Welcome to the T2L Toolkit

*Teach to Learn* is a four-year National Science Foundation funded project to improve science teaching and learning by pairing college undergraduates from both science and non-science backgrounds and K-7 classroom teachers to design and deliver NGSS-aligned units of instruction. The overarching project goals are to improve elementary teachers’ and college undergraduates’ understanding of the nature of science, teachers’ science teaching self-efficacy, as well as to increase undergraduates’ success in science coursework and retention in science majors. We also hope to improve attitudes toward learning science and science achievement among K-7 students.

The purpose of this toolkit is to share the resources developed and lessons learned from our implementation of this initiative. Our hope is that other grade K-7 teachers, public schools, and colleges will access and adapt the program model, or specific tools (e.g. the NGSS-aligned units of instruction), to meet their needs and support improvements in science teaching and learning in grades K-16.
Section I
Partnership and Project Staff

The partnership for this project includes the North Adams Public Schools, Massachusetts College of Liberal Arts, and Williams College. All three institutions are located within 10 miles of one another in the far northwest corner of Massachusetts. The populations of Williamstown and North Adams were 7,754 and 13,708 respectively in 2010. We are about an hour away from the nearest metropolitan area (Albany, NY).

The North Adams Public Schools serves 1500 students in three K-7 schools and one 8-12 high school. Fifty percent of our students are from low income backgrounds. Twenty-five percent are students with disabilities. Seventeen percent are students of color, and only about 1% are English language learners.

The Massachusetts College of Liberal Arts is a part of the state university system with an enrollment of about 1850 undergraduate students. 74% receive need-based financial aid. 75% of students are from Massachusetts. 30% of new students are non-white. The college accepts 72% of applicants.

Williams College is a highly selective private four-year college serving about 2000 students. 50% of the students at Williams receive some degree of financial aid. 16% are the first in their families to attend college. In the class of 2018, 34% are students of color.

Forming the Partnership
Both colleges had independent relationships with the North Adams Schools prior to the Teach to Learn (T2L) science program. The T2L initiative developed out of conversations between the school district’s Chief Curriculum, Officer, college science education faculty from MCLA, and staff from Williams College’s Center for Learning in
Action Office (the college’s community outreach office). All five individuals who began this project were known to at least one other person in the group through previous professional contacts. While receiving funding from the National Science Foundation has been key in allowing the rapid expansion of the size of this endeavor, the individuals involved in the initial planning and leadership at the institutions they represent all had a deep and enduring commitment to find ways to work together to improve K-12 education, and science education in particular. In fact, even prior to receiving NSF funding, the three institutions made modest financial commitments (a few thousand dollars each) to enable the T2L project to begin on a smaller scale.

It is also important to note that the T2L project represents a “next generation” version of a program that Williams College started at two North Adams elementary schools 15 years earlier. The program also had college students developing science units in the summer (with some guidance from individual elementary teachers) that were then taught in the schools by college students the following year. There were important lessons learned from the program created by Williams College that helped to inform and develop the T2L program.

During the original program run by Williams College, college staff worked directly with teachers but without the active oversight and engagement of school/district administrators, and without alignment of the science units with the North Adams Schools’ science curriculum. While individual partnerships between particular faculty or departments at colleges and K-12 teachers may be easier to manage, evidence from our experience shows that their ability to address systemic needs, and improve science teaching and learning for public school faculty and students was limited. We have since added professional development focused on the best practices in science instruction for both elementary faculty and college students teaching in the program along with regular collaborative planning time for the teams. These additions were not possible when the program was run solely between Williams College and individual elementary school teachers.

**Keys to an Effective Partnership**

Building and maintaining an effective partnership across institutions with different operating structures and institutional cultures takes patience and understanding. Some of the key practices and lessons learned include the following:

- **Regular meetings with the entire program staff.** In general we meet at least once a month for about two hours. The meetings are usually devoted to planning the next upcoming event in the annual program calendar. We believe that having the entire team present most of the time enables us to learn about each other’s unique institutional perspectives and challenges. This helps build a foundation of mutual respect, trust, and commitment to project goals that supports the continued improvement of the project. As our external program evaluator wrote in her year one report, “The provision of a culture in which each individual perceived themselves as a valued and contributing partner was...key to a successful implementation.”
• **Clear roles.** While this took us some time to define initially, over time we settled into more differentiated lead roles for individual program staff. Some staff take the lead on curriculum development, some on the logistics of managing the Science Fellows, and some on the research aspects of the project. While all project staff are welcome to provide input and are available to help problem solve for any aspect of the program, having clear lead people for various program activities has improved our efficiency.

