

BEING AN EFFECTIVE PHYSICS TA

7 September 2016

Dan Weaver &

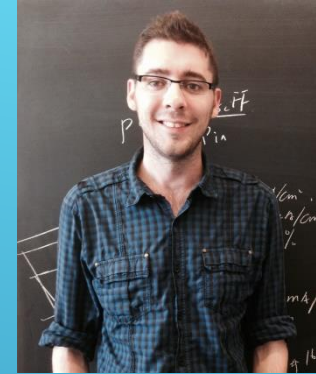
Stephen Foster

OUTLINE

The role of a TA
University policies
Grading
How to engage students
Support & Resources



INTRODUCTIONS



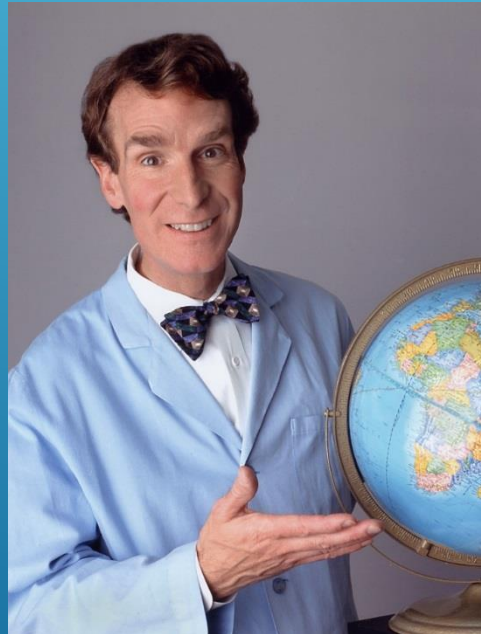
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SURVEY: DO YOU ALREADY HAVE TEACHING EXPERIENCE?



DISCUSS: WHAT IS YOUR PURPOSE AS A TA?

- ▶ Talk with one or two people near you
- ▶ Write down at least one idea
- ▶ Be ready to share with everyone in a few minutes!

VALUE of TAs

Approachable
source of help

Insights

Share experiences

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

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

TEACHING ASSISTANT JOBS

Tutorials

Labs

Practicals

One-on-one tutoring

Marking

10

COMMUNICATION 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?

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
- ▶ 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
- ▶ 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)

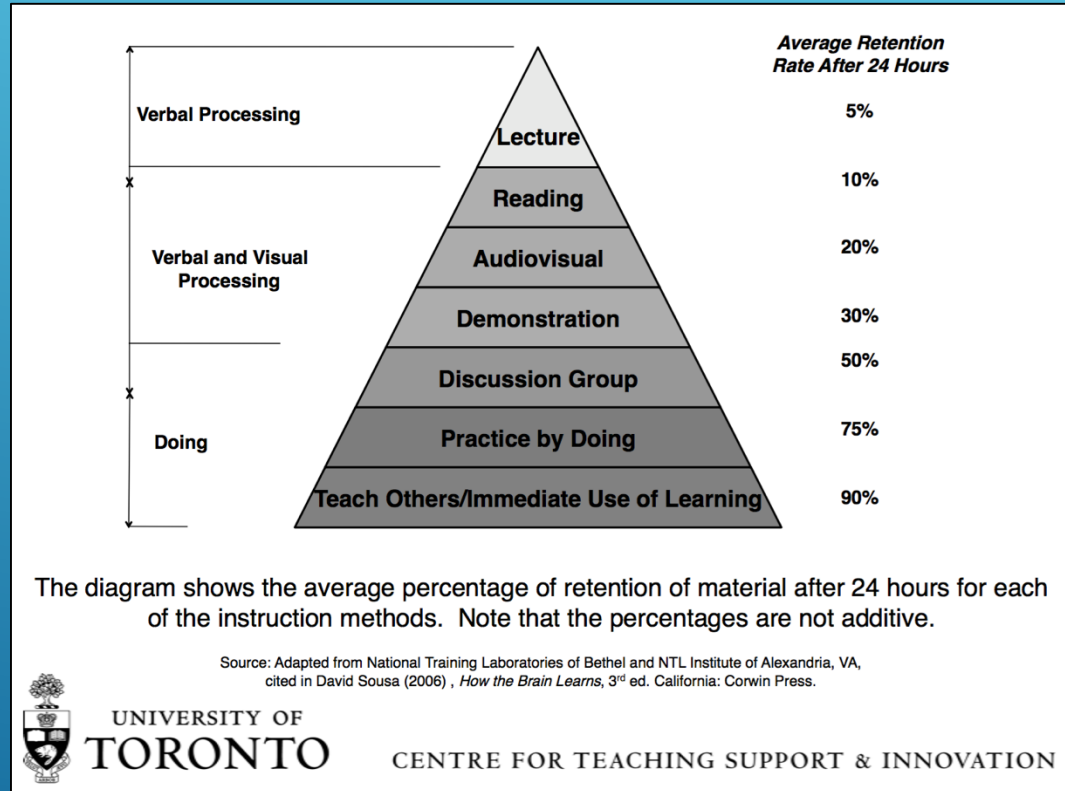
There are plenty of under-used opportunities for students to get help: TA & Professors' office hours, Drop-in Centre, writing centers

