Chapter 5: The UTeach Instructional Program

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Student Assessment

The UTeach Instructional Program allows students to major in a STEM field of interest while simultaneously obtaining secondary teacher certification within four years. Though the program is streamlined, the curriculum is rigorous and specifically designed for future math and science teachers.

This chapter provides an overview of the UTeach curriculum, explains the instructional program elements that are essential to the success of the program, and provides individual course descriptions, which include rationale and objectives, core components, instructional emphasis, methods of assessment, and organizational topics for online resources.

Instructional Program Elements

The UTeach program offers a streamlined, field-intensive curriculum that is firmly situated within the domains of math and science. The instructional program elements are:

- *compact and flexible degree plans* that fully integrate students' STEM content major requirements and UTeach program requirements and allow students to obtain secondary STEM teaching certification while earning degrees in science, computer science, engineering, or mathematics within four years;

- *rigorous research-based instruction* designed to develop deep understanding of content of particular importance to future secondary STEM teachers and build strong connections between mathematics and science and between educational theory and practice;

- *early and intensive field experiences* that provide a carefully scaffolded sequence of intensive teaching opportunities beginning in the first semester of the program and continuing throughout; and

This chapter is part of the UTeach Operations Manual. The full manual is available on the UTeach Institute members-only website for partner programs: [https://www.utexas.edu/uteach-institute](https://www.utexas.edu/uteach-institute). [January 21, 2014]
• dedicated master teachers who, as clinical faculty, collaborate with faculty to teach courses, manage field experiences, and offer UTeach students continuous constructive feedback and support as they progress through the program.

These elements inform both the design of individual UTeach courses and the development of the program’s entire instructional framework.

Compact and Flexible Degree Plans

To make the prospect of a teaching career more attractive to strong STEM degree majors, UTeach program developers placed a high priority on integrating certification requirements into compact, four-year STEM degree plans. By reducing the number of required education courses and eliminating a small number of upper-division content courses, UTeach-based programs offer bachelor of science degrees with a Teaching Option, with majors in biology, chemistry, physics, mathematics, computer science, or engineering, ranging from 120 to 126 credit hours. In addition to the reduced commitment of time and the associated financial savings, having teaching certification as a component of a STEM degree has several distinct advantages:

• Students, as well as their parents and others influential in their decision-making, usually view teacher certification as a significant added benefit to the degree. Because all Teaching Option degree plans maintain rigorous coursework in the STEM major, UTeach students are prepared for graduate school or a STEM career should they choose it. At the same time, they gain an additional valuable career option in teaching.

• Most sources of financial aid, even loan programs, require that all courses being paid for count toward the degree itself. For students using VA benefits, for example, the scholarship would not fund hours for teacher certification as an additional course of study. Having certification requirements met within a STEM degree plan thus allows students who wish to teach a way of maximizing their use of financial aid.

• Keeping the Teaching Option within the various mathematics and science departments reassures those departments with typically small enrollments that not only will the UTeach program not cause their student populations to decrease, it has the potential to attract more students to the major.

Creating a Teaching Option within four-year STEM degree plans makes teaching a more attractive and viable option for a wide range of students and helps create buy-in from STEM department heads and faculty who may not have previously promoted teaching as a career option. Such support is essential, given that UTeach curriculum development and course implementation are highly collaborative, ongoing processes. (For examples of degree plans offered by UTeach Austin and universities replicating the program, visit the UTeach Members Website: https://www.utexas.edu/uteach-institute.)

Efficient Course Design

Most UTeach degree plans require only 17 hours of UTeach coursework prior to students’ final practicum, Apprentice Teaching. One way this was accomplished was by carefully designing courses to fulfill multiple university and state degree requirements. The University of Texas at Austin, for example, requires all students to take two courses designated as having a substantial writing component, and the
UTeach Research Methods and Perspectives on Science and Mathematics courses are both approved for this requirement. The Perspectives course also satisfies a university requirement that students take a course in fine arts or the humanities. Thus, one course is able to fulfill three degree requirements. Most partner programs have found similar ways to efficiently use UTeach courses in this manner.

Compact degree plans are also made possible by integrating STEM content and pedagogy—including a number of relevant themes such as assessment, technology, and equity and special populations—in every UTeach course. In addition, UTeach courses strategically build upon each other throughout the program, and field experiences are carefully coordinated with classroom content. This means that UTeach instructors must adopt a programmatic perspective and continually strive to understand how the individual courses they teach are situated within the larger instructional program, including the field component.

More about the design of courses and field experiences is covered later in this chapter.

**Providing Flexible Entry Points**

UTeach degree plans also offer the advantage of flexibility with respect to when students may enter the program and take required courses. This is particularly attractive to STEM majors who make the decision to teach later in their undergraduate education and yet want to stay on track for a timely graduation. UTeach provides a post-baccalaureate pathway that allows these students to complete the program in as few as three semesters.

Figure 5.1 illustrates how multiple points of entry into the UTeach curriculum can accommodate students at different points in their undergraduate career.

**Figure 5.1: Flexible Entry Points**
Advising Students

Due to the flexibility and compact nature of the UTeach program, the importance of advising students so that they can graduate on time cannot be overstated. Everyone who has contact with students needs to maintain ongoing communication so that everyone knows where to send students and what to tell them. This recommendation applies not just to advisors, but also to master teachers, faculty, and even administrative staff who are at the frontline in answering students’ requests for information.

Enforcing UTeach advising bars each semester permits advisors to monitor all aspects of a student’s progress in fulfilling his or her degree plan and maintaining an acceptable GPA.

Rigorous, Research-Based Instruction

The unique approach to instruction is at the heart of the UTeach program model. As a whole, the UTeach instructional program is designed to foster a deep understanding of content of most relevance to future secondary STEM teachers and to build strong connections between educational theory and professional practice.

Rigorous learning outcomes are aligned with national, state, and program standards. Evidence of student proficiency is measured throughout the program using standardized assessments, including a final portfolio of student work and a field teaching evaluation. In order to be recommended for certification, students are required to demonstrate competency across domains ranging from STEM content knowledge to equitable instruction and professional responsibility.

Course Design Principles

To meet the commitment to maximize the quality and relevance of every course, developers worked from two course design principles: (1) integrate content and pedagogy, and (2) connect theory and practice.

Integrate content and pedagogy

Course content and instruction are firmly based on current STEM and STEM education research. UTeach faculty are expected to remain active in areas of inquiry most relevant to their respective teaching assignments, including the development of STEM field knowledge, the history and philosophy of science and mathematics, and domain-specific student learning.