• **Ad-hoc meeting as needed.** In addition to our major meetings once or twice a month, subgroups meet frequently for a shorter period of time to address specific project needs (e.g., preparation for professional development, preparation of materials bins, summer planning, etc.).

• **Frequent communication.** Program staff e-mail one another frequently, and respond promptly to each other's e-mails. This is especially important since for most project staff *Teach to Learn* is only a small part of their overall job responsibilities. All staff maintain a commitment to prioritize collaboration and communication for this project.

• **Alignment of Teach to Learn goals with institutional goals.** Independent of *Teach to Learn*, each of the three institutions have goals that are supported by the project: Williams College’s emphasis on service learning and civic engagement, MCLA’s long-term focus on improving STEM education and offering opportunities for education majors, and North Adams Public Schools’ focus on improving science teaching and learning and aligning curriculum to the [Next Generation Science Standards](#).

• **Conflict resolution.** All team members have learned to identify sources of conflict and address conflict immediately. Whether inter-institutional or interpersonal, our external evaluator noted that all team members described “the importance of each partner and individual listening to each other to understand the reasons the conflict exists and to come to a successful, mutually satisfactory resolution to the conflict” as significant for the overall success of the project.

**Program Staffing**
There are eight main staff members who do the bulk of the work associated with this project. Only two are supported (½ time each) by grant funds. The other staff members are employed by their respective institutions in various roles and devote part of their efforts to the *Teach to Learn* project.

**College Liaisons** - We have one liaison from MCLA and one from Williams College who each work roughly half time.
Lindley Wells: Education Outreach Consultant, Williams College (lew1@williams.edu)
Leslie Rule: Project Supervisor, Teach to Learn, MCLA (leslie.rule@mcla.edu)
**MCLA Science Education Faculty** - Two faculty from the science education department help manage the program at their institution, recruit Science Fellows through science and education courses, and work on program research. 
Nick Stroud: Assistant Professor of Science Education (N.Stroud@mcla.edu)  
Chris Himes: Assistant Professor of Science Education (C.Himes@mcla.edu)  

**Williams College Center for Learning in Action staff** - Two employees from the Center are involved in the project. One participates mainly in the research end of the project (see Section X) and the other oversees and works in a capacity similar to the College Liaison. 
Jennifer Swoap: Director of Elementary Outreach (Jennifer.C.Swoap@williams.edu)  
Molly Polk: North Adams Coordinator Williams Elementary Outreach (Molly.Polk@williams.edu)  

**North Adams Public School Administrators** - The Chief Curriculum Officer and the Science Curriculum Coordinator both contribute to the project, recruiting Classroom Teachers, overseeing the development of instructional units, and working on program research. 
Jean Bacon: Administrator for Teaching and Learning (jbacon@napsk12.org)  
Lindsay Osterhoudt: Science Coordinator (losterhoudt@napsk12.org)  

All program staff are involved in the planning and delivery of the professional development for Science Fellows and Classroom Teachers.
Section II
Multi-Year Roll Out and Annual Timelines

The T2L program has two distinct components: a summer curriculum development component, and a school year classroom teaching component.

Our summer curriculum development programs run for 9 weeks. The Science Fellows work 40 hours per week under the direction of the North Adams Science Coordinator with support from the College Liaisons. In our second summer we added the Science Coordinator as a full time presence to work with the Science Fellows on a daily basis. This daily adult supervision dramatically increased the quality and quantity of work the Science Fellows produced (as opposed to year one, when there were weekly meetings between the North Adams Schools program staff and the Science Fellows, but Science Fellows primarily worked independently). The Classroom Teachers who work on the summer curriculum development also benefit from meeting regularly with the Science Fellows and the North Adams Science Coordinator. Heading into our third summer we are going to require that Science Fellows and Classroom Teachers meet and work together at least twice a week for two hours.