PROACTIVELY CHECK STUDENT UNDERSTANDING



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

WILL STUDENTS REMEMBER?



PHYSICS DROP-IN CENTRE

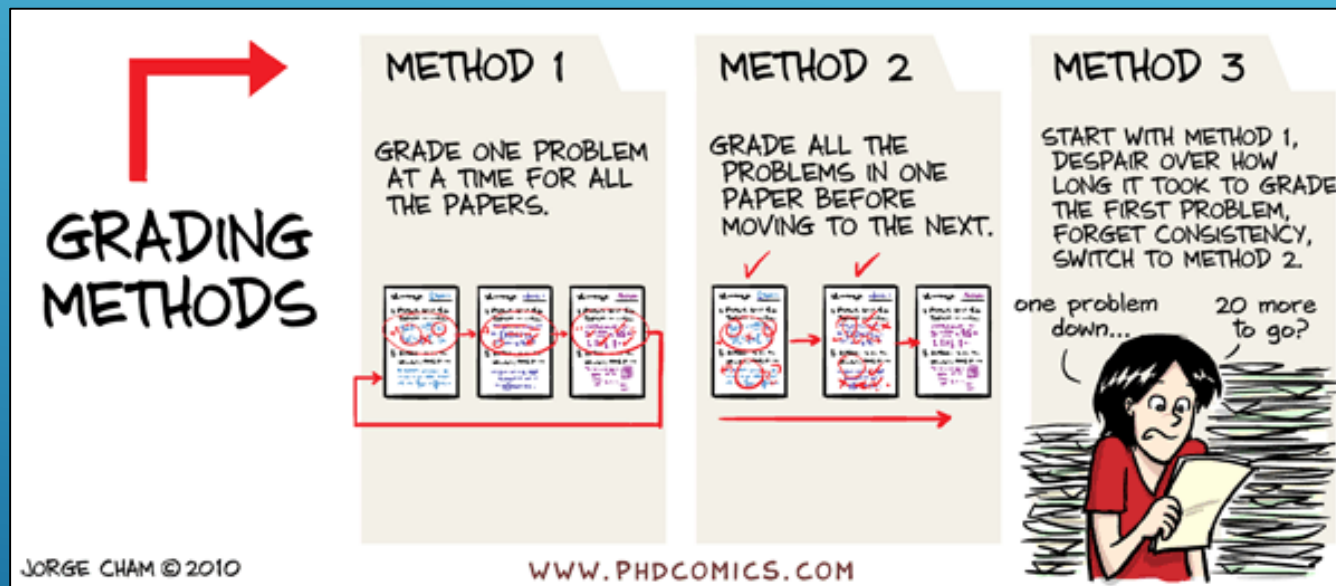
- ▶ Outside MP125B in student lounge
- ▶ Undergrads can stop by during Drop-In Centre hours and ask questions to a TA
- ▶ Focused on first-year classes (mostly PHY131)
- ▶ If an advanced undergrad student drops by hoping for help, and you don't know the material, that's OK.
- ▶ Encourage students to use it!