Education courses center around domain-specific content appropriate to future secondary STEM teachers. In turn, content courses that count toward the degree major (e.g., Research Methods, Functions and Modeling) incorporate relevant pedagogical knowledge and insights. Courses are tightly articulated to encourage a thorough synthesis of content and pedagogical knowledge.

Though originally conceived as a means of efficient program design, the integration of STEM content- and discipline-specific pedagogy throughout the UTeach curriculum has greatly enhanced the value of the entire program. In every course, instruction emphasizes the underlying connections between mathematics and science, as well as among the sciences, while making explicit what research implies about the similarities and differences in how each is taught and learned. Furthermore, students from the various STEM majors take UTeach courses together and are encouraged to collaborate whenever possible.
The integration of content and pedagogy includes attention to several important instructional themes. Rather than address assessment, equity, and technology in stand-alone courses, students are continually engaged in these topics in every UTeach course. Besides contributing to a more streamlined curriculum, integration of these topics has the added benefit of strengthening students’ understanding of their relevance to the primary content of each course and their capacity to utilize them effectively in their professional practice.

**Connect Theory and Practice**

Education courses emphasize that learning theory consistently provides the basis for lesson planning and decisions teachers make about their professional practice. Classroom observations and carefully scaffolded teaching experiences give students the opportunity to implement and reflect on the instructional strategies they are learning.

It is important to review UTeach courses and curriculum on an ongoing basis to ensure course alignment, minimize redundant assignments, identify gaps, and ensure compliance with state requirements and national guidelines. In addition, to maintain a leading edge in instruction, pedagogical courses often need to be updated according to current learning research. Strong partnerships exist between the College of Natural Sciences, the College of Education, and the College of Liberal Arts, and among faculty within the colleges. Consistent attention should be paid to strengthening these partnerships.

**The UTeach Curriculum**

The UTeach curriculum consists of a sequence of tightly articulated courses. Comprising just 24 to 27 total credit hours, the UTeach curriculum was designed with the philosophy that the combination of relevant content, intensive teaching opportunities, and extensive individualized coaching will develop students’ knowledge and skills at an accelerated rate. Rather than offer stand-alone courses, important topics, including instructional technology, assessment, and equity and special populations, are embedded in all UTeach courses.

The UTeach course sequence, pictured in Figure 5.2, includes the following groups of courses:

- **UTeach Recruitment Courses** (colored orange in the figure): These courses are designed to encourage STEM majors to “try out teaching.” Step 1: Inquiry Approaches to Teaching and Step 2: Inquiry-Based Lesson Design are one-hour courses that include authentic teaching experiences in local schools. These courses, offered with tuition rebates, emphasize thoughtful design of inquiry-based lessons and are taught by master teachers.

- **UTeach STEM Education Courses** (blue): These courses are based on current research in teaching and learning specifically within the STEM domains. Knowing and Learning in Mathematics and Science, Classroom Interactions, and Project-Based Instruction are all taught by science and mathematics education faculty.

- **UTeach STEM Content Courses** (green): These courses are generally taken concurrently with STEM education courses and are designed to fulfill multiple degree requirements while emphasizing content of particular importance to secondary math and science teachers. Functions and Modeling, Research Methods, and Perspectives on Science and Mathematics are taught by research faculty from either the College of Science or the College of Liberal Arts.
Apprentice Teaching (purple): This course consists of a semester-long teaching experience and a seminar that provides a culminating opportunity for students to demonstrate proficiencies required for certification and acquire the experience and confidence needed for their first teaching positions.

Portfolio (gray): Students provide evidence through the portfolio that they are proficient across a number of criteria ranging from subject-matter knowledge to effective instructional design and classroom management. Along with proficiencies required during the final Apprentice Teaching experience, this collection of evidence must satisfy minimum criteria in order for a student to be eligible for certification. A preliminary portfolio requires students to satisfactorily address a subset of the final portfolio criteria in order to be admitted into Apprentice Teaching.

Figure 5.2: Curriculum Snapshot

See Table 5.2 at the end of this chapter for a table summarizing the UTeach course sequence.
Early and Intensive Field Experiences

To help develop UTeach students' confidence and skills in the classroom, course content and in-class instruction are accompanied by authentic teaching assignments in local schools where students are closely supported as they implement the instructional strategies about which they are learning.

UTeach field experiences are designed so that time in the classroom is purposeful. Significant time is devoted to preparing for, debriefing, and reflecting on students' actual teaching experiences to help them integrate their learning, develop confidence, and develop clearly identified proficiencies. Master teachers and classroom-based mentor teachers provide feedback during lesson development. Further feedback is provided when lessons are practiced in class prior to being taught in the field. During field teaching, students are observed by course instructors, UTeach master teachers, and their mentor teacher, all of whom provide written feedback. Throughout the course of field teaching, students are formally observed a minimum of 18 times. While limited, purposeful classroom observations are a component of the field experience, 80% of student time in the field is devoted to teaching lessons. Additionally, in all field-based courses, there is significant emphasis on peer review and individual student reflection throughout all phases of lesson planning and implementation.

Field experiences are introduced early, in Step 1, where students develop and implement three inquiry-based lessons with elementary learners. The focus on the development and implementation of inquiry-based lessons continues throughout the program. During Step 2, students develop and implement three lessons in a middle school classroom. Students have their first high school teaching experience during Classroom Interactions, where they develop and implement multi-day, connected lessons. These lessons are videotaped and student analysis of their teaching is a major component of the course. When students progress to Project-Based Instruction, they implement multi-day, connected problem-based lessons in a secondary setting that culminate in an out-of-school, field-based student investigation. Even in the required history course, Perspectives on Science and Mathematics, a percentage of the course is devoted to the development and analysis of lessons that incorporate historical content.

In total, UTeach students complete approximately 40 hours of field experience leading up to a semester-long immersion experience made up of roughly 280 hours of closely supervised teaching designed to synthesize all they have learned about inquiry-based lesson design, formal and informal assessment, and addressing the needs of diverse learners. During Apprentice Teaching, students spend 20 hours observing classrooms and orienting themselves to the school before they are expected to assume full responsibility for a minimum of two courses for a full 12 weeks. While the total UTeach field hours of approximately 320 hours may be fewer than the number customary in teacher preparation programs or required by the state, the intensive and highly-supported design makes for a very high-quality experience for students. (See Table 5.1.)
Table 5.1: Field Experience Hours in UTeach Austin

<table>
<thead>
<tr>
<th>UTeach Course</th>
<th>Observation Hours (approx.)</th>
<th>Teaching Hours (approx.)</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1: Inquiry Approaches to Teaching</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Step 2: Inquiry-Based Lesson Planning</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Classroom Interactions</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Project-Based Instruction</td>
<td>4</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>Apprentice Teaching</td>
<td>20</td>
<td>260</td>
<td>280</td>
</tr>
<tr>
<td><strong>Total Field Experience Hours</strong></td>
<td></td>
<td></td>
<td><strong>320</strong></td>
</tr>
</tbody>
</table>

**Dedicated Master Teachers**

The active involvement of master teachers is a unique feature of UTeach that is critical to student success. These experienced, successful secondary classroom teachers, hired as clinical faculty, participate in multiple aspects of the program, and their role in implementing curriculum deserves special attention. Having a dedicated team of former secondary teachers to teach introductory classes, supervise field experiences, and track students’ progress has proven to be one of the most important elements in the success of UTeach.