During the school year, we place pairs of Science Fellows in the classroom for one two-hour block per week. During the two hour block of time, one hour to one and a half hours is spent co-teaching the science lesson from the T2L curriculum unit, fifteen minutes to a half hour is spent debriefing and planning for the next lesson, and fifteen minutes to a half hour is spent setting up and cleaning up the lesson. Where possible we try to pair one new and one returning Science Fellows together in a classroom. Classroom Teachers participate in the program by choice and receive a stipend for their
participation in the school year program, but most have indicated that they would participate even if no stipend was involved.

In the first year of the project we began with four grade levels, 17 classrooms, and 43 Science Fellows working in three schools. (Our four-year goal is to serve eight grade levels (K-7), 30 classrooms, and involve 60 Science Fellows).

If we had it to do over again we would have started smaller. We would suggest focusing on only one or two grade levels, and perhaps concentrating on only one school. To ensure program quality, there should be a program staff member with deep knowledge of the curriculum being taught to oversee implementation at a given grade level, and provide the curricular support needed. Our advice would be to assign one person on your team to become an expert in each instructional unit to be taught, and then decide how many classrooms that person could reasonably support given the types of support you deem desirable (see Section VII Making it Work in the Classroom below).

After the first year, we developed an annual calendar to help us stay organized and on top of project management.

See Appendix II for PDF of handouts
T2L Annual Timeline

This calendar includes references to the surveys we do as part of our research agenda. Even if you are not doing research, we would recommend you regularly collect feedback from participants to help you improve your program. The “Science Fellow Questionnaire” and “Classroom Teacher Questionnaire” included in Section X Research contain questions that solicit feedback relevant to general program improvement.
Section III
Recruitment of Science Fellows and Classroom Teachers

See the Annual Calendar in Section II Program Components and Annual Timelines above for the timing of the annual recruitment cycles. Science Fellows and Classroom Teachers are recruited separately for the school year classroom teaching and summer curriculum development components of the project.

**Science Fellows**

**Job Descriptions and Expectations**
Science Fellows are hired three times during the year; for the fall, spring, and summer semesters. The number of Science Fellows hired varies from semester to semester and year to year depending on the number of Classroom Teachers participating in the program and if the scheduling works out. During the fall and spring both Williams and MCLA hire around twenty Science Fellows each. Williams and MCLA hire three Science Fellows each for the work that takes place during the summer.

Each institution has slightly different processes and protocols when it comes to hiring Science Fellows and the expectations for the Science Fellows.

**Outreach and Advertisement**
MCLA and Williams advertise and recruit for the Science Fellow position in various ways, including word of mouth, posting on student job sites, faculty members sharing information with students, in-class presentations, posting on project websites, tableing at activities/club fairs and admissions events, and through informational emails.
Interview Process
Williams and MCLA interview all applications for the Science Fellow position. The questions and duration of the interview vary from applicant to applicant. The main purpose of the interview is to describe the responsibilities and expectations to the applicant, answer any questions the applicant has, and to observe their interpersonal skills. It is important to note that not all applicants are hired for the Science Fellow positions.

See Appendix III for PDF of handouts
Science Fellow Job Posting
Interview Questions for Science Fellows
Expectations for Science Fellows
Science Fellow Recruitment Flyer

Classroom Teachers
As a public school district we are required to post all positions. The job descriptions for our summer curriculum development and school year science teacher participant positions are below. In addition to formal postings, we also e-mail all eligible teachers to alert them of the opportunity, and sometimes speak to individual teachers to explain the opportunity and answer questions.

During the school year, we have been able to accept all teachers who have applied to participate in the program. In year one we had 15 teachers participating. In year two we have 17 teachers participating. The teachers who did not return to participate in our second year, or who expressed interest but ultimately did not participate cited the difficulty of scheduling a two-hour block of time on a weekly basis to host the Science Fellows, being moved to a new grade level where they were less comfortable with the curriculum overall, or having a “difficult class” as their reasons for not participating.

For the summer work we have had more applicants than positions available. Our interview questions are in the file below. During our first summer we hired six teachers to participate in the curriculum development work. We found that effectively managing six teachers and six fellows to meet our expectations for the quality and quantity of work produced was challenging. Entering our second summer our plan is to involve only three teachers, but for more time and with more structured, consistent meetings with the Science Fellows.

