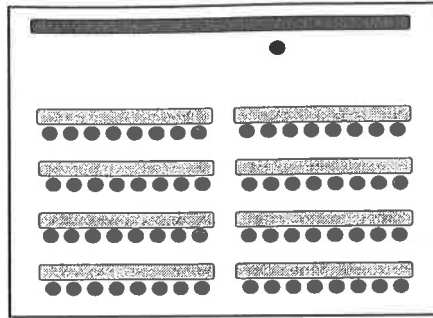


Large Classroom Setting

(Varies from minimal use in lecture setting to maximum use in fully-flipped classrooms)



Typical Learning Environment

In lecture settings that use personal response systems (“clickers”), Learning Assistants assist with facilitation of peer instruction. They circulate the class (as does the instructor), making sure all students are engaged in discussion, promoting useful dialogue, answering student questions, and providing feedback to the instructor on student understanding.

What Do Students Do?

After the instructors pose a question, students either respond on their own, or discuss with neighboring students before responding. Typical discussions for challenging conceptual questions last 2-3 minutes.

What do LAs Do?

LAs circulate among groups of students, asking them to share their reasoning and probing their responses. Their role is not to confirm answers but to help students articulate their ideas and justify their reasoning to themselves and other students.



Materials Needed

- Challenging conceptual questions; 4-5 per 50-minute class session
- Students need clickers or other technology to submit their responses. For a guide on how to effectively use clickers, go to: <http://www.cwsei.ubc.ca/resources/clickers.htm>
- Instructors need technology to receive student responses.

LA to Student Ratio

1 LA to 40 - 50 students for minimal LA use; 1 LA to 20 for flipped class

Hiring Needs

1 LA per 40 - 50 students in the course

5

Coordination with Other Course Components

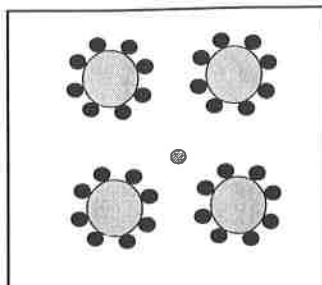
Courses that use LAs in lecture often also have either required or optional recitation-like sessions that run throughout the week. In many cases, the same LAs who facilitate clicker discussion in lecture also facilitate small-group discussions in recitation.

Variations and Suggestions

- If possible, leave empty rows between every two rows of students for LAs and instructors to circulate among students.
- If space is unavailable, assign LAs to “regions” within the lecture hall so they can alter their placement among a smaller group of 50 students
- Have students work in teams of 3-4 and choose a name for their “clicker group.” Instructors can then use group names to solicit feedback as in, “Would someone from the Quantum Dots group share what you selected and why?”

Small Lecture Class

(Class time is used for interactive engagement and potentially lecture)

