Learning Assistant Programs: Supporting Learning, Creating Community, Building Physics Identity

Eleanor W. Close
Building Thriving Undergraduate Physics Programs
February 11, 2018
Outline

1. Big Picture (with pretty graphs)
2. The Learning Assistant Model
3. Implementation at TXST
4. Studying program impact
   - A few quantitative results
   - Video examples
5. Resources: Learning Assistant Alliance
A Learning Assistant program can:

1. Grow your physics program
2. Create a community of majors
3. Make your provost happy
4. Generate a bunch of research data
Seattle Pacific University

Small private university
~3500 students

http://www.phystec.org/institutions/
Physics Graduates, 1994-2013

Complete faculty turn-over
Seattle Pacific Univ. Physics

Physics Graduates, 1994-2013

Complete faculty turn-over

NSF CCLI, reformed intro courses with UG assistants
Seattle Pacific Univ. Physics

Physics Graduates, 1994-2013

Complete faculty turn-over

Full LA program (Pedagogy course)

reformed courses
E. W. Close, L. Seeley, A. D. Robertson, L. S. DeWater, and H. Close,

Seattle Pacific University: Nurturing preservice physics teachers at a small liberal arts school

Texas State University

Large public university
~38,000 students
Texas State University Physics

Physics Graduates 2006-2017

LA Program

Non-LAs  LAs


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What is a Learning Assistant?

LAs: Undergraduates who are catalysts for student group learning

- Work with faculty to develop and implement student-centered environments
- Guide student discussions to facilitate learning

• Receive extensive training/mentoring
  - Close mentoring from faculty instructors
  - Curricular support: LA Pedagogy course
What is a Learning Assistant?

LAs: Undergraduates who are catalysts for student group learning
- Work with faculty to develop and implement student-centered environments
- Guide student discussions to facilitate learning

• Not typical “teaching assistants”
  - De-emphasize 1-on-1 office hours
  - No classic problem-solving recitation sessions
What is a Learning Assistant?

LAs: Undergraduates who are catalysts for student group learning
  – Work with faculty to develop and implement student-centered environments
  – Guide student discussions to facilitate learning

• Not Supplemental Instruction Leaders
  – Work intimately with faculty mentors
  – Significant classroom presence
What is the Learning Assistant Model?

**Practice → An LA’s Primary Role**
Facilitate discourse in small groups of students collaborating on group-worthy activities

**Preparation → Weekly Prep Mtg**
Reflect on past week
Work through materials
Anticipate student ideas

**Pedagogy → LA Course**
Discipline-Based Ed Research
Formative assessment
Teaching reflections

**Secondary Role(s)**
Help room
Attend class
Develop materials
Grading
What are the goals of the LA Model?

1. **Course transformation:** Improve the education of all STEM students (K–16)

2. **Recruitment:** Recruit more, and improve the preparation of, future STEM teachers

3. **Research:** Engage STEM faculty in preparation of teachers and in discipline-based educational research

4. **Institutional Change:** Transform departmental cultures to value research-based teaching as a legitimate activity for ourselves and for our students.
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LAs at Texas State

Practice
LAs at Texas State

Practice

Preparation
Fridays 12:00-2:00 pm

Pedagogy
PHYS 3210:
Physics Cognition and Pedagogy
LAs at Texas State: Preparation

**Preparation**: Focus on building community
- All ~35 LAs and LA-supported faculty begin together
- Split out by course (not by instructor)
LAs at Texas State: Pedagogy

PHYS 3210: Physics Cognition and Pedagogy

- Seminar-style – Tuesdays 5:00-7:00pm (with snacks!)
- Weekly readings
- Teaching reflections
- Physics Interview Project
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TXST Normalized Gain ($\langle g \rangle$) on FCI

\[ \langle g \rangle = \frac{(post - pre)}{(100\% - pre)} \]
TXST Normalized Gain (<g>) on FCI

\[ \langle g \rangle = \frac{(post - pre)}{(100\% - pre)} \]
TXST Normalized Gain (<g>) on FCI

Ave. for IE = 0.39

Ave. for lecture = 0.22
TXST DFW Rate
TXST DFW Rate

- LA Program pilot
- LA Program All sections
TXST DFW Rate
TXST DFW Rate By Instructor
TXST DFW Rate By Instructor
Physics Graduates 2006-2017

