Interactions between teaching assistants and students boost engagement in physics labs

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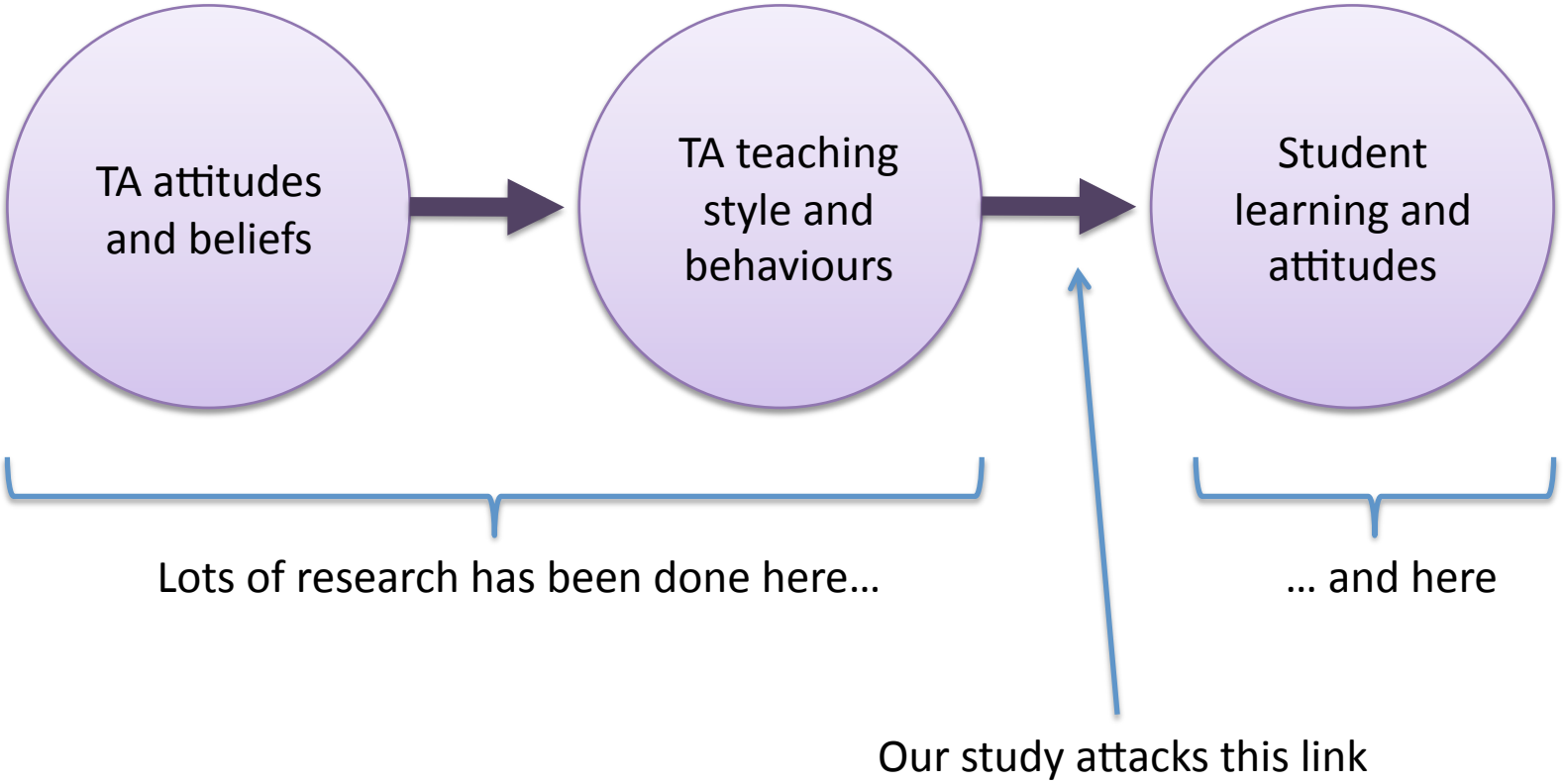
The question

- What teaching assistant (TA) behaviours contribute to student motivation, attitudes and learning?