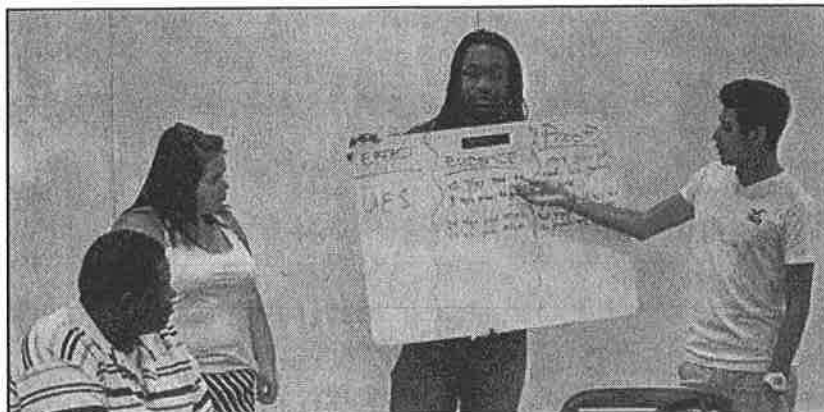


Typical Learning Environment

Small sized classes can also benefit from using LAs whether it is an introductory course at a small institution or an upper level course at a small or large institution. A studio-style classroom is ideal (tables with 4 to 9 students), but a traditional seminar-style classroom will also work. Small lecture classes may use a hybrid of other classroom instructional styles. This includes student use of personal response systems (“clickers” as seen in large-lecture classrooms) as well as guided-inquiry activities or problem-solving activities (as seen in recitation and flipped-classrooms). Learning Assistants assist with facilitation of peer instruction. They circulate the class (as does the instructor), making sure all students are engaged in discussion, promoting useful dialogue, answering student questions, and providing feedback to the instructor on student understanding.

What Do Students Do?

Students engage in conversations with the peers to answer clicker questions and work through inquiry activities. Students must justify their answers and work together to deepen understanding.



What do LAs Do?

LAs help facilitate discussion by encouraging students to share, discuss, and justify their answers. They may engage in Socratic dialog to help guide students to understanding. The LAs guidance in the classroom is modified based on the nature of the activity (clicker question or group learning activity.)

Materials Needed

- Challenging conceptual questions for lecture.
- Students need clickers or other technology to submit their responses. Low-tech alternatives, such colored sticks or holding the number of their answer in front of their chest, may also work. For a guide on how to effectively use clickers, go to: <http://www.cwsei.ubc.ca/resources/clickers.htm>
- Guided-inquiry based activity documents or sets of well-sequenced questions that allow students to articulate, defend, and modify their ideas. For examples, see:
 - Tutorials for Introductory Physics <https://sharepoint.washington.edu/phys/ugrad/tutorials>

- Process-Oriented Guided Inquiry Learning (POGIL) <https://pogil.org>
- ChemEd XChange <https://www.chemedx.org/page/activity>

LA to Student Ratio

1 LA to 15 - 30 students

Hiring Needs

1 LA per course

Coordination with Other Course Components

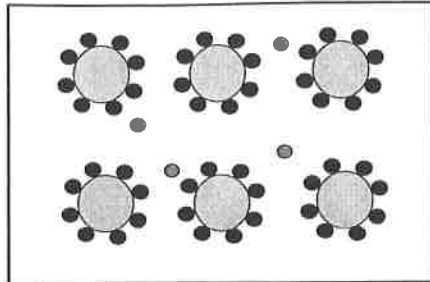
Courses that use LAs in lecture may also have either required or optional recitation-like sessions or an associated laboratory course. In many cases, the same LAs who facilitate in lecture can also facilitate small-group discussions in recitation or laboratory.

Variations and Suggestions

- During lecture portions of the course, have the LA sit at student tables not off to the side to help foster communication between the LA and students.
- If a small group is particularly struggling, the LA can be assigned to provide greater support to the struggling group, while the instructor fields the majority of questions from the remaining groups.
- LAs can provide real-time feedback to instructors during class regarding pacing and challenging questions that may require full-class discussion.

Flipped Classroom

(Class time is used for interactive engagement, lectures watched as homework)



Typical Learning Environment

A studio-style classroom is ideal (tables with 4 to 9 students), but it can also work in a traditional theatre-style classroom. Similar to: POGIL, Scale-Up, Laboratory Classroom, Blended Learning

What Do Students Do?

Students work in groups on challenging activities or carefully sequenced questions that can help them build conceptual understanding or problem solving sophistication. Two examples are provided in this section.

What do LAs Do?

LAs circulate around the classroom listening and observing groups as they work through context-rich problems. When appropriate, LAs engage students in Socratic dialog, asking probing questions about the groups' current thinking. Large, mobile, dry-erase boards (see below) are helpful for making students' thinking visible to LAs. LAs also try to get students into discussions about the problem with one another. LAs do not give answers; instead they ask probing questions that can help lead students move into productive discussions.