See Appendix III for PDF of handouts
Classroom Teacher Recruitment Flyer
Classroom Teacher Summer Curriculum Developer Job Posting
Interview Questions for Summer Classroom Teacher Curriculum Positions
Section IV
Logistics

School Year Science Teaching Component

Matching Science Fellows and Classroom Teachers
The logistics of finding a time that works for both Science Fellows and Classroom Teachers can be challenging. To facilitate the process the North Adams Public Schools staff collect all the possible two-hour blocks each of the Classroom Teacher participants has available. They create a google spreadsheet which is then shared with the College Liaisons.

Once the available times for the Classroom Teachers have been identified, the liaisons then compare those times to the available times of the Science Fellows. After careful consideration regarding optimal teaching teams, trying to place new students with returning students, and being conscious of scheduling conflicts, the liaisons place the Science Fellows into the classrooms. Efforts are made to place Science Fellows with partners and teachers they have worked with in the past.

During the hiring process it is made clear to Science Fellows that placement is not guaranteed due to the complexities of scheduling. If the liaisons are unable to place a Science Fellow in a given semester, the student is encouraged to reapply the following semester. Ideally all Classroom Teachers work with two Science Fellows, but we have had instances where we are only able to place one Science Fellow with a Classroom Teacher. We try to avoid this scenario if possible.
Security
All Science Fellows must be complete a criminal records checks (CORI) before being allowed to work in the schools. There is a volunteer coordinator for the public schools that handles this process. Building secretaries are also authorized to accept CORI paperwork. The College Liaisons work directly with the school system’s’ volunteer coordinator to ensure that the Science Fellows come with the correct identification and complete the CORI paperwork before their first session in the classroom.

Paying College Students
Both colleges pay students on a biweekly basis. Students are responsible for logging the hours they spend teaching, preparing, and developing their lessons each week. On average students log 2-5 hours per week. The hours logged by students are reviewed and approved by the staff at the corresponding college. Students are also compensated for any professional development, orientation, or programmatic events they attend.

Transportation
Transportation is an important part of the project. Williams College students are transported by hired drivers, student drivers, the T2L College Liaison, public transportation, and personal vehicles. There is a large amount of coordination to ensure the students get where they need to go at a specific time each week. MCLA differs in that it has “commuter” students, so many of the students have their own cars. In addition, one of the elementary schools is within easy walking distance of MCLA, simplifying transportation management.

Collaborative Time
Time for the undergraduate Science Fellows and Classroom Teachers to collaborate, debrief their teaching experience, and plan for the next lesson are critical to building an effective partnership in the classroom. The documents below help provide structure for this collaborative time. Classroom Teachers are expected to complete and submit a lesson feedback form for to the North Adams District staff members. These are critical in supporting a robust curriculum revision process (see Section V Curriculum below) At the beginning of each semester (fall and spring), we include a two hour planning session for Science Fellows and Classroom Teachers to plan out at least the first few lessons they will teach.

See Appendix IV for PDF of handouts
Lesson Feedback Form
Lesson Planning Advice
Unit Teaching Plan

Managing Materials
Materials management is an enormous part of this project, without the utmost care and attention to materials this program would not function properly. At the beginning of this
program Williams College took the lead on this aspect of the program, during year two North Adams now deals with all the materials and material management as part of their long term plan to develop a science materials management system to better support science instruction in the district.

Each unit that is taught has an accompanying materials bin which needs to be stocked and created prior to the beginning of the unit. Generally each Classroom Teacher receives his/her own bin to work with during the semester. Some larger items (ie. microscopes, large lights, fans) are shared across classrooms within a school building.

North Adams has hired a materials manager whose role is to order and purchase materials, empty, stock, and manage materials from semester to semester. Hiring the materials manager was a great help to the rest of the project staff who previously managed materials. It is important to note that having one person who focuses solely on materials is one reason for the project's success.

Summer Curriculum Development Program

Compensation and Housing
In addition to receiving a $3600 stipend ($10/hour for a 40 hour week for 9 weeks), William College is able to provide low cost room and board for the Science Fellows during the summer that is open to students from both of the colleges. This greatly facilitates the ability of students from beyond the local areas to participate in the summer Science Fellow program.