The TA-student relationship: A simple model



Setting: Physics 100 lab

- Physics 100
  - Physics for students who have not taken Physics 12 (many students not in Faculty of Science)
  - Large class: ~700 students in 17 lab sections
  - Has lecture, tutorial, lab, and online components
- The Physics 100 lab
  - Weekly 1.5 hour lab
  - TAs are sole instructors
  - Lab summary:
    - Intro and clicker questions
    - Extended period of students working in pairs
    - Summary discussion and closing clicker questions

Design

- Basic strategy: **Observe** the lab
- **Observe** TAs
  - How do TAs adhere to and deliver the lesson plan?
  - How do TAs interact with students during the work session?
- **Observe** students
  - Take snapshots of their engagement level
- **Correlate** TA and student results

- Observations done without disturbing the lab: reduce 'observer effect'
  - TA observations from back of room
  - Student engagement observations done discreetly

Participants: The TAs

- 17 lab sections each led by 2 TAs
  - Average of 39 students per section
- 11 different TAs in course:
  - Instructed 1-4 sections weekly
  - Underwent 8 hour TA Professional Development Workshop and 3 hour Physics 100 specific workshop
  - Many are first time TAs

TA observations

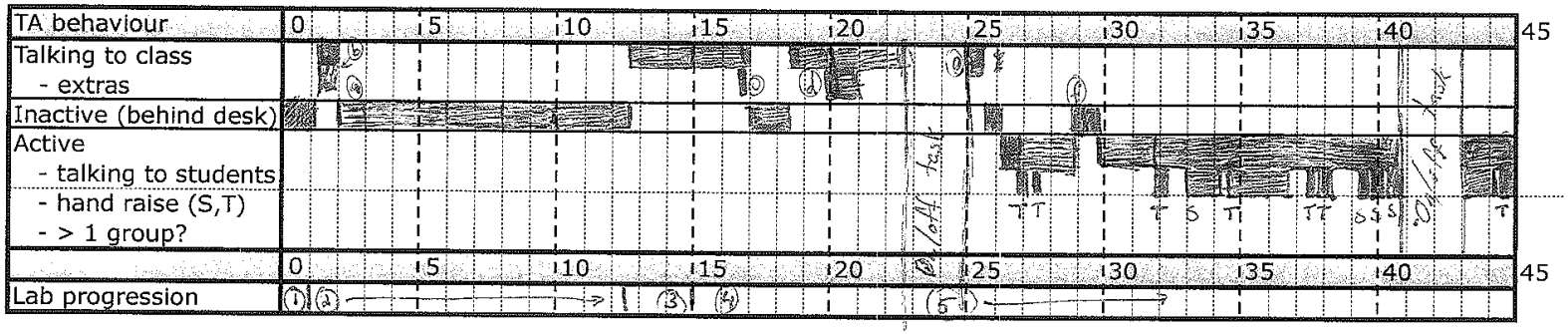
- How do TAs adhere to and deliver the lesson plan?
  1. Note TA behaviours outside of the standard script
     - Examples: Using the chalkboard to discuss a point, playing music from YouTube, having a back-and-forth with TA partner during a class discussion
  2. Number of TA announcements to class during working period
- How do TAs interact with students during the work session?
  3. Number of TA-student interactions
  4. Length of interactions