**Continuous Coaching and Support**

To optimize the value of the UTeach field experiences, UTeach has developed a comprehensive approach to supporting students’ development and success. All along the way, students are provided guidance and constructive feedback.

Master teachers provide students with their first introduction to teaching as instructors of the first two UTeach courses, Step 1 and Step 2, and they are the last ones to work with students during their intensive Apprentice Teaching experience. They are formally involved in coordinating the field component of additional UTeach courses (Classroom Interactions and Project-Based Instruction) and are continuously involved informally in all other courses as a source of support for students and as a resource for how students can apply what is being learned to their classroom practice.

Master teachers provide ongoing intensive coaching and support to students as they progress through the program. Being easily accessible at all times, master teachers constitute the backbone of support for students as they progress through the program. (For more about the role of master teachers, see Chapter 3.)

**Mentor Teachers**

Mentor teachers, in whose classrooms UTeach students work, are skilled educators who receive special training each semester on their role as mentors and are paid for their participation. Working with dedicated mentor teachers gives UTeach students the ideal opportunity to integrate pedagogic theory with practice as they experience the realities of working in a classroom environment.
Because field assignments are so tightly linked to UTeach course content, the specific roles and responsibilities of mentor teachers vary. Generally, however, mentor teachers suggest topics for lessons, review lesson plans prior to their presentation, and provide verbal and written feedback to UTeach students upon the completion of each lesson. They also complete individual evaluations at the end of each teacher experience.

Mentors who host students during their Apprentice Teaching semester are responsible for reviewing proposed lesson plans each week to see that they are coordinated with the curriculum and otherwise appropriate, as well as for providing guidance in other aspects of classroom management. Apprentice teacher mentors also complete four formal observations and work as needed with the university supervisor assigned to the student. (For more about the role of mentor teachers see Chapter 3.)

**After Graduation**

UTeach not only prepares its students to be good teachers, but it also supports them after they graduate and are working in classrooms. The UTeach induction program is designed to support new teachers during the first few crucial years, and the National UTeach Alumni Network will support them throughout their entire careers. See Chapter 6 for more information about these topics.

**Course Descriptions**

This section provides detailed descriptions of all UTeach courses. For the purpose of replication, UTeach courses are expected to incorporate the Course Design Principles described above. Course fidelity is gauged by the degree to which each course meets the unique Core Components and Course Objectives for that course. UTeach replication does not demand that courses be implemented exactly as they are documented, but it does require adherence to these foundational elements.
**Step 1: Inquiry Approaches to Teaching**

Step 1 allows students to explore teaching science, mathematics, computer science, or engineering as a career at no cost. The course instructors, typically master teachers—clinical faculty employed by the university with extensive, exemplary K-12 teaching experience—introduce students to the theory and practice behind excellent inquiry-based science and mathematics instruction; guide them through the process of designing and preparing to teach lessons in elementary classrooms; and assess their progress toward course objectives.

Master teachers provide students direct exposure to people who love teaching and view it as a rewarding career choice. Mentor teachers at the low-socioeconomic schools where students practice demonstrate effective teaching techniques and classroom management skills and provide thoughtful feedback and coaching to give future teachers a true taste of working in a supportive, diverse educational setting.

In Step 1, students teach science or mathematics lessons in local, high-need elementary classrooms and obtain firsthand experience with planning and implementing inquiry-based curricula.

The master teachers introduce students to the theory and practice behind excellent inquiry-based science and mathematics instruction, guide them through the process of designing and preparing to teach lessons, and assess their progress toward course objectives.

Mentor teachers at the low-socioeconomic schools where the students practice demonstrate effective teaching techniques and classroom management skills and provide thoughtful feedback and coaching to give the future teachers a true taste of working in a supportive, diverse educational setting.

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**Step 1 Course Core Components**

The course is taught by master teachers—experienced, successful classroom teachers who have joined the university faculty.

Students observe exemplary teachers and obtain field experience planning and teaching three mathematics or science lessons in local elementary schools with diverse student populations.

Students receive mentoring from high-quality classroom teachers, as well as instructor feedback based on field observations.

The course emphasizes using the 5E Instructional Model.

Key instructional approaches include classroom discussion, lesson demonstration, student reflection, collaboration, and peer coaching.
Course Objectives
Students will be able to . . .

• demonstrate science or mathematics content knowledge in the planning and teaching of three upper-elementary-grade lessons.

• utilize exemplary sources of inquiry-based science or mathematics lessons.

• write performance objectives aligned with national and state standards and assessments of those objectives for each lesson.

• design and teach inquiry-based lessons using the 5E Instructional Model.

• demonstrate awareness of personality and learning differences and discuss the implications for teaching and learning.

• use probing questions to elicit feedback to determine students’ acquisition of knowledge.

• discuss strategies for achieving instructional equity.

• demonstrate proficiency in the use of technology for professional productivity purposes.

• plan for and implement safe classroom practices.

• reflect on personal interest in teaching.

Instructional Emphasis
In this course, students focus on lesson preparation and practice, as well as on thoughtful reflection on their classroom observations and teaching experiences. Step 1 instruction emphasizes inquiry-based learning using the BSCS 5E Instructional Model, developed in the late 1980s by the BSCS Center for Curriculum Development. Useful information about this model can be found in a report, *The BSCS 5E Instructional Model*, available at http://www.bscs.org/bscs-5e-instructional-model.

See About Inquiry Approaches to Teaching in the Step 1 Course Resources on the UTeach Institute Members Website for more information on inquiry and the 5E Instructional Model.

Working in pairs (or occasionally alone or in triads, depending on scheduling), students choose three science or mathematics lessons from modules developed with the support of the National Science Foundation. They then develop the lessons further using the 5E model. Students submit drafts of their lesson plans electronically to their master teacher, who provides suggestions for improvement or redevelopment as needed. Students provide final copies of their lesson plans to the mentor teacher at the elementary school where they will be teaching. The mentor teacher observes the lesson being taught and provides written feedback to each student or pair/triad of students to help them improve as the semester progresses.

