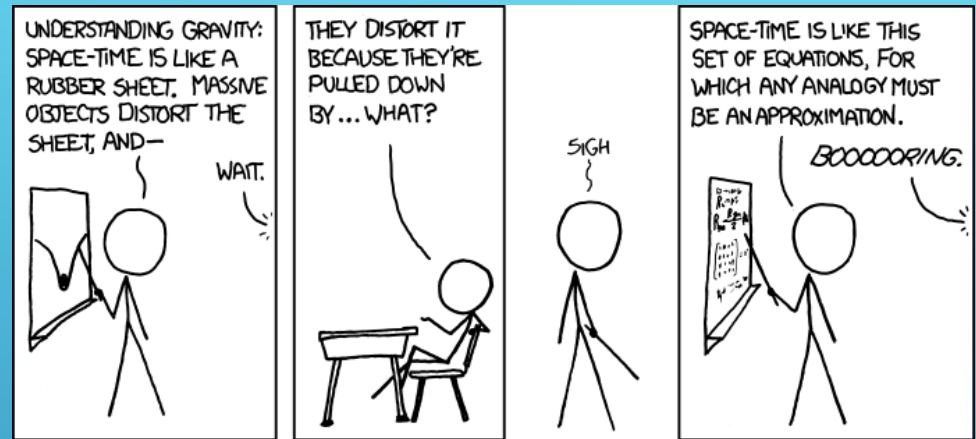
# GRADING: DISPUTES

- ▶ Students are students – they WILL argue about grades
- ▶ Do NOT comment on grading issues if you weren't the marker – refer the student to the course instructor or marker. Listen respectfully and openly to student concerns
- ▶ Encourage students to discuss why they got their mark – it's an opportunity to help them identify misunderstandings
- ▶ Feedback and comments should help remind you why you graded as you did
- ▶ Use of a standard rubric can help justify grades
- ▶ If you can't resolve a dispute, discuss the issue with the course instructor

# PART IV: TEACHING TIPS AND STRATEGIES



# EACH CLASS HAS ITS OWN CHARACTER & CHALLENGES



- ▶ Why are students in the course
- ▶ What they are getting out of lectures
- ▶ How do they learn best
- ▶ Background knowledge & understanding
- ▶ English language barriers

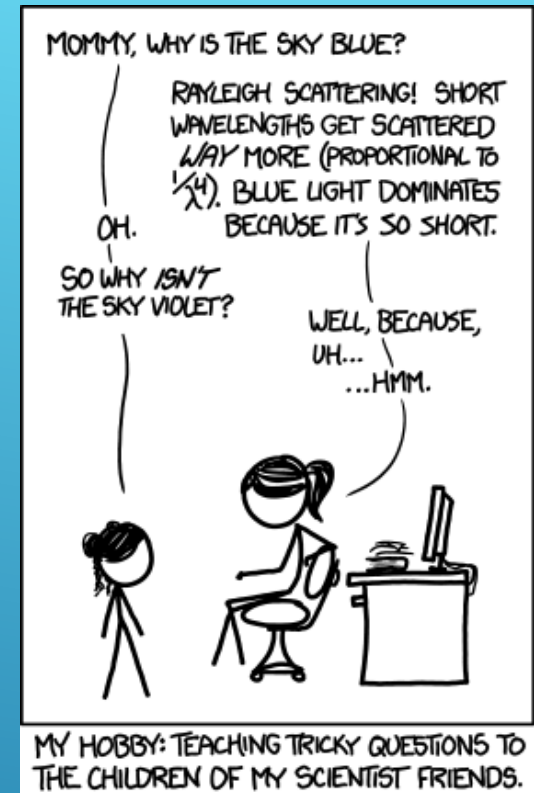
**Get to know your students!**

# TIMING

- ▶ It can be tough to plan the right amount of material for a session
- ▶ **Aim to cover 1-3 critical skills/ideas**
- ▶ Create opportunities to be adaptable
- ▶ Try to build your lesson plan in modules: enable yourself to drop/add parts because of the flow of the session.
- ▶ Think about how **you** would have liked to be taught that subject as a student to identify where to spend more time.

# WHEN YOU DON'T KNOW THE ANSWER

- ▶ **RELAX!** It's not the end of the world!
- ▶ Ensure you understand the question
- ▶ Commit to finding out what the answer is and get back to the student
- ▶ If you are in front of a class, there is no shame in turning the hunt for an answer into a group effort!
- ▶ Physicists are like physicians: there are specialists because there's too much for one person to know everything!





# REFLECTION AND ITERATION

- ▶ After each class/lab/practical, reflect on what went well or not
- ▶ Apply new ideas about how to be effective to the next time you teach and share insights with others
- ▶ *Learning to teach is a continuous process*

# DESIGNING QUESTIONS TO ASK STUDENTS

- ▶ Be mindful of implying there is a singular “right” answer
- ▶ Ask a variety of question types
- ▶ Encourage participation
- ▶ Probe for intuition, partial understanding, & logic
- ▶ Aim to ask questions that prompt students to show their understanding

# TEACHING TIPS: LEAVE SPACE FOR ANSWERS

- ▶ Ensure you leave time for students to think about the question you asked
- ▶ Try not to answer your own questions
- ▶ Be comfortable standing in front of a class in a few seconds of silence
- ▶ Make them comfortable and at ease (often, students are shy and scared of being wrong in front of others)

# CLASS MANAGEMENT: POTENTIAL CHALLENGES

- ▶ Food & drink in labs
- ▶ Teaching right before/after an exam or deadline
- ▶ Inattentiveness (e.g. to instructions)
- ▶ Not working constructively with group members
- ▶ Creating excessive noise
- ▶ Entering class late or leaving early
- ▶ Use of phones (or computers) in the classroom
- ▶ Disrespecting others' rights to express their viewpoints

# LISTENING

- ▶ Listen carefully and attentively
- ▶ Avoid pre-forming an answer or being too strict in how students should formulate their answer
- ▶ Restate questions to confirm their understanding
- ▶ Watch for signals of confusion in students (don't talk to the board!)