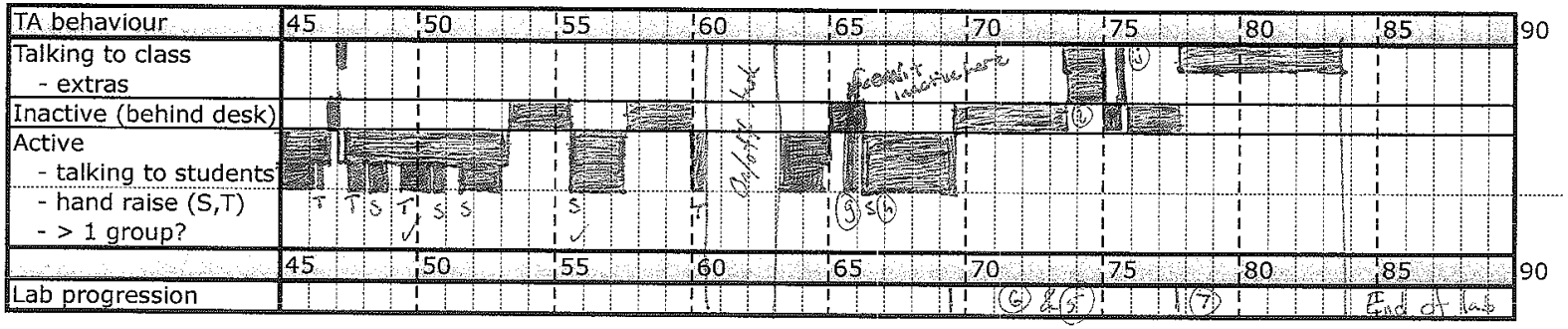
TA observation form allows one to record a timeline of TA's behaviour during the lab

TA observation form

TA observation form

Observer: Craig Reitmeier Section: L1C Date: Oct. 23/2012 Time: 9:30 am





Lab progression key:
1. Before TA begins class
2. Going over homework
3. Introduction
4. 1st group of clicker questions
5. Students working
6. Testing predictions
7. 2nd group of clicker questions
8. Other

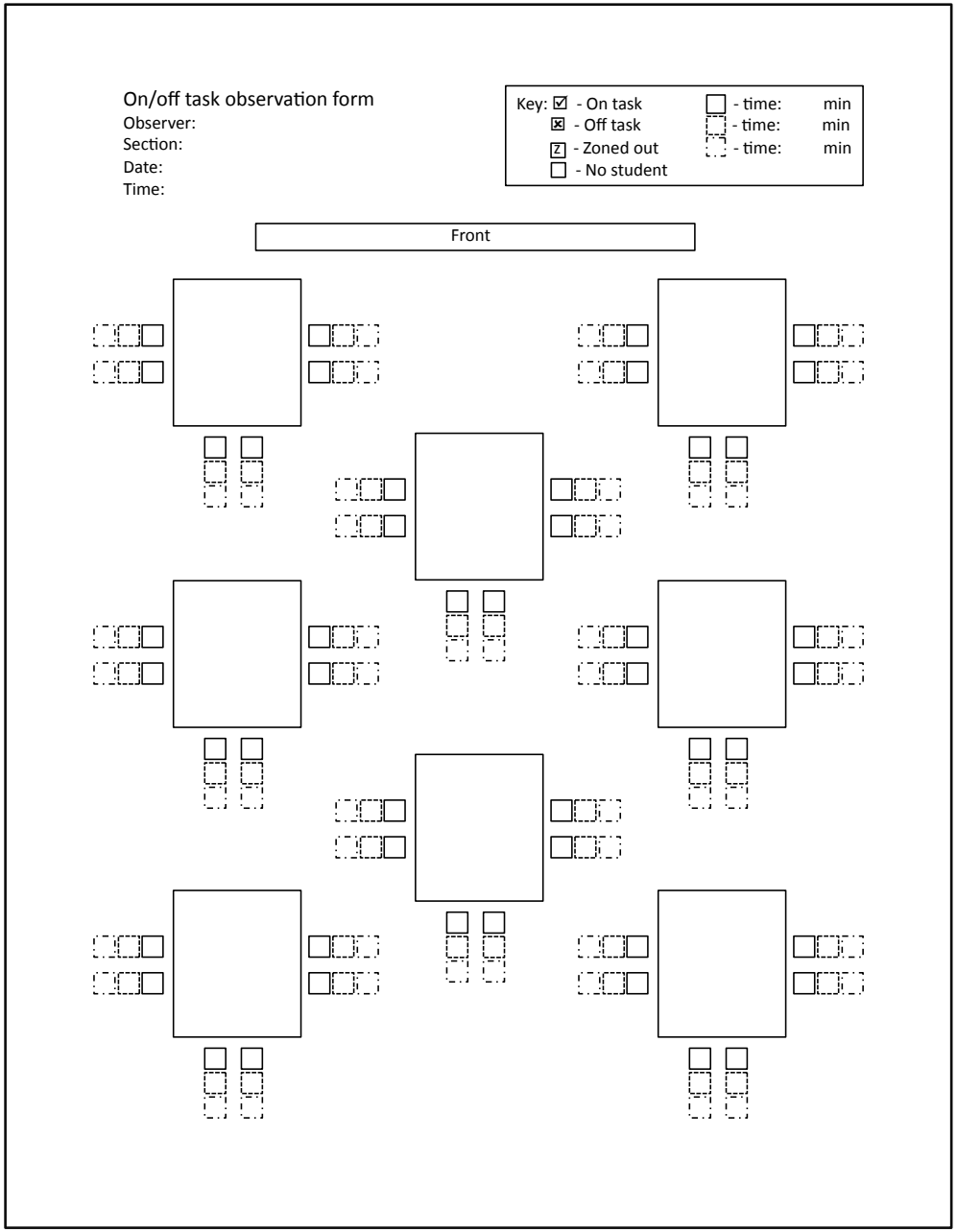
(Please mark lab end)