GRADING

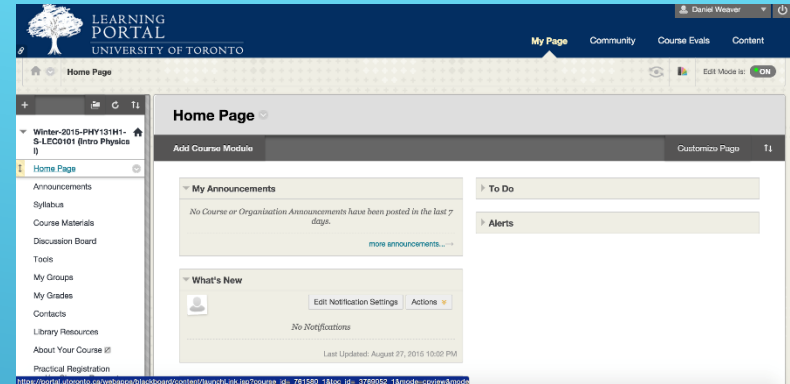
- ▶ Evaluation informs students and TAs what they understand
- ▶ Keep a personal record of grades (e.g. in addition to Blackboard – never too safe!)

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

LATER, WE WILL DO A MARKING ACTIVITY!



BLACKBOARD



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

PREPARATION

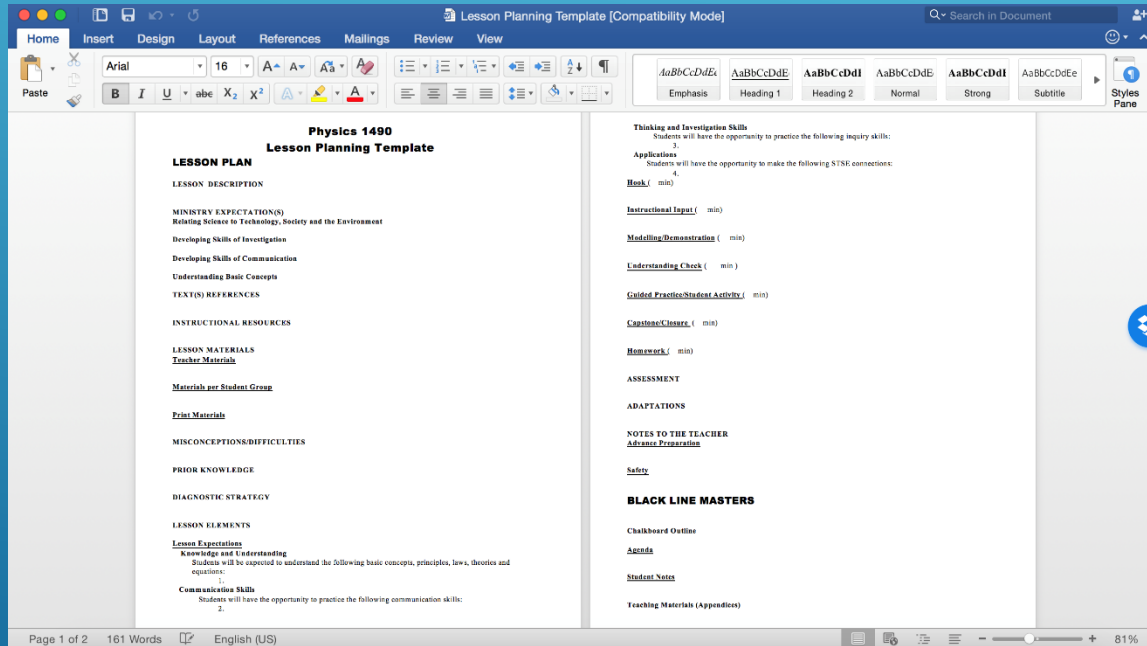
“Before anything else, preparation is the key to success.”

– 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 WAY TO PLAN LESSONS THAT WORKS FOR YOU