Demonstration lessons led by instructors, as well as science or mathematics lessons adapted by students, are carefully selected to serve a number of purposes. They should not only model best
instructional practices, but also address relevant national, state, or local science and mathematics standards. Additionally, consideration should be given to the lesson source. Lessons should be identified that are research-based, endorsed by leading science and/or mathematics organizations, and that are “tried and true”—having been taught repeatedly, by a number of instructors and with a variety of students. It is critical that during this early introduction to teaching, students are exposed to exemplary mathematics and science curriculum, activities, and lessons. At The University of Texas at Austin, curricula include FOSS and GEMS kits, for example.

**Assessment**

Students’ approved lesson plans, teaching experiences, and written reflections are the basis for assessing performance and account for nearly 60% of the course grade. Class participation is crucial in Step 1, so a rigorous attendance policy is enforced and attendance is a grading component of the course.

Although the mentor teacher feedback provided after each lesson is critically important to students, this information is not used as performance assessment. Master teachers evaluate students’ lesson planning skills through review of submitted lesson plans, taking into account improvement in response to feedback. Master teachers also observe and evaluate each team of students during one of their lessons.

Mentor teachers are required to submit a final student evaluation form. While this final evaluation is not used as a basis for grading, it does provide valuable feedback both to master teachers and students. The final student evaluation represents a subset of the competencies detailed in the Teacher Development Rubric (TDR). The TDR is the final field-evaluation instrument used during the Apprentice Teaching experience. Portions of the instrument are used in the Step 1 and 2, Classroom Interactions, and Project-Based Instruction courses. On the Members Website, see the documents Lesson Feedback Form, Final Student Evaluation Form, Teacher Development Rubric (TDR) and the Course Syllabus in the Course Resources section for more information on how students are assessed.

**Course Topics and Resources on the UTeach Institute Members Website**

Resources for Step 1 are organized by Course Topics and are available on the UTeach Institute Members Website (https://www.utexas.edu/uteach-institute). Topics for this course are as follows:

- Course Overview
- Teaching and Reflecting on Lessons
- Preparing 5E Lesson Plans
- Meeting the Needs of Diverse Learners
- Classroom Management
- Cooperative Learning
- Assessment of Learning
Step 2: Inquiry-Based Lesson Design

Step 2: Inquiry-Based Lesson Design is the second recruitment course in the UTeach professional development sequence. This course provides students with middle school experience using lessons they have written based on district curriculum. As with Step 1, Step 2 is offered at no cost to students in order to get them to “try out” teaching. The course is taught by master teachers—non-tenured clinical faculty with exemplary secondary classroom teaching experience—who work closely with students as they develop inquiry-based (5E) lessons using research-based, recognized curricula and materials.

In Step 2, students continue developing the lesson planning skills they learned in Step 1 as they become familiar with exemplary middle school mathematics and science curricula. After observing a lesson being taught in a local school district classroom, students work alone or in pairs to plan and teach three inquiry-based lessons to sixth-, seventh-, or eighth-graders.

Middle school classrooms are selected both for the diversity of the student body and the quality of the classroom teachers, who serve as mentors for the Step 2 students assigned to them. By the end of Step 2, students are usually able to make a decision about whether to pursue teacher certification through the UTeach program. Historically, a significant number of those who have continued have ended up teaching in the middle grades as a result of their positive experiences in this course.

Step 2
Course Core Components

The course is taught by master teachers—experienced, successful classroom teachers who have joined the UTeach faculty.

Students observe exemplary teachers and obtain field experience planning and teaching three mathematics or science lessons in local middle schools with diverse student populations.

Students receive mentoring from high-quality classroom teachers, as well as instructor feedback based on field observations.

The course emphasizes the 5E Instructional Model, aligning lessons to district curriculum, attributes of adolescent students, utilization of technology by teachers and students, and formal and informal methods of assessment.

Key instructional approaches include classroom discussion, lesson demonstration, student reflection, collaboration, and peer coaching.
**Course Objectives**

Students will be able to . . .

- demonstrate science or mathematics content knowledge in the design and teaching of middle school lessons aligned with district curriculum.

- utilize exemplary sources of inquiry-based science or mathematics lessons.

- identify the unique attributes of adolescent students and implement teaching strategies that are effective in the middle school environment.

- design and teach inquiry-based lessons using the 5E Instructional Model.

- plan for and implement safe classroom practices.

- discuss strategies for achieving instructional equity.

- design and teach lessons that incorporate the use of technology.

- use probing questions to elicit feedback on students’ acquisition of knowledge.

- use pre- and post-assessments aligned to performance objectives to evaluate student learning, to provide instructive feedback to middle school students, and as a basis for revising lesson plans.

- provide instructive feedback to peers.

- reflect on teaching experiences to revise lesson plans.

- assess commitment to pursue teaching as a career path.

**Instructional Emphasis**

The Step 2 course emphasizes writing high-quality 5E lesson plans with a focus on the importance of using appropriate questioning strategies throughout the lesson. Students discuss the unique attributes of adolescent students and strategies for teaching in the middle school environment. They learn to align lesson plans to district curriculum and how to develop and administer pre- and post-assessment instruments. For their final product, students analyze and modify one of the lessons they taught, taking into account the results of the assessments, their reflection on how successful the lesson was, and feedback from their mentor teacher and the course instructor who observed the lesson.

The classroom mentor teachers provide Step 2 students with the topics and mathematics or science concepts they should incorporate into each of their three lessons. At least one of the lessons incorporates the use of technology. The class sessions provide students with the opportunity to work with instructors and teaching assistants in preparing to use equipment to teach lessons, organizing teaching materials, and practicing instruction. They are required to practice the lesson activities and to present portions of their lessons to their peers before they receive approval to go out and teach the lessons.
Demonstration lessons led by instructors, as well as instructional materials made available for students to adapt their own lessons, are carefully selected to serve a number of purposes. They should not only model best instructional practices, but also address relevant national, state, or local mathematics or science standards. Additionally, consideration should be given to the lesson source. Use lessons that are research-based; endorsed by leading mathematics and science organizations; and that are “tried and true”—having been taught repeatedly, by a number of instructors, and with a variety of students. It is critical that during this early introduction to teaching, students are exposed to exemplary mathematics and science curricula, activities, and lessons.

As the semester progresses, the classroom mentor teacher and the master teacher provide intensive coaching that enables Step 2 students to improve their teaching skills. The mentor teacher remains in the classroom at all times and provides immediate feedback on lessons. The master teacher observes and provides feedback on aspects of the instruction for a minimum of one lesson. Students reflect, in writing, on each of their classroom experiences by answering given questions or responding to given prompts.