Materials Needed

- Guided-inquiry based activity documents or sets of well-sequenced questions that allow students to articulate, defend, and modify their ideas. For examples, see:
 - Tutorials for Introductory Physics <https://sharepoint.washington.edu/phys/ugrad/tutorials>
 - PER User's Guide <http://perusersguide.org>
 - Minnesota's Context-Rich Problems <http://groups.physics.umn.edu/physed/Research/CRP/crintro.html>
 - Process-Oriented Guided Inquiry Learning (POGIL) <https://pogil.org>
 - Berkley's Understanding Evolution <https://evolution.berkeley.edu/evolibrary/teach/index.php>
- Large (1meter \times $\frac{3}{4}$ meter), mobile, dry-erase boards are useful for students to build ideas, work problems, and modify ideas collaboratively as a group.

- Videos of lectures must be made available to students through YouTube or other video-sharing media. Some instructors provide screencasts, pencasts, or vodcasts to supplement or augment or replace the lecture.

LA to Student Ratio

1 LA per 20-25 students

Hiring Needs

1 LA per 20-25 students

Coordination with Other Course Components

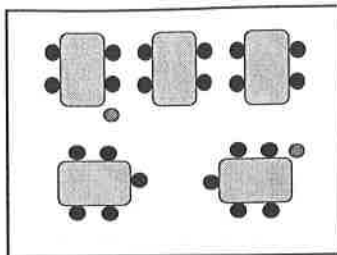
Generally, Flipped Classrooms involve intensive problem solving in class. Thus, outside of class there can be different types of learning that LAs can facilitate. Homework can either be done at home, or in the classroom where students can work together. Recitations are generally not needed as much as in a traditional classroom, but a help-room or online chat-room can be of use.

Variations and Suggestions

- Flipping a Classroom is very labor intensive in the beginning
- Proficiency with technology is key, as it will be the primary way professors are directly conveying content knowledge

Recitation-Style Session

(50 min sessions, typically in addition to lecture and can be optional or required)



Typical Learning Environment

Approximately 20-25 students per 50-minute meeting in groups of 4 or 5. One LA and one graduate TA co-facilitate entire session. Each LA facilitates 3 - 4 sessions per week. Sessions may occur all in one day of the week, or spread throughout the week.

Also Known As

Tutorials, co-seminars, work groups. Shares features with Supplemental Instruction.

What Do Students Do?

Students work in groups on challenging activities or carefully sequenced questions that can help them build conceptual understanding or problem solving sophistication. Two examples are provided in this section. Students are expected to defend their reasoning and negotiate meaning with their peers.

What Do LAs Do?

LAs circulate around the classroom listening and observing groups as they work through context-rich problems. When appropriate, LAs engage students in Socratic dialog, asking probing questions about the groups' current thinking. Large, mobile, dry-erase boards are helpful for making students' thinking visible to LAs and to all students in the group. LAs also try to get students into discussions about the problem with one another. LAs do not give answers; instead they ask probing questions that can help lead students move into productive discussions.



Materials Needed

- Guided-inquiry based activity documents or sets of well-sequenced questions that allow students to articulate, defend, and modify their ideas. For examples, see:
 - Tutorials for Introductory Physics <https://sharepoint.washington.edu/phys/ugrad/tutorials>
 - PER User's Guide <http://perusersguide.org>
 - Minnesota's Context-Rich Problems <http://groups.physics.umn.edu/physed/Research/CRP/crintro.html>
 - Process-Oriented Guided Inquiry Learning (POGIL) <https://pogil.org>
- Large (1meter \times $\frac{3}{4}$ meter), mobile, dry-erase boards are useful for students to build ideas, work problems, and modify ideas collaboratively as a group.

LA to Student Ratio

1 LA to 25-30 students for each session, each LA facilitates 3 of the same sessions per week

Hiring Needs

1 LA per 60 - 80 students in the course

Coordination with Other Course Components

Typically, recitation-type sessions co-occur with a class that meets 3 - 4 times a week. Recitation sessions are often scheduled throughout the week, but some departments manage to get all the recitations for the course scheduled on a single day of the week, between two of the class days.