It doesn't need to be a formal and detailed document, but it should be something



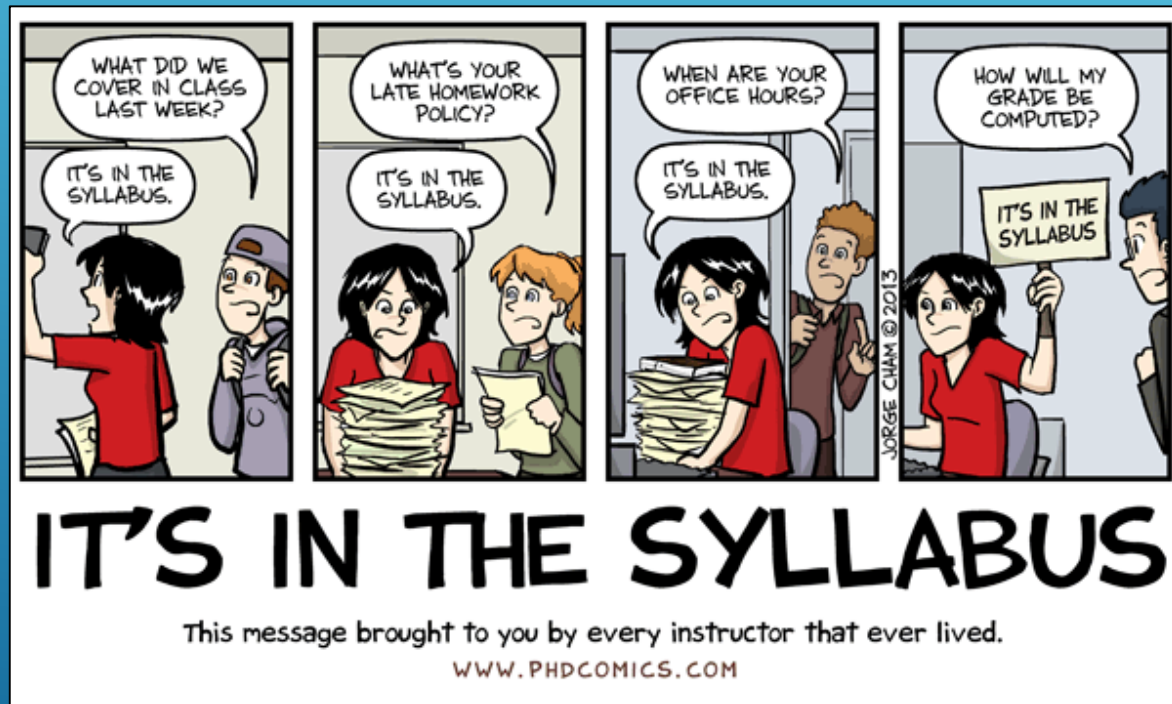
YOUR FIRST CLASS

- ▶ 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...”

SETTING POLICIES DURING THE FIRST CLASS WILL HELP SAVE TIME & CONFUSION THROUGHOUT THE SEMESTER



PART TWO: 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)

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 VIOLATIONS

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

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

www.utoronto.ca/academicintegrity
www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize

Dept. of Physics, TA Training

EXAMPLES

What should you do as a TA?

1. You notice that Jack and Jill's assignments look strangely similar, with the exception of a few variables or of a few explanations worded differently.
2. Susan's assignment was flawless. However, while entering the grades you notice that her two previous assignments were poorly done and so was her mid-term.
3. When marking 50 assignments you start to get a feeling you have read one particular phrase or sentence over and over again.
4. A student is doing okay for a long question, but the writing style suddenly switches.

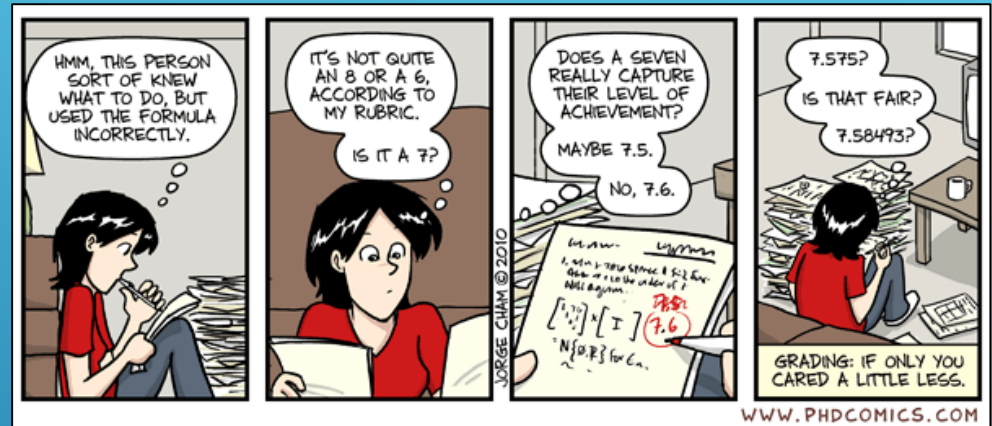
PART THREE: MARKING

- ▶ Marking exercise
- ▶ Time allocation
- ▶ Fairness
- ▶ Feedback



MARKING ACTIVITY

- ▶ Determining “fair”
- ▶ Interpreting answers & where students went wrong
- ▶ Precision & uncertainties



MARKING ACTIVITY

First, everyone read and mark one of the sample student solutions.