**Assessment**

Students’ approved lesson plans, completion of field requirements, and written reflections on their teaching experiences are the basis for assessing performance and should account for the majority of the course grade. Because attendance at each class session is vital to students’ success in the course, a large portion of the course grade should be determined by class attendance and participation.

Although the mentor teacher feedback provided after each lesson is critically important to students, this information is not used as performance assessment. Master teachers evaluate students’ lesson planning skills through review of submitted lesson plans, taking into account improvement in response to feedback. Master teachers also observe and evaluate each team of students during at least one of their lessons.

Mentor teachers are required to submit a final student evaluation form. While this final evaluation is not used as a basis for grading, it does provide valuable feedback both to master teachers and students. The final student evaluation represents a subset of the competencies detailed in the Teacher Development Rubric (TDR). The TDR is the final field-evaluation instrument used during the Apprentice Teaching experience. Portions of the instrument are used in the Step 1 and 2, Classroom Interactions, and Project-Based Instruction courses. See the Course Resources, Lesson Feedback Form, Final Student Evaluation Form, Teacher Development Rubric (TDR) and the Course Syllabus, for more information on how students are assessed.

**Course Topics and Resources on the UTeach Institute Members Website**

Resources for Step 2 are organized by Course Topics and are available on the UTeach Institute Members Website ([https://www.utexas.edu/uteach-institute](https://www.utexas.edu/uteach-institute)). Topics for this course are as follows:

- Course Overview
- Preparing 5E Lesson Plans
- Using Data to Revise Lesson Plans
• Focus on Explanation
• Integrating Math and Science
• Questioning Strategies
• Understanding and Managing Adolescents
• Technology and Inquiry
Step 1 and 2 Combo Course

The Step 1 and 2 Combo course combines the Step 1 and Step 2 experiences into a single course for select students. This two-credit course is primarily designed for post-baccalaureates who are interested in teacher certification, but it can also be taken with special permission by college juniors or seniors who come to UTeach later than usual. The course is extremely fast-paced and time-intensive and should not be offered to freshmen and sophomores.
Knowing and Learning in Mathematics and Science

The goal of this course is for students to construct the model of knowing and learning that they will take with them into their classroom. This course focuses on issues of what it means to know and learn science and mathematics, and students develop a powerful toolkit of relevant approaches. What are the standards for knowing that we will use? How are knowing and learning structured, and how does what we know change and develop? For the science and mathematics educator, what are the tensions between general, cross-disciplinary characterizations of knowing (e.g., intelligence) and the specifics of coming to understand powerful ideas in mathematics and science?

The Knowing and Learning course was developed as a significant alternative to the educational psychology courses typically included in traditional teacher certification programs. While these traditional courses aim to contribute to teacher education by focusing on concepts and strategies assumed to be generally applicable across disciplines and age groups, this course focuses on knowing and learning in secondary mathematics and science, resting on the premise that formal research in these disciplines now constitutes a robust line of inquiry and design of its own. This line of inquiry has tended to be situated relative to classroom practice and draws on significant insights from many fields, including psychology, anthropology, critical literacy, sociology, biology, linguistics, neuroscience, philosophy, developmental theory, artificial intelligence, and the domains of mathematics, science, and computer science. Some now call this integration of domains a learning science perspective.

Knowing and Learning in Mathematics and Science
Course Core Components

The course is taught by faculty who are actively engaged in research in mathematics and science education.

The course focuses on knowing and learning specifically within the context of mathematics and science.

Students analyze domain-specific problem-solving activities and approaches in an applied fashion, such as through the clinical interview process.

Students explore the implications of individual and social learning theories on the design of learning environments within classrooms and within the context of larger social justice issues.

Course activities and instruction model the use of technologies to support knowing and learning in mathematics and science.

Key instructional practices include modeling effective direct-teaching and questioning strategies, interactive discussion, collaborative group tasks, and formative and/or summative assessment of student learning of skills, knowledge, and understanding.
**Essential Questions**

- What does it mean to know something?
- What does it mean to learn something?
- How can we understand what students are thinking?
- What are the links between knowing and developing in learning theory, and the content and evolution of mathematical and scientific ideas?
- What are the connections between kinds of assessments and theories of knowing and learning?
- For the science and mathematics educator, what are the tensions between general, cross-disciplinary characterizations of knowing (e.g., intelligence) and the specifics of coming to understand powerful ideas in mathematics and science?
- How are various uses of technology associated with specific approaches to learning?

**Course Objectives**

Students will be able to . . .

- construct models of knowing and learning to guide classroom practice.
- use the clinical interview method to make sense of someone's reasoning about a topic in mathematics or science.
- articulate various standards for knowing science and mathematics and articulate the implications of these standards for assessment, especially standardized assessment.
- articulate what it means to know and learn relative to cognitive structures and describe how what people know changes and develops.
- describe various paradigms or perspectives for evaluating mathematics and science understanding.
- express informed opinions on current issues and tensions in education, especially as they relate to mathematics and science instruction.
- explore the affordances offered by various technologies in supporting knowing and learning in mathematics and science.
- explore the implications of deficit models of learning on issues of equitable instruction and learning environments.
**Instructional Emphasis**

The Knowing and Learning course starts by imparting the understanding that there is a science to learning and by having students examine ideas of what it means for an individual to know or understand something. Students then take a close look at domain-specific understanding in mathematics and science, identifying the standards for knowing that will be used throughout the course, and considering different ways of looking at students’ ideas.

In further consideration of the implications of current learning theories, the course then expands its focus to include learning as a social activity. Issues of student identity, agency, and participation are emphasized as learning is examined in this broader context. Finally, the view of learning expands beyond the classroom to consider how instruction either increases opportunities and justice for all students or perpetuates the privileges of a select group, particularly the way that standardized testing does or does not enhance these opportunities. This expansion to the group or classroom as the unit of analysis and design is intended to lay the foundation for the focus of the next course in the UTeach sequence, Classroom Interactions.

The field experiences for this course consist of student analysis of problem-solving activities in an applied fashion through use of the clinical interview process. Students conduct one-on-one interviews with learners who are engaged in a problem-solving activity. Students typically interview a variety of children, peers, and experts about how they would approach specific problems in mathematics and science extracted from the research literature. Students transcribe the interview and write up a detailed analysis of their subjects’ reasoning.

**Assessment**

As with all UTeach courses, class attendance is vital to student success. Students are expected to prepare for and participate in class discussions and activities. A rigorous attendance policy is enforced, and attendance is a grading component of the course.

Readings and discussions are a significant component of this course. Students are expected to devote 6 to 10 hours per week outside of class and to answer questions about course readings on a weekly basis. Instructors are encouraged to pose 1 or 2 questions (or more) about the readings that allow students to make more sense of the readings and be able to discuss them in class. If possible, students should respond online to the questions by class time, using Blackboard or a similar interactive environment. These responses may help to structure the classroom discussions, too.