Non-LAs
LAs

LA Program


Texas State University Physics
Physics Graduates 2006 - 2017

LAs create community

Year

2013 2014 2015 2016 2017
Preparing and Supporting University Physics Educators Focused Collection

A special collection highlighting the current state of the field of physics education research as it relates to preparing and supporting physics educators at colleges and universities. [Editorial]

Becoming physics people: Development of integrated physics identity through the Learning Assistant experience

Eleanor W. Close, Jessica Conn, and Hunter G. Close

Participation in a learning assistance program supports both stronger physics student and instructor identity, and reconciles these into a coherent integrated physics identity.
Community Membership & Competence

Emergent themes:

• LAs become more competent and confident in physics
• LAs feel like part of a supportive and collaborative community
• Being an LA increases teaching competence and re-shapes LAs concepts of good teaching
• Participation in the LA program changes ways of learning and of being a student
• Variety is valuable for learning
• It’s okay to be wrong and to ask for help
Relationships with peers and faculty

LAs experience closer contact and more interaction with faculty and with peers

Becoming more engrossed in the physics department has allowed me to establish rapport with professors, other tutors, and my fellow peers, giving me that sense of belonging in science, which I desired.

One of the things I really enjoyed about [being an LA] was that I became way more involved in the department and I feel like I have a larger network of help if I need it because of it.
Becoming a better learner

LAs develop metacognitive skills as they learn to listen carefully to the students they are helping.

“I have used what I have learned as an LA in all of my studies. First, I become familiar with my own mental models and then I compare these to what is known to be true. Being an LA has taught me that being able to recognize your own inherent beliefs and intuitions when learning a new concept is extremely important.”
LA Prep Video Excerpt 1: “Δv”

In this video, the group is made up of:

- Ava – third-semester LA
- Beau – second-semester LA
- Lars – professor new to LAs
- Dustin – first-semester LA
III. Motion that includes a change in direction
A. Complete the velocity diagram below for the portion of the motion that includes the turnaround.

B. Choose an instant before the turnaround and another after.

In the space below, draw the velocity vectors and label them $\vec{v}_i$ and $\vec{v}_f$.

Draw the vector that must be added to the velocity at the earlier time to obtain the velocity at the later time.

Is the name change in velocity that you used in sections I and II also appropriate for this vector?
What’s going on here?

What did you notice in the video?

Did you see evidence for...

- LAs becoming more competent and confident in physics?
- That LAs feel like part of a supportive and collaborative community?
- ...Being an LA increases teaching competence and re-shapes LAs concepts of good teaching?
- ...Participation in the LA program changes ways of learning and of being a student?
- ...It’s okay to be wrong and to ask for help?
Communities of Practice

Theory of Situated Learning:
- Learning occurs through practice

What defines a Community of Practice?
- Mutual engagement
- Joint enterprise (negotiated)
- Shared repertoire
Characterizations of identity:

• Identity as **community membership**
  We define who we are by the familiar and the unfamiliar.

• Identity as **nexus of multimembership**
  We define who we are through the work of reconciling forms of membership in multiple communities.
In this video, the group is made up of:

- Sammy – first-semester LA
- Ava – third-semester LA
- Craig – fourth-semester LA
- Dustin – first-semester LA
Video Excerpt 2: “throat punch”

IV. Supplement: Contact and non-contact forces
A. A magnet is held up by another magnet as shown at right.

1. Draw a free-body diagram for magnet 2. The label for each of the forces on your diagram should indicate:
   - the type of force (e.g., gravitational, normal),
   - the object on which the force is exerted, and
   - the object exerting the force.
Craig: But M1 is gonna feel a force normal, right? On M1 by M2.
What’s going on here?

What did you notice in the video?
Did you see evidence of membership in multiple communities?
What identities is Dustin working on reconciling?
Are the other LAs also reconciling identities?
Is this group off task?
Why are LAs so happy?

The work of reconciliation is a **profoundly social** kind of work. We cannot become human by ourselves.

(Weinger, 1998, p. 161/146)

LA Program participation provides a forum for reconciling many forms of community membership & practice
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Where can you learn more?
Where can you learn more?