Compare with other TAs in your group:

- ▶ Grade you assigned to an answer
- ▶ How you decided on the mark
- ▶ Feedback you offered the student

MARKING ACTIVITY

Feedback ideally included:

- ▶ Mention of a strength in their work
- ▶ Suggested area of improvement
- ▶ A strategy on how to improve
- ▶ No need for a novel: key words are fine!

TIME MANAGEMENT & MARKING

Some courses are at times quite marking-intensive!
Some strategies you can use:

- ▶ Summary list: Note frequent mistakes and discuss them in class in more detail
- ▶ Set small goals (e.g. one question, 10 papers)
- ▶ Allow a “buffer” of time & have reasonable deadlines
- ▶ Enter grades as you go, or all at once
- ▶ Have everything you need on hand (text, rubric)
- ▶ Read a few (~10) papers first to get a feeling for how students approached the problem
- ▶ Depending on the submission format, create a set of responses and recycle them

FEEDBACK

- ▶ Giving students useful (constructive) feedback is a key part of being a Teaching Assistant
- ▶ Ensure you give both positive and negative feedback
- ▶ Avoid being general and vague in comments (if useless, it's just a waste of everyone's time)
- ▶ Comments on assignments can be very helpful if they clarify where a student went wrong (minimally), why (better), and how it could be avoided (wow!).
- ▶ Balance feedback & advice
- ▶ Especially valuable early in the year

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

EXAMPLE OF A RUBRIC (GRADE 11 PHYSICS CLASS PROJECT)

PH₃U Kinematics Project: Evaluation Rubric for Projectile Motion Machines

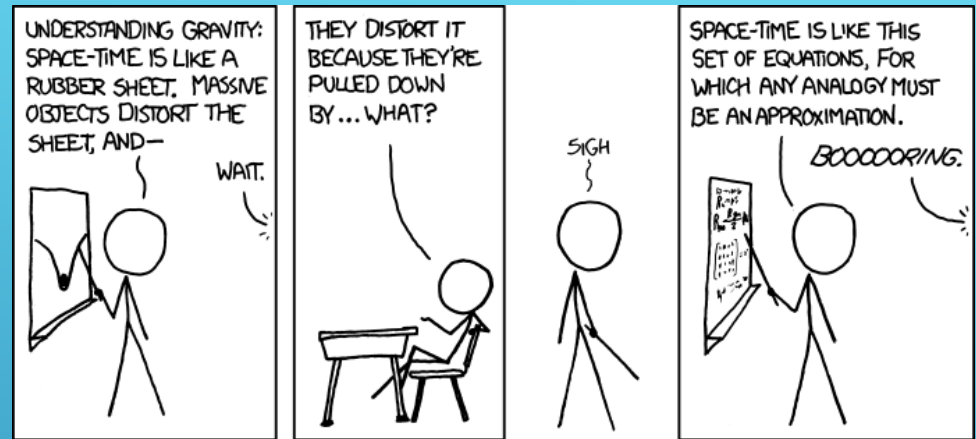
Criteria	Level 4	Level 3	Level 2	Level 1
Quality of Construction	Design and construction is durable, able to be transported and moved without damage, well laid out, has a polished/finished look	Durable design with 1-2 components easily disrutable; mostly well laid out, mostly "finished" look	Design must be carefully handled, somewhat well laid out, appears rushed and unpolished	Design is fragile and easily broken, poorly laid out, not aesthetically pleasing
Ability to launch projectile	Machine launches projectile with high degree of effectiveness	Machine launches projectile effectively	Machine launches projectile with limited effectiveness (i.e. launched, but landed immediately in front of device)	Machine launches provided wooden sphere into non-projectile motion
Ability for device to reproduce "specifications" during test-firing	Test-firing distance accurately reproduces specifications to within 10% of distance.	Test-firing distance accurately reproduces specifications to within 25% of distance.	Test-firing distance accurately reproduces specifications to within 50% of distance.	Test-firing distance does not accurately reproduce specifications
Creativity in overall design	Overall design demonstrates highly creative use of materials	Design shows some creative use of materials	Design shows limited creative use of materials	Design shows no evidence of creative use of materials
"Design Specifications" summary is effective and complete	Design specifications summary is informative, concise, and provides expected performance values complete with sketch of design, data, and calculations	Design specifications summary is informative, and provides most expected performance values mostly complete with sketch of design, data, and calculations	Design specifications summary provides expected performance values with partially complete sketch of design, data, and calculations	Design specifications summary provides partial expected performance values without justification or discussion of design decisions
Machine meets design restrictions (size, re-set in 20 seconds, etc.)	<ul style="list-style-type: none"> No component of PM-Machine exceeds size restrictions Device can be easily re-set in $t < 20$ s 	<ul style="list-style-type: none"> Minor size restriction violations Device can be re-set in $t < 20$ s with difficulty 	<ul style="list-style-type: none"> Size restrictions for 1 or 2 dimensions are exceeded by up to 15% Device can be re-set in $20 \text{ s} < t$ 	<ul style="list-style-type: none"> Size restrictions exceeded by more than 15% in any given dimension Device is not easily re-set