Students conduct and analyze two clinical interviews throughout the semester. There is also a midterm and final project. There are two options for the midterm exam. Part I gives students a subset of their weekly response questions. Part II presents students with a sample of student work. They are asked to make sense of the student’s reasoning, use the student’s strategy to solve a similar problem, and then make predictions as to whether the student could solve a third, transfer problem. In the second option for Part I of the midterm exam (both versions incorporate Part II), students are asked to describe two theories from the course and explain how they could be used to inform the design of a classroom. This question is given ahead of time so that students can prepare a thoughtful response. For the final project, students either take a traditional final exam or complete a project where they observe a learning activity and analyze it within the context of current learning theories.
Course Topics and Resources on the UTeach Institute Members Website

Resources for Knowing and Learning are organized by Course Topics and are available on the UTeach Institute Members Website (https://www.utexas.edu/uteach-institute). Topics for this course are as follows:

- Course Overview
- Math and Science Instruction
- Nature vs. Nurture: Perspectives on Learning and Assessment
- The Cognitive Revolution and Social Perspectives
- Literacy, Social Critique, and Agency
Classroom Interactions

Classroom Interactions is the fourth course in the UTeach professional development sequence and the second of three courses in the College of Education, following Knowing and Learning and preceding Project-Based Instruction. This course continues the process of preparing students to teach mathematics and science in upper elementary and secondary settings by providing opportunities to see how theories explored in Knowing and Learning play out in instructional settings. Students design and implement instructional activities informed by their own understandings of what it means to know and learn mathematics and science, and then evaluate the outcomes of those activities on the basis of student artifacts (i.e., what students say, do, or create).

Classroom Interactions Course Core Components

The course is taught by faculty actively engaged in research in mathematics or science education.

Students engage deeply with science or mathematics content, reflecting on their own and others’ learning and problem solving, as well as the underlying structures of these disciplines and their relation to other fields of inquiry.

Students participate in an intensive, highly coached high school field experience comprised of 3 observations and 2 co-teaching events, including a multiple-day, connected lesson.

Students continually explore and compare various models of teaching (direct instruction, inquiry, cooperative grouping, etc.).

Students prepare and present detailed analyses of their lessons and teaching events (at least one of which is videotaped) for instructional effectiveness, highlighting issues of equitable instruction.

Students continually explore issues of equity through readings, classroom activities, lesson design and analyses, and individual research.

Students observe, analyze, and implement effective use of technology in science or mathematics instruction.

Key instructional approaches include intensive coaching of students in developing multi-day inquiry-based lessons by research faculty and master teachers; modeling of effective instructional strategies that illustrate equitable treatment of students; demonstration of effective questioning strategies; implementing cooperative / collaborative learning groups; interactive classroom discussions about research on teaching and learning and application to classrooms; student presentations that demonstrate analysis and reflection of their teaching; and peer collaboration and coaching.
An important focus of Classroom Interactions is on building students’ awareness and understanding of equity issues and their effects on learning. Students are provided frameworks for thinking about equity issues in the classroom and larger school settings, and they learn strategies for teaching students of diverse backgrounds equitably. Additionally, the course introduces ways in which curricula and technologies are used in classroom settings to build relationships among teachers and students. In essence, Classroom Interactions is centered on a close examination of the interplay between teachers, students, and content, and how such interactions enable students to develop deep conceptual understanding. Students learn how content and pedagogy combine to make effective teaching.

**Course Objectives**

Students will be able to . . .

- observe, analyze, and discuss how students’ knowledge and skills can be built using a variety of instructional strategies (including direct instruction, inquiry teaching, and use of small groups), focusing on what each model requires of teachers.

- create and evaluate tasks to build students’ content knowledge; assess students’ content knowledge based on evidence, including video and written artifacts.

- plan and teach, with a small group of peers, multi-day high school mathematics or science lessons on an assigned topic.

- solve problems in mathematics or science topics, justify their solutions, reflect on their own learning and the learning of others, relate results to learning science and demonstrate awareness of alternative conceptions and their possible origin.

- observe and analyze classroom instruction and data on student participation and performance with regard to equitable and diverse instructional approaches that afford all students an opportunity to learn.

- employ relevant technologies in teaching (e.g., presentation, computer simulation, and graphical analysis and representation software); analyze how technology can affect classroom interactions.

- read and analyze research results and theoretical literature in mathematics or science education and cite these results in analyses of their own teaching and reports to their peers.

- create a significant portion of their preliminary portfolios and demonstrate beginning competency as measured by applicable teacher certification standards.

**Instructional Emphasis**

Having conducted and analyzed a number of clinical interviews in the previous course, Knowing and Learning, students should already understand that the process of concept acquisition must encompass learners’ prior formal and informal knowledge. They should also grasp the importance of task construction in eliciting student thinking and the critical role of reflection and language in the construction of knowledge. Whereas in Knowing and Learning, students study the meaning behind understanding a particular content area from an individual perspective, in Classroom Interactions, the
The UTeach Instructional Program perspective shifts to studying how classroom events might promote or discourage student equity and learning mathematics and science.

Throughout the course, students participate in several in-class learning activities and consider how the activities reveal and change their own understanding of content prior to designing and implementing similar activities in high school classrooms. These activities allow students to evaluate their own learning and understanding of a subject. Bringing together students from different disciplines allows them to see their subjects from the perspective of a novice and to consider how different perspectives might affect the same curriculum.

Equity issues are also explored through in-class learning activities. Specific topics include learning disabilities, gender issues, cultural issues, bilingual education, school funding, curriculum inequality, teacher caring, teacher expectations, and stereotype threat. There is a continuous focus in the course on the implications of deficit thinking (for example, blaming the student) on classroom outcomes. Students are encouraged to consider questions such as: Is it fair for only the fastest students to contribute to an activity? How would learning be different if all students were not only allowed but required to participate? Is it fair that some students are learning in a language that is not their first language?

The reading list for the course evolves from semester to semester as new teacher-friendly research articles related to the course topics are published. For example, the reading list published as part of the UTeach curriculum in Fall 2008 included a large selection of readings that had been used in the previous 5 years. The UTeach program at The University of Texas at Austin has found that undergraduates need a great deal of scaffolding in order to read and absorb the information in research articles; those are chosen judiciously. Individual instructors generally choose readings based on personal preference.