Classroom Teachers received a stipend of about $900 during year one for an estimated 30 hours of work. In year two, we have decided to hire fewer teachers and pay $2500 for about 80 hours of work. We believe more concentrated teacher input will lead to better integration of Common Core science literacy standards into the units, as well as more
polished units by the end of the summer that require less final editing and polish by T2L program staff before they are ready for publication.

**Location and Daily Schedule**
The daily work of the Science Fellows takes place at Williams College. T2L has a dedicated space for the summer with adequate access to technology, copiers, video equipment, etc. Science Fellows are also free to find their own space on campus to work for parts of their days, but they know that the North Adams Public Schools Science Coordinator, who oversees the summer curriculum development work, will always be available in the central workspace should they have questions.

As noted above, having this on-site adult supervision, a program component we added in year two, greatly increased the quality and quantity of work produced. Each day begins and ends with a full group meeting in which Science Fellows review what was accomplished that day, set goals for the next day, and use each other and the North Adams Science Coordinator as resources to share ideas and receive formative feedback on their work.

In year one, we required the Science Fellows and their Classroom Teacher advisors to meet 5-6 times during their 9-week stint. However, during year two we are going to require twice weekly meetings of two hours (four hours per week) to develop closer collaboration and a higher investment among the Classroom Teachers.

![Image of Science Fellows](image)

**Informal Education Opportunities**
The Science Fellows also have the opportunity to teach during the summer. Williams College has a summer science lab for 5th graders, and the Science Fellows spend one week teaching in that camp under the guidance of the high school science teachers and college faculty who run it.

They also have the opportunity to test out the lessons they are devising in the North Adams Public Schools Summer Science Camp for students in grades 1 to 5. Science Fellows have found this program component particularly helpful, and they may or may not have had any experience teaching science to elementary students of various ages prior to becoming summer Science Fellows developing curriculum.
Section V
Curriculum

Development
The development of the T2L Science Curriculum has taken place each summer as we are working towards creating a set of three units per grade level (K-7) that will cover most of the new NGSS-aligned Massachusetts Science Standards.

We have been using a modified version the the Wiggins & McTighe Understanding by Design unit template to get the planning process started. North Adams Schools curriculum administrators put together the standards, essential understanding (drawn from the NGSS disciplinary core ideas), and write unit-level student learning objectives. Teams of Science Fellows, T2L project staff, and Classroom Teachers work together to develop curriculum during the summer months. The core of the unit development is completed by the Science Fellow in collaboration with the Classroom Teacher.

One of the first tasks of the Science Fellows and Classroom teachers in creating a new science unit is to develop the essential questions for the unit, along with a first draft of the learning plan (i.e. the sequence of lessons that will need to be developed to support the unit-level students learning objectives.) We have found the following book chapter from ASCD a helpful tool in building understanding about what makes a good essential question.

ASCD Resources on Essential Questions

We spend some of our summer professional development focus on the backward design approach to unit development, and specific components of that approach such as the development of essential questions, unpacking the science standards, and the development of student learning objectives. (See Section VI Professional Development below.)
To assist them with backward design, the Science Fellows and Classroom Teachers also have available a bank of questions related to the science standards for their unit that exemplify the types of questions students should be able to answer at the completion of the unit. North Adams Public Schools curriculum administrators put together these sample questions based on our state science exams, and an NGSS-aligned test item bank purchased by the district.

Program staff provide feedback on unit plans before the Science Fellows and Classroom Teachers begin their main work of developing lessons. We encourage them to gather lessons plans and ideas from multiple sources to assist them in their work. One of the documents below lists these resources.

Program staff use the Science Unit Review Protocol below to review the drafts of each unit both during its development and for the final phase of copy editing before publication.

See Appendix V for PDF of handouts
Unit Formatting Template
Resources for Science Curriculum Development
Science Unit Review Criteria

![The 3 Stages of Backward Design](image)

Revisions
As each unit is implemented, Classroom Teachers and Science Fellows discuss how each lesson went and the Classroom Teacher completes a T2L Lesson Feedback Form (see Sections IV Logistics above). In the first year of implementation we tried gathering feedback on lessons during end-of-term meetings with the Classroom Teachers as well as written feedback questionnaires collected after the unit had been taught. We found that this retrospective approach yielded little constructive feedback except from the most conscientious teachers. We now collect the individual Lesson Feedback Forms once or twice during the semester as each unit is being taught.
Program staff review these feedback sheets and develop a detailed list of changes to be made to improve each unit. Not all changes teachers suggest are implemented. Program staff, and especially the T2L staff from the North Adams Schools, thoroughly analyze teachers’ suggestions to ensure that they align with the standards, maintain the integrity of the unit objectives, and would be helpful to the Science Fellows and Classroom Teachers who will implement the unit in the future (i.e. that they are not idiosyncratic to a particular classroom or teaching style).