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 FOUR: TEACHING TIPS AND STRATEGIES

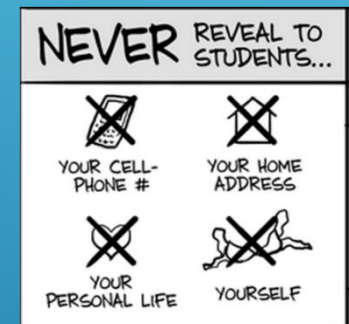
EACH CLASS HAS ITS OWN CHARACTER & CHALLENGES



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

GETTING TO KNOW YOUR STUDENTS

- ▶ Who are they?
- ▶ Why are they taking the class?
- ▶ What background knowledge do they have?
- ▶ What do they expect to learn from the course?
- ▶ How do they learn effectively?



This will help you be adaptable, and will put your students at ease.

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

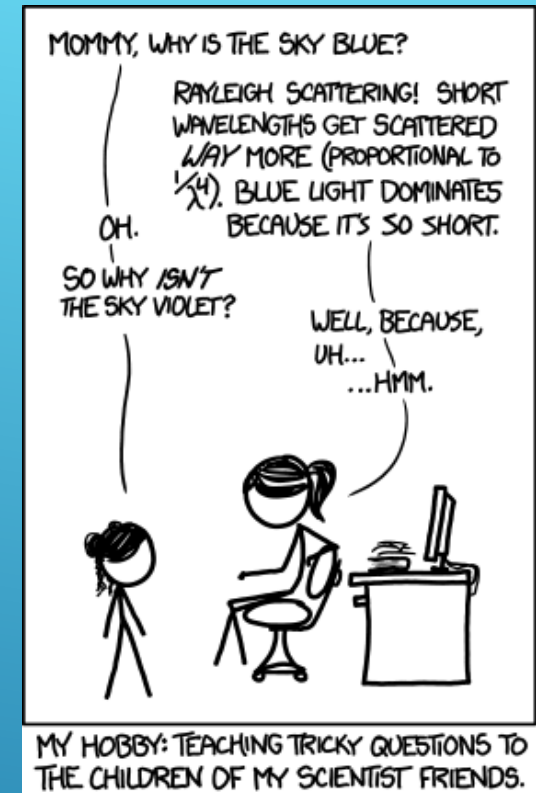
TIMING



- ▶ 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 & 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**

EXPERIMENTAL SKILLS



“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.



YOUR TA COLLEAGUES



Can help you with:

- ▶ Lesson planning, problem solving, marking
- ▶ Classroom management strategies
- ▶ Teaching approaches
- ▶ How to interact with other TAs and CI

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



UNIVERSITY OF
TORONTO

CENTRE FOR TEACHING SUPPORT & INNOVATION

TA TRAINING SCHEDULE

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

QUESTIONS?

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