A major portion of this course is the field experience. Students interview and observe classroom teachers and teach twice in high school classrooms. The first teaching experience is a 1-day event; the second lasts 2 days. Both teaching experiences are videotaped. Students spend significant time preparing, practicing, and revising lessons for the teaching events. In addition to the course instructor and TAs, master teachers work closely with students on lesson preparation and implementation. They assist with the development of sample activities linked to the content to be taught during the field experience. Master teachers are then paired with groups of students according to discipline expertise. They guide students in the development of knowledge packages (Ma, 1999) on which the lessons are based. Because lessons are videotaped, there are additional support needs related to video technology. Another major component of the course is reading, analyzing, and applying research and practitioner literature to teaching situations. For a detailed description of field experience preparations, see the Course Resources document, Planning Field Experiences, on the Members Website.

**Assessment**

Students are expected to devote 7 to 10 hours per week outside of class (1) preparing to conduct model teaching in local schools, which includes collaborating with their teaching groups, individual preparation, and practicing using all materials involved in a lesson; (2) reading and analyzing books and articles, and preparing written analyses of their teaching and other issues; and (3) watching, processing, and analyzing videos of classroom interactions, including their own teaching.
Grades are determined in the following manner:

- Participation 25% — In-class, online, and other participation
- Preparation and implementation of model teaching 30% — Lesson plan development, practice, and implementation
- Formal analyses and reflections 45% — Written reflections, lesson analyses and presentations, final exam project (media presentation on equity issues or a qualitative analysis of data from their field experience)

Course Topics and Resources on the UTeach Institute Members Website

Resources for Classroom Interactions are organized by Course Topics and are available on the UTeach Institute Members Website (https://www.utexas.edu/uteach-institute). Topics for this course are as follows:

- Course Overview
- Preparation, Implementation, and Analysis of Teaching Events
- Teacher–Student Interactions
- Interactions with Content
- Equity in Classroom Interactions
- Student–Student Interactions
- Designing for Learner-Centered Instruction
Project-Based Instruction

Project-Based Instruction (PBI) is taught by faculty in the College of Education. It is the fifth course in a sequence of professional development courses that includes Step 1, Step 2, Knowing and Learning, Classroom Interactions, and Apprentice Teaching. When UTeach students complete PBI, they are fully prepared for Apprentice Teaching, in which they serve as instructors of record in a middle or high school classroom.

PBI is offered as a key component on the premise that project-based instruction engages learners in exploring authentic, important, and meaningful questions of real concern to high school students. Project-based instruction promotes equitable and diverse participation and engages high school students in learning.

Whereas in the previous course in the sequence, Classroom Interactions, UTeach students gained experience designing a sequence of several lessons that they taught to a high school class, in PBI, students design full units of connected lessons. A number of the major principles and themes of the UTeach program—integration of mathematics and science content; infusion of technology in representation, analysis, modeling, assessment, and contextualization of content; immersion in intensive field-based experiences; and a focus on designing equitable learning environments—are synthesized as students develop an intellectually challenging project-based instructional unit. PBI also provides UTeach students with the experience of managing lessons and high school students outside a classroom, in a field setting.

Despite its name, PBI incorporates a variety of instructional approaches, focusing on differentiating between project-based instruction and other inquiry-based methods.
Project-Based Instruction
Course Core Components

The course is taught by faculty actively engaged in research in mathematics and science education and who have experience with project-based instruction (PBI).

Students participate in an intensive, highly coached secondary field experience comprised of classroom observations of PBI, field-based implementation of problem-based lessons, and management of wet lab and field-based learning environments.

The course incorporates a variety of instructional approaches, distinguishing among project-based and other examples of inquiry-based instruction.

The course emphasizes the perspective of teacher as designer of the learning environment, stressing adaptation over adoption of curriculum.

Key instructional practices include intensive coaching of students by instructor, master teacher, and teaching assistants in the development of a project-based unit and problem-based lessons; modeling of effective instructional strategies, including collaborative groups, teacher/student facilitated interactive classroom discussions; student presentations of project-based units; group and individual reflection on teaching experiences; collaboration and peer coaching.

Essential Questions

• How does a teacher choose a topic or learning goal that leads students to enduring and meaningful understanding of the material?

• What scaffolding can be provided by teachers to increase student learning during project-based instruction?

• When and how should teachers use formative and summative assessment during project-based instruction?

• How can a teacher develop the necessary social structures to promote participation and leadership in students while engaged in project-based instruction?

Course Objectives

Students will be able to . . .

• discuss and critique the merits of project-based instruction in terms of students’ cognitive development, equity, and motivation.
• reflect on applications of educational theory as it relates to classroom practice in the area of project-based instruction.

• distinguish between project-based instruction and other instructional approaches and decide which approach best fits instructional goals based on the benefits and limitations of each.

• evaluate the usefulness of technology in achieving learning objectives and select appropriate resources for student use based on the relationship of salient features of the technology to learning objectives.

• use inquiry methods with secondary students in a problem-based setting.

• describe examples of project-based instruction in math or science and analyze those examples in terms of several well-studied, field-tested models for PBI.

• demonstrate skill in setting up and managing lab and field project-based environments.

• use PBI design principles to develop an interdisciplinary, three- to four-week project-based unit for secondary math and/or science courses.

• develop alternative assessments appropriate for project-based instruction.

• discuss lab safety and liability issues related to project-based instruction and wet-lab or field environments (OSHA regulations, how to read materials safety data sheets, safe disposal of chemicals, etc.)

• use relevant technology to develop projects (e.g., concept mapping software, video editing software, etc.).

• integrate relevant technology into curricular units (e.g., Internet, simulations, data analysis packages, modeling software, etc.).

• plan instruction that promotes equitable and diverse participation so that all students have an opportunity to learn.

Instructional Emphasis

A major focus of this course is in developing an approach to designing, implementing and evaluating problem- and project-based curricula and processes by employing approaches that have emerged from collaborations between teachers and researchers. Specifically, four common design principles are emphasized:

• Defining learning-appropriate goals that lead to deep understanding;

• Providing scaffolds such as beginning with problem-based learning activities before completing a project, using “embedded teaching,” “teaching tools,” and a set of “contrasting cases”;  

• Including multiple opportunities for formative self assessment, and
• Developing social structures that promote participation and revision.

PBI has three essential components:

• **Theory-driven perspective**: Students learn about how people learn and how project-based instruction may be among our most informed classroom learning environments for bridging the gap between theory and practice.

• **Instructional development**: Technological and pedagogical content knowledge are developed as UTeach students work toward the design of project-based units. Competency is continually built as students read about and discuss the principles of PBI; reflect on observations of project-based learning environments in high school settings; and incorporate what they are learning into the design of problem-based lessons and ultimately, an entire project-based unit.

• **Field experience**: An intensive field component includes observation of well-implemented project-based instruction in local schools as well as implementation of problem-based lessons with area high school students on a study field trip.