During the summer curriculum development program, the first task for the summer Science Fellows is to revise the units taught the previous year based on the revision tasks outlined by the T2L program staff. This enables the Science Fellows, who may or may not be familiar with the T2L unit structure and expectations, to work through a completed unit and develop a sense of what they will need to do when they begin to create new units from scratch. Below is an example of one of the revision plans T2L staff provided to the summer Science Fellows to guide their revision work.

See Appendix V for PDF of handout
T2L Grade 4 Weathering and Erosion Task List

Curriculum Units
The files below are the units we have completed thus far. We will be adding to this section each summer as we complete new units. You can access additional units that we have developed and implemented, but that have not yet undergone our revision process at the North Adams Public School Website.

It should be noted that in January of 2016 Massachusetts adopted new Science and Technology Standards which are based on, but not identical to, the NGSS standards. Any standards in the units that have an “MA” after them have been added to the NGSS by Massachusetts. Other standards are identical to NGSS standards, sharing the same
numbering system. Not all NGSS standards are included in the Massachusetts standards. Some units may also contain italicized science standards. These are the “old” (pre-NGSS) Massachusetts science standards. Our state science tests have not yet transitioned to the new Massachusetts science standards, so we are advising teachers to address the old standards as well when they are related to the new NGSS-aligned standards.

The units contain references to Massachusetts’ Standards for Literacy in History/Social Studies, Science, and Technical Subjects which are derived from the national Common Core Standards. Most of the T2L units contain science literacy lessons, and/or incorporate literacy standards into individual lesson activities. Especially for elementary generalist teachers, we have found that teaching integrated units of science and literacy makes it much more likely that science curriculum is delivered.

Finally you will see in some units references to tiered vocabulary and language objectives. We are slowing trying to build examples of these supports for building academic language skills into our T2L units. These supports benefit not only our English-language learners, but all students with significant language deficits (e.g. many of our students from low income families).
Section VI
Professional Development

For curriculum development
We have modified the professional development we provided for the summer Science Fellows and Classroom Teachers during each of the two summers we have done this work thus far, and are planning to modify it once again for Summer 2016. The lessons we have learned are that professional development to prepare Fellows and Teachers to do the curriculum development work is best delivered in small chunks, focused on specific tasks at hand, with collaborative work time in between to practice the skills they have just learned. The most useful topics, PD instructor outlines, and handouts we have developed are below.

See Appendix VI for PDF of handouts
T2L Essential Questions Guidance
Unpacking the Standards to Create Student Learning Objectives

For Science Teaching
In our first year we ran an orientation session for all Science Fellows and Classroom Teachers to introduce the T2L program, its goals and expectations, and review program logistics and the units that would be taught. As the program has developed, we have left the “general program overview and logistics” portions of this meeting for project staff to do individually or in small groups with new Fellows and Classroom Teachers. Most Classroom Teachers and about half of Science Fellows return for subsequent semesters.

At the beginning of each semester we provide a one and one-half to two hours guided planning session for Science Fellows and Classroom Teachers to review together the curriculum units with program staff, and begin detailed planning for their first few lessons. See documents under “Collaborative Time” in Section IV Logistics above.
Over the two years of the project thus far, we have offered a number of two-hour joint professional development workshops for Science Fellows and Classroom Teachers with the goal of building capacity to teach science using best-practice techniques, and purposefully building elementary students capacity to engage in the eight NGSS scientific practices. Topics and relevant materials are listed below.