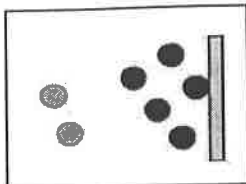
Variations and Suggestions

- Two LAs can facilitate each session instead of an LA and a TA.
- These session may be either a regular part of the lecture course, an additional 1-credit course, or an optional study session.
- In transforming a course, cancelling one lecture per week and run recitations sessions instead may allow for more small group work and individual attention for students.
- Experienced LAs can run an additional recitation section per week in addition to serving as an LA in the lecture course.



Oral Assessments

(50 min sessions, typically in addition to lecture and can be optional or required)



Typical Learning Environment

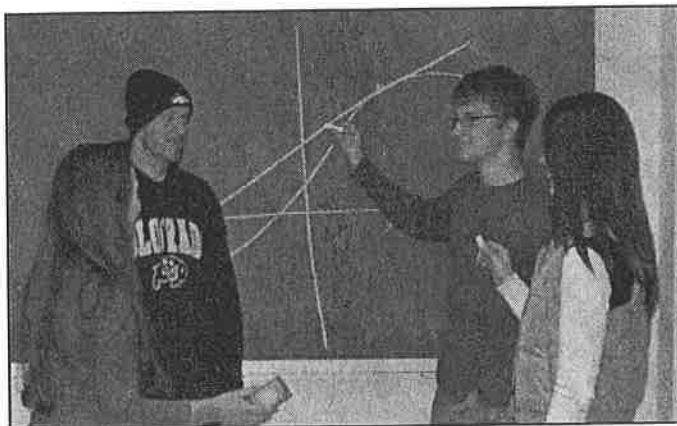
Orals typically occur outside of class time. Five to eight students meet for 60 minutes. Each session is facilitated by 1 or 2 LAs, and each LA facilitates 3 - 4 sessions before each written exam. In some courses, oral assessments are only offered during exam preparation weeks, but LAs often offer extra oral sessions on a weekly basis for struggling students.

What Do Students Do?

- Students work in small groups of 5 to 8 students.
- Groups meet for an hour in a small room with ample board space so that all students can write.
- Students are asked both conceptual and procedural questions and they are expected to defend their reasoning and negotiate meaning with their peers and the LA.
- Students are asked to explain the “how” and “why” of important topics.

What Do LAs Do?

Oral assessments typically last one hour and are offered prior to exams. Orals are geared to improve student understanding and allow instructors and LAs to work with students on an individual basis to address difficult conceptual issues. Students attend each oral assessment in a group of 5-8 and work at a chalkboard or dry-erase board to answer primarily scripted, conceptual questions. The LA asks the initial scripted questions as well as follow-up probing questions and encourages students to work together to make sense of the ideas.



Materials Needed

- Sets of well-sequenced questions that allow students to articulate, defend, and modify their ideas. For examples, see:
 - Minnesota’s Context-Rich Problems
<http://groups.physics.umn.edu/physed/Research/CRP/crintro.html>
 - ChemEd XChange Conceptual Chemistry Questions
<https://www.chemedx.org/blog/conceptual-chemistry-questions>
 - University of Colorado Boulder Math Examples
<https://www.colorado.edu/amath/academics/oral-exams/sample-oral-assessments>
- Ample chalkboard or dry-erase boards

LA to Student Ratio

1 LA to 5-8 students for each session, each LA facilitates 2 or 3 sessions prior to written exams.

Hiring Needs

1 LA per 60 - 80 students in the course

Coordination with Other Course Components

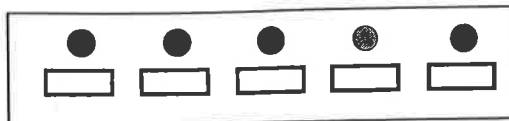
Typically, orals co-occur with a class that meets 2-3 times a week. Orals may be organized before unit exams and the final.