Notes:

(a) Left room briefly - standing off to side while watching other TA
(b) Gathered the class at the front
(c) pointed out error in handout by using overhead
(d) Going over method of solving clicker
(e) answering observer's
(f) discussing lab with other TA
(g) getting collected ~~data~~ predictions from student helpers
(h) worked with students at board with the collected data
(i) Talking to entire class at board
(j) Asked other TA question in front of everyone to spark explanation

Student engagement observations

- At a glance, place a check/'x' on classroom map if student is on/off task
- Completed at intervals of 10 minutes



Results: Descriptives

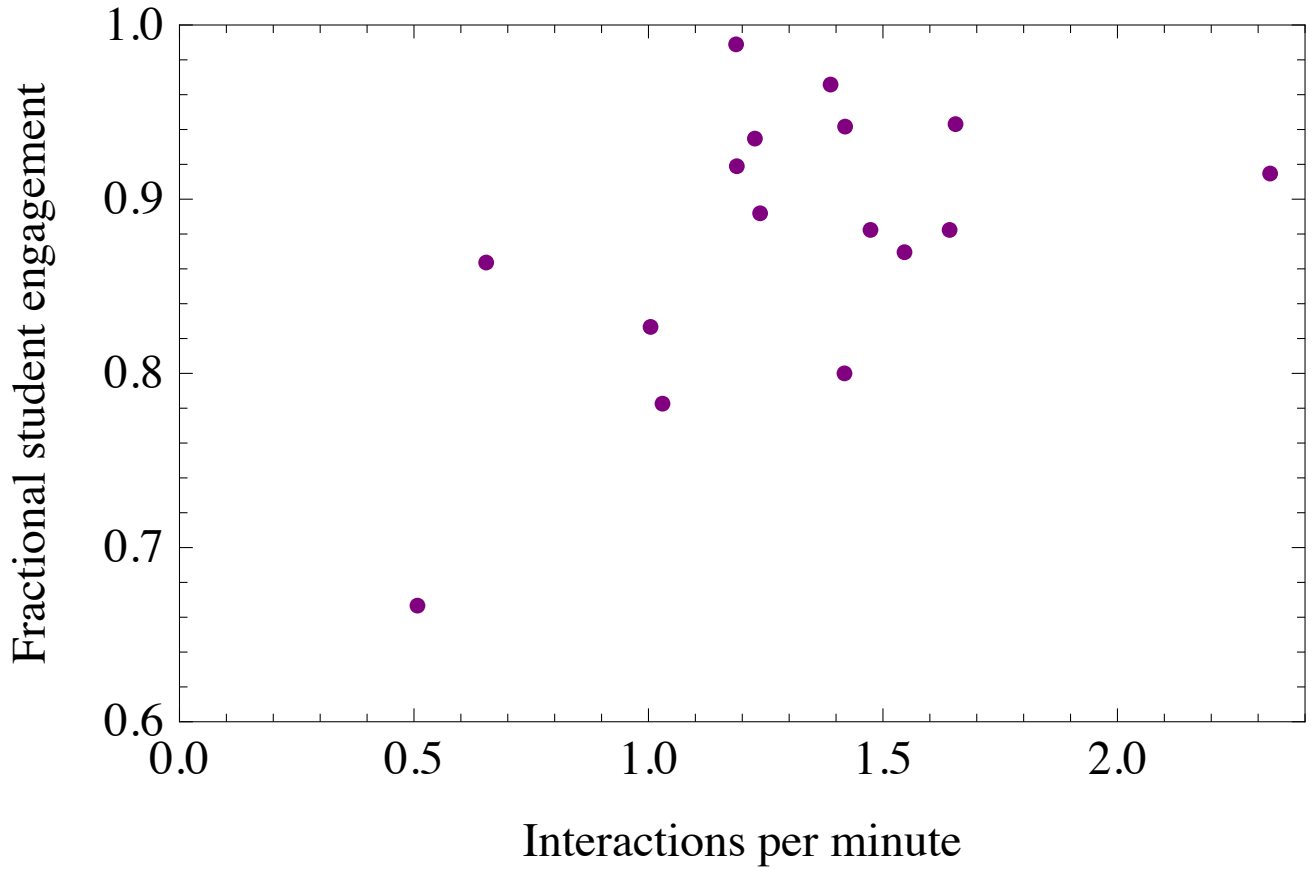
- Observed time per TA: 27.7 +/- 5.40 minutes
  - Normalize values by time observed
- Engagement observations span ~20 minutes
- Very high engagement in Physics 100 lab!
  - Fractional student engagement: 0.88 +/- 0.081
- Mostly short (< 1 minute long) interactions
  - 581 TA-student interactions; 399 < 1 minute long
  - 2 sections had more long interactions than short
- Majority of interactions initiated by TAs
- Most sections had less than one announcement every ten minutes
  - 3 sections had more than one announcement every 4 minutes!
- The average lab section…
  - Spent 7.91 minutes discussing last week's homework (SD = 3.11 minutes)
  - Was 78.5 minutes long (SD = 4.29 minutes) (This was a *short* lab)
  - Finished 2.30 minutes late (SD = 4.16 minutes)

Results: Correlation with engagement

TA behaviour	Mean	SD	r(16)	*p*
1. (# of) TA behaviours outside the standard TA script	5.93	2.59	0.30	0.23
2. Number of announcements per minute	0.13	0.14	-0.25	0.32
3. Number of interactions per minute	1.31	0.42	**0.52**	**0.03**
4. Ratio of short (<1 minute) to long (>=1 minute) interactions	2.77	1.33	-0.099	0.70

Number of interactions gives only significant correlation with engagement

Results: # of interactions correlates with engagement



Conclusions

- Number of interactions correlates with engagement
  - Just a correlational study; there may be other factors at play here (for example, TA social aptitude)
  - Length of interactions does not seem to matter for engagement
- Other factors do not associate with engagement, but may show up elsewhere

What TAs do in class matters.