Learning Assistant Resources Site

- General Program Elements
- Starting and Maintaining Your Program
- Funding and Supporting Your Program

Learning Assistant Resources Site

Learning Assistants are undergraduate students who, through the guidance of weekly preparation sessions and a pedagogy course, facilitate discussions among groups of students in a variety of classroom settings that encourage active engagement.

Traditional Model

- Instructor
- Students

LA Model

- LA
- LA
- LA
- LA
- LA

Pillars of the LA Experience

- Practice: Facilitate discourse in small groups of students.
- Content: Engage in weekly class planning sessions.
- Pedagogy: Participate in a weekly STEM education seminar.

Click here to access text, diagrams and photos, useful for promoting your own program. These General Program Elements describe key features of all LA Programs.

Starting and Maintaining Your Program

- LA Implementation Guide
- Getting Started
- Transforming Course
- Pedagogy Course
- Run Your Program
- Workshops for Your Faculty

Funding and Supporting Your Program

- LA Program Overview Slideshow
- Sustain and Scale Overview
- Slides for Making the Case
- Funding
Where can you learn more?
LA Supported Student Outcomes (LASSO) tool

The LA Alliance is engaged in a study on student outcomes in LA-facilitated courses. While faculty do not have to have LAs in their courses to participate, they must join the LA Alliance (which is free). We offer concept inventories in the disciplines of Astronomy, Biology, Chemistry, Math, and Physics (full list).

All of our concept inventories are administered online and student scores are calculated in real time. Participating faculty members who give their students both the pre and post test will receive reports examining their students' learning. Faculty not yet using LAs can participate, in fact, this is an excellent opportunity to collect baseline data they will need.
Disciplinary Assessments

Astronomy
- Light and Spectroscopy Concept Inventory (LSCI)

Biology
- Concept Inventory of Natural Selection (CINS)
- Genetics Concept Assessment (GCA)
- Introductory Molecular and Cell Biology Assessment (IMCA)
- Colorado Learning Attitudes about Science Survey (CLASS) – Biology

Chemistry
- Chemical Concepts Inventory (CCI)
- Colorado Learning Attitudes about Science Survey (CLASS) – Chemistry

Math
- Pre-Calculus Assessment (PCA)

Physics
- Force Concept Inventory (FCI)
- Force and Motion Concept Evaluation (FMCE)
- Brief Electricity and Magnetism Assessment (BEMA)
- Conceptual Survey of Electricity and Magnetism (CSEM)
- Colorado Learning Attitudes about Science Survey (CLASS) – Physics
LA Supported Student Outcomes (LASSO) Study

Pre and Post Scores (n = 130)

Assessment: FMCE
Institution: LASSO University
Course: ABCD 1000 - 001
Instructor: Riley Patterson
Semester: Fall 2015

Your Data
N (class) = 250
N (pre) = 190 (mean = 45%)
N (post) = 190 (mean = 75%)
N (paired) = 130
Learning Gain:
(post - pre) / (1 - pre) = 0.55

Effect size (Cohen's d) is a common statistical measure of student improvement. It measures student improvement in units of standard deviations (%post-%pre)/SDmean. To help interpret the magnitude of an effect size, Cohen provided the following guidelines [1]:

<table>
<thead>
<tr>
<th>Effect Size</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;small&quot;</td>
<td>-0.2 - 0.3</td>
</tr>
<tr>
<td>&quot;medium&quot;</td>
<td>-0.5</td>
</tr>
<tr>
<td>&quot;large&quot;</td>
<td>-0.8</td>
</tr>
</tbody>
</table>

Effect Size (mean=2.11)

N (paired) = 130
Average Effect Size: 2.11
Note: 1 score was less than -1.
The Big Picture

A Learning Assistant program can:
1. Grow your physics program
2. Create a community of majors
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4. Generate a bunch of research data

Create a thriving community of physics students & faculty
Eleanor Close
Hunter Close
David Donnelly
Brandon Lunk
Steven Wolf
Cody Blakeney
Aaron Collins
Jessica Conn
Chase Gammon
Gabrielle Harmon
Shahrzad Hesaaraki
Joseph Hook
Sara Hull
Nichole Libby
Jean-Michel Mailloux-Huberdeau
Austin McCauley
Rebel Nicholson
Korley Roesler
Sean Tarter
Ryan Zamora

DUE-1431578
DUE-1557405
DUE-1240036