Variations

- When LAs are first learning to facilitate orals, a team approach with either with one TA and one LA or the Instructor and one LA can be fruitful. The LA may lead sessions independently prior to exams later in the semester.
- For more detailed information about implementation see:
http://serc.carleton.edu/sp/library/learning_assistants/examples/example5.html

Online Class

(may be a fully online course or a hybrid with both online and in-person components)



Typical Learning Environment

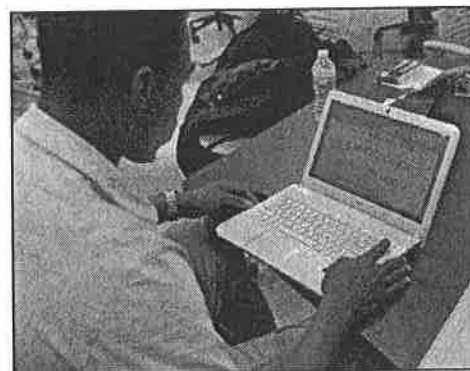
Many colleges and universities are increasing online class offerings, especially for non-major courses. These courses can also benefit from using LAs. The learning environment can either be exclusively online or a hybrid of online activities and in-person meeting times. Most online activities are asynchronous which require different LA interactions with students than in an in-person classroom context. Online modules can include interactive activities, such as discussion forums and peer review, in addition to individual activities, such as papers and exams. LAs assist with facilitation of interactive activities by supporting and probing understanding in online discussions. They can serve as a peer-reviewer and tutor to support students in individual activities, in addition to providing feedback to the instructor on student understanding.

What Do Students Do?

Students engage in discussion about content applications in online forums based on readings, simulations, and/or videos.

What do LAs Do?

In the online environment, LAs hold two roles: that of the model student and as a co-administrator or learning support. In the role of model student, LAs help facilitate discussion by encouraging students to share, discuss, and justify their answers in the discussion forums. They also serve to guide students back to scientifically accepted explanations if discussion veers too far. In the role of learning support, LAs can also provide direct support to students through online tutoring sessions or peer-review. They can also assist the instructor by pre-viewing activities and aiding in development of course materials such as designing rubrics or finding relevant videos online.



Materials Needed

- Challenging questions for discussion, which do not have “right” answers to support rich discussion.
- Flexible course management system.
- Guided-inquiry based activity documents or sets of well-sequenced questions that allow students to articulate, defend, and modify their ideas which are suitable for online completion. For examples, see: PhET Online Simulations: <https://phet.colorado.edu/>

LA to Student Ratio

1 LA to 15 - 30 students

Hiring Needs

1 LA per course

Coordination with Other Course Components

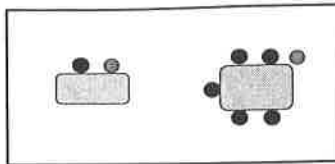
Some courses may be hybrids with either in-person laboratories or class session. The LA may also serve as the LA for these components of the class as well. Students in the online component of the hybrid course may be more open with the LA if they have worked with them in person as well.

Variations and Suggestions:

- The LA must be comfortable with using technology and the course management system. Online modules should be open to the LA before they are open to students to enable the LA to be prepared. The LA should introduce themselves to the online course students through either email introductions or a video, so students are aware of their presence and comfortable turning to them for help.
- Before faculty open a new module, LAs can preview it to ensure that the links and directions are easy to follow for a non-expert student.
- LAs can have online office hours when students know someone is available for video-conferencing.
- LAs can moderate small groups who choose to meet synchronously online to delve deeper into discussion.
- LAs can email students who appear to be struggling to provide more support.

Other Settings

(Laboratory, Help Sessions, and Office Hours)



Typical Learning Environment

LAs can be used in a multitude of ways. They can be used in laboratories, help/review sessions, and in office hours. All of these settings should have the space where students can work, and LAs can facilitate learning.