**See Appendix VI for PDF of handouts**

**Using Science Journals:**
Science Journal PD Powerpoint
Classroom Teacher Science Journal PD Agenda
Types of Science Journal Entries Tally Sheet

**Scientific Modeling:**
Scientific Modeling PD Powerpoint
Scientific Modeling PD Exit Ticket
Scientific Modeling PD Follow up

**Science Talk:**
TERC Productive Discussions Hand Out
TERC Talk Science Primer
Section VII
Making it Work in the Classroom

Role Clarity
To have a successful partnership in the classroom it is important to make sure Classroom Teachers and Science Fellows have clarity about their roles. We created the document below outlining their roles to help provide this clarity.

See Appendix VI for PDF of handout
Science Fellow and Teacher Roles and Responsibilities

Observations and Feedback
During each semester, every Science Fellow/Classroom Teacher team is observed at least one time by a member of the project team. These observations give the project team insights about the dynamic between the Science Fellows/Classroom Teachers, if the curriculum is being successfully implemented, and how the elementary students are reacting to the unit. These observations are essential to inform the project staff about what is actually happening on the ground.

We encourage Science Fellows and Classroom Teachers to provide any of the project staff with feedback. As a part of the collaborative time between the Science Fellows and Classroom Teachers, Classroom Teachers complete and submit a lesson feedback form to the North Adams district staff members. The feedback provided is essential and is used to identify areas of the curriculum that need revision.

Space in the Classroom
In order for a lesson to be successful it is important to make sure the classroom will meet the needs of the lesson. For many of the lessons taught, a large amount of open space is required.
If teachers don’t have enough space in their classroom we encourage them to use the gymnasium, auditorium, or a place outside.

We encourage Classroom Teachers and Science Fellows to do a “tech check” before the lesson. This means checking to make sure they have enough electrical outlets, setting up projectors and computers prior to the start of the lesson, and bookmarking or preloading videos to ensure they will run smoothly.
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Section VIII
Financing

As noted above, the Teach to Learn project is currently being funding by a combination of in-kind support from the three partner institutions and a grant from the National Science Foundation (Grant # 1432591).

The institutions provide staff time; work and meeting space; access to office supplies and support (such as reproduction of materials); payroll, ordering, and account payable services; and transportation costs to get Science Fellows to the schools. We are currently working on a detailed cost accounting of the value of these contributions.

The NSF grant pays for the two half-time College Liaisons (who earn between $22 and $25 per hour), the Science Fellows (who earn around $10 per hour), stipends for the Classroom Teachers (currently $800 for school year participation), and $10,000 per year to purchase science supplies.

Our plan is to build sustainability for these ongoing costs by accessing college work study, America Reads and America Counts funding to support the Science Fellows, and to work with our respective institutions to build into the regular budget the ongoing staff costs that are currently covered by the grant.

The summer costs we currently incur in relation to curriculum development will cease after the grant period as we will have completed all the unit development and revision work by the end of this four-year project.
Section IX
Other Institutional Resources

This program is continuously growing and the demands of the project cannot always be fulfilled by the project staff. Each partner relies on other institutional resources to help the program flourish. Some of the outside resources we’ve utilized are listed below:

**MCLA and Williams**
- Faculty members and administrators: Offer their expertise and support
- HR Office: Assist with student employment and pay
- IRB Office: Assist with research components of the project
- Office of Student Life: Assist with advertising and general program support
- Controller’s Office: Assist with money management, student pay, research, and general program support
- Hired Drivers: Transport students to and from the schools in which they are teaching
- Williams Students: Assist with transportation, bin stocking, research, and curriculum revisions
- Williamstown Rural Lands Foundation: Provides a field trip destination for classes associated with the program
Section X

Research

The National Science Foundation funding for this project is predicated on its import as a research project exploring the impact of participation in informal science education (i.e. curriculum development and teaching) on college undergraduates. In particular we are examining the impact of the T2L experience on undergraduates’ understanding of the nature of science, their ability to explain science concepts to a lay audience, on the likelihood that they will take science courses, choose to major in science, or stick with a science major through graduation.

In addition we have secondary research questions regarding the impact of the program on elementary classroom teachers and on elementary students.

The various survey instruments we use to collect data from our Science Fellows, Classroom Teachers, and elementary students are below:

See Appendix X for PDF of handouts
Science Fellow Survey
Science Fellow Questionnaire, School Year
Classroom Teacher Survey
Classroom Teacher Questionnaire, School Year
Elementary Student MATSI Survey