# STUDENT QUESTIONS

**Encourage questions.** There are many reasons students are reluctant to ask.

- ▶ Make sure you understand the question
- ▶ Paraphrasing may help with understanding
- ▶ Ask them what part they don't understand
- ▶ Pause and reflect, to help form clear answers

# CHOOSE WORDS CAREFULLY

- ▶ Be deliberate & precise in your choice of words
- ▶ Your use of words is how students learn content
- ▶ There are many basic terms which may not be understood by all students
  - ▶ E.g. precise vs accurate, error vs uncertainty

Terms that have different meanings for scientists and the public		
Scientific term	Public meaning	Better choice
enhance	improve	intensify, increase
aerosol	spray can	tiny atmospheric particle
positive trend	good trend	upward trend
positive feedback	good response, praise	vicious cycle, self-reinforcing cycle
theory	hunch, speculation	scientific understanding
uncertainty	ignorance	range
error	mistake, wrong, incorrect	difference from exact true number
bias	distortion, political motive	offset from an observation
sign	indication, astrological sign	plus or minus sign
values	ethics, monetary value	numbers, quantity
manipulation	illicit tampering	scientific data processing
scheme	devious plot	systematic plan
anomaly	abnormal occurrence	change from long-term average

A table from “Communicating the Science of Climate Change” by Richard C. J. Somerville and Susan Joy Hassol, October 2011 issue of *Physics Today*

# EFFECTIVE FEEDBACK: more than marking

- ▶ Formal evaluation (e.g. assignments, tests)
- ▶ Informal feedback is critical to “scaffolding” student learning
  - ▶ Checking up on lab groups during session (probe with targeted questions)
  - ▶ Answering questions (e.g. tutorials, one-on-one meetings, etc.)



# CLASSROOM PRESENCE

- ▶ **Be aware**, receptive and responsive to the mental, emotional, and physical state of students in the learning environment
- ▶ **Fostering a good relationship between you and students facilitates student learning**

# HELPING WITH EXPERIMENTS

“Something isn’t working!”

- ▶ It’s tempting to fix equipment or adjust it to ensure a smooth lab experience. Resist.
- ▶ “Teachable moment”



# TEACHING TIPS: MISCONCEPTIONS

- ▶ It's important to reflect and investigate what misconceptions and misunderstandings your students have.
- ▶ Try to understand where your students are starting from
- ▶ **Misconceptions are what students think is true but is not.** They are a significant obstacle to understanding.



# IDENTIFYING MISCONCEPTIONS

- ▶ E.g. “friction always opposes motion” but that’s not quite right

“It [is not] what you don't know that gets you into trouble.  
It's what you know for sure that just [is not] so.

- Mark Twain

# PUBLIC SPEAKING: EVERYTHING MATTERS

Become aware of the details

- ▶ Your voice: volume, tone
- ▶ Your eye contact
- ▶ Choice of words
- ▶ Body language
- ▶ Enunciation
- ▶ Confidence

There will be a more detailed talk in two weeks about public speaking.

# TEACHING PUTS A NEW LENS ON THE WORLD

You may start to recognize opportunities for new examples to use in the classroom in a variety of places: everyday life, your research, etc.



# PART V: RESOURCES



# TEACHING SUPPORT

Becoming an educator is a continuous process.  
You have plenty of support available:

- ▶ Fellow TAs
- ▶ Course instructors
- ▶ Teaching Professors!
- ▶ TATP
- ▶ Other online resources



# PERSPECTIVES

A few key points to remember:

- ▶ There is no “one-size-fits-all” approach. Learn from your good experiences and mistakes.
- ▶ You will develop your own teaching style as you go.
- ▶ There are many opportunities offered by the department: find what suits you best.
- ▶ See TAing as an opportunity to develop your teaching skills: something that will be useful for your future career!

# USEFUL RESOURCES & PROFESSIONAL DEVELOPMENT

## Teaching Assistants' Training Program

- The TATP is here to help you Free-of-charge peer-training program
- Workshop series
- Two certificate programs
- In class observations and microteaching
- Awards in recognition of outstanding teaching by TAs
- A resource library (print, DVD and web) and individual consultations
- Robarts Library, 4th floor



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CENTRE FOR TEACHING SUPPORT & INNOVATION

# REMINDER: TA TRAINING SCHEDULE

- ▶ Week 1: Introduction to TAing
- ▶ Week 2: Micro-teaching (short lessons)
- ▶ Week 3: Public Speaking (lecture)
- ▶ Week 4: Micro-teaching, part 2

(also: improvisation workshop Sept. 12!)

# QUESTIONS?

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## Acknowledgements & Thanks

Prof. Jason Harlow

TATP

Comics from: XKCD & PHD Comics