Laboratory

LAs in large universities are usually paired with TAs to help students understand key concepts from class. In smaller universities and colleges they may work with a faculty member in the laboratory. LAs facilitate learning by having students work in small groups, and help students come to their own conclusions about what they are observing in their data. If used in lab settings, may need to hire a lot of LAs, as each lab session typically lasts 2-3 hours. LAs function particularly well in laboratory courses that emphasize argumentation such as Argument Driven Inquiry (<https://www.argumentdriveninquiry.com/>) or Model-Observe-Reflect-Explain (<https://www.acs.org/content/dam/acsorg/education/policies/hsstandards/chapter-4.pdf>)

Help/Review Sessions

This is a setting where students can come together with the LA to work through hard concepts and problems together. It is usually optional for students, so on its own, does not guarantee regular opportunities for the LA to work with small groups of students. The LA encourages students to work in pairs or in small groups and focuses on problem solving, instead of simply getting the answer. LAs can also model problem solving techniques, which will not only help their learning, but also help students with exams. If LAs are used in this way, it is usually paired with another structured course component such as in-class activities or recitation.

Office Hours

LAs can also hold office hours, similar to a professor or TA. They can help students by modeling problem solving skills, as well as having students explain their reasoning while they work aloud on problems that they are struggling with. LAs can also encourage students to work together on questions that they have in common. These office hours can happen throughout the week at set blocks of time and are usually supplemental to other structured opportunities for LAs to regularly facilitate small group learning.

Auxiliary Settings

The pillars of the LA model are Classroom Practice, Pedagogy Course, and Weekly Meetings. Use in other setting that support the model can be fruitful. For instance, LAs might help at a university open house and use their skills to lead a demonstration activity for visiting high school students. Experienced LAs may want to learn more about Discipline Based Research to contribute discourses about practice and pedagogy.

Case Studies

General Chemistry 1 and 2: University of Colorado Boulder

Context at a Glance:

- **Research 1 Institution**- ~30,000 undergraduate students
- **Large Enrollment Service Courses**- enrollments between 500 – 100 each semester
- **Multi-Component Course**
 - Large Lecture
 - 3 hours per week
 - Enrollment in each lecture section is between 100 – 450 students
 - PowerPoint presentation supplemented with problem solving on a document camera and live demonstrations
 - Daily use of classroom response system
 - Required Weekly Recitation Sessions
 - 1 hour per week
 - Enrollment in each recitation section is approximately 20 students
 - Weekly recitation activities are published in a workbook that students purchase and bring to recitation every week.
 - These materials are designed to encourage group work and conceptual learning.
 - Each section is co-facilitated by a Graduate Teaching Assistant and a Learning Assistant
 - Co-requisite Lab Course
 - 2.5 hours per week
 - Enrollment in each lab section is approximately 20 students
 - Weekly lab activities are published in a lab manual that students purchase and bring to lab each week.
 - Each section is taught by one Graduate Teaching Assistant
- **LA Hiring** – approximately 1 LA is hired per 60 students enrolled in the course
- **Use of LAs**
 - Lecture
 - LAs attend one lecture section throughout the semester
 - LA move around the lecture hall during in-class concept tests (clickers) and help students with their thought process
 - LAs are interacting with students approximately 30% - 40% of the lecture period
 - Recitation
 - LAs co-facilitate 3 – 4 recitation sections per week with a Graduate Teaching Assistant
 - LAs and TAs move between groups of 4 - 5 students, checking their understanding, pushing them to articulate their reasoning behind their answers and assisting students in their learning
 - LAs are interacting with students 100% of the recitation period
- **LA Weekly Preparation:** LAs and TAs for each course meet as a group for one hour per week with one of the lecture instructors. During these meetings, the previous week's sessions are reviewed and content for the upcoming week's activities are discussed. Common student misconceptions are presented and strategies are developed to help students strengthen their understanding.