**Assessment**

Student grades are based on participation in discussions, successful completion of classroom observations and study field trips, and a final project-based unit. An example of how these elements might be weighted toward the final grade is below:

• Attendance, Participation: 5%

• Discussions: 25%

• Field Experiences: 25% (made up of 4 to 6 hours of classroom observation, 6 to 9 hours preparing in the field, and 9 to 10 hours teaching in the field)

• Final Project (PBI unit): 45%

There are 9 student-led class discussions of readings. Each student is responsible for leading 1 discussion as a member of a discussion leader team. All students are provided with focus questions, or expanded subsets of midterm questions that are correlated to the readings. Students are required to submit focus question responses via email to the course instructor and discussion leaders. Discussion leaders summarize student views and work to draw out key points during discussions.

Course field experiences comprise another key assessment category. Each student is required to spend a minimum of four hours observing high school lessons taught in a project-based classroom environment. They record their observations and post them to a discussion board. Multiple postings of an individual classroom develop into overviews of that class, mini-case studies, for everyone to read.

For the final project, students develop an interdisciplinary, 3- to 4-week project-based unit of instruction suitable for use in a high school setting. The unit includes an anchor video, benchmark lessons, investigations, a calendar of instruction, objectives mapped to local, state, or national standards, a project rationale, the theoretical basis for the project, a concept map, assessment strategies, related
resources, modifications for special needs students, and technological tools to assist in implementing the project. One last component of the final project is a student-prepared grant proposal to obtain materials and equipment needed to implement their proposed projects.

Field Experiences

The field component is a parallel and integral part of PBI. It is critical that students have the opportunity to observe project- and problem-based learning as well as to engage in this modality of teaching and learning. Field activities are designed to provide those experiences. Field experiences include:

- **Observations**: Students conduct 2 classroom observations in schools that implement project-based learning, such as the New Tech network of schools. The observations are guided, and students are offered a chance to discuss their observations in class.

- **Voice of the Customer interviews**: Students conduct 3 interviews in order to determine the valued components of education for each customer. The 2 key customer groups are secondary students and their teachers. The 3rd customer group can include either employers or parents. Students choose which customer they wish to interview and then collaborate on the questions they wish to ask. Using a wiki or discussion board sometimes helps facilitate this process.

- **Field-based teaching experience**: As part of a mini-project, UTeach students design and implement 4 days of field teaching, which includes 2 days of classroom lessons that culminate in half-day, out-of-classroom field investigations for secondary students, followed by final classroom presentations.

Course Topics and Resources on the UTeach Institute Members Website

Resources for Project Based Instruction are organized by Course Topics and are available on the UTeach Institute Members Website (https://www.utexas.edu/uteach-institute). Topics for this course are as follows:

- **Course Overview**

- **Developing a Project-Based Unit**

- **Meeting the Needs of Diverse Learners**

- **Funding a Project-Based Unit**

- **Preparing and Teaching Project-Based Lessons**
Apprentice Teaching

Apprentice Teaching reinforces and expands teaching strategies that students have developed through their coursework and field experiences. The UTeach program also attempts to fill any gaps in students’ professional development during this final semester. In particular, Apprentice Teaching focuses on classroom management and time management strategies, parent-teacher communication strategies, school culture, effective middle school and high school dynamics, legal and logistical issues in teaching, the final portfolio, and state certification examinations.

Apprentice Teaching Course Core Components

The course is taught by master teachers—experienced, successful classroom teachers who have joined the UTeach faculty.

Apprentice teachers are hosted by high-quality cooperating teachers who allow them to demonstrate required teaching proficiencies.

Apprentice teachers receive regular, intensive feedback by highly trained observers who have considerable teaching experience in addition to that provided by master teachers and mentor teachers.

The seminar course is designed to provide a highly supportive environment that promotes collaboration, reflection, and sharing and that is continually responsive to apprentice teacher needs.

The seminar topics reflect state standards for teacher certification.

Apprentice teachers complete and submit a final portfolio providing evidence that they have met state standards for teacher certification.

Key instructional practices include (1) intensive cognitive coaching of students by instructors, master teachers, field mentor teachers, and field observers to support the enhancement of daily teaching skills in the public school classrooms, (2) modeling effective instructional strategies, including individualized learning plans, collaborative groups, and meeting the needs of a diverse student population, (3) group and individual reflections on teaching experiences; collaboration and peer coaching.

The purpose of the Apprentice Teaching course is to offer UTeach students a culminating experience that provides them with the tools needed for their first teaching position. In Apprentice Teaching, students are immersed in the expectations, processes, and rewards of teaching. Apprentice Teaching is comprised of (1) field experiences in local public secondary schools (6 credit hours) and (2) a weekly seminar that brings apprentice teachers together with university master teachers to share experiences and work on solutions to problems they encounter in the field (1 credit hour).
An underlying philosophy of the UTeach program is that extensive, individualized, and ongoing coaching will improve apprentice teachers’ skills at an accelerated rate. The Apprentice Teaching course exemplifies this philosophy. Master teachers teach the weekly seminar and coach apprentice teachers throughout their field experiences; cooperating teachers at local public secondary schools mentor apprentice teachers assigned to their classrooms; and university facilitators, highly trained observers with considerable teaching experience, provide extensive and regular feedback to apprentice teachers.

**Course Objectives**

Students will be able to . . .

- design instruction appropriate for all students that reflects an understanding of relevant content and is based on continuous and appropriate assessments.

- create a classroom environment of respect and rapport that fosters a positive climate for learning, equity, and excellence.

- promote student learning by providing responsive instruction that makes use of effective communication techniques, instructional strategies that actively engage students in the learning process, and timely high-quality feedback.

- fulfill professional roles and responsibilities and adhere to legal and ethical requirements of the profession.

Apprentice teachers are required to teach 2 sections of a science, math, or computer science class in a public middle or high school. They remain on the school campus a minimum of 4 hours per day. In addition, apprentice teachers are required to complete district requirements to qualify as substitute teachers, so they may substitute for their cooperating teacher in the event of the cooperating teacher’s absence.

UTeach apprentice teachers explore professional development opportunities beyond the classroom, including attending conferences, subscribing to education journals, joining professional organizations, and conducting presentations in educational settings. The goal of Apprentice Teaching is to provide the experiences, information, and coaching that will enable these students to be successful teachers who are leaders in their schools and communities.

**Seminar**

The Apprentice Teaching seminar provides a supportive environment where apprentice teachers share their experiences and work on solutions to problems they may be experiencing. Master teachers teach the weekly seminar, share their teaching experiences, and facilitate discussions to help apprentice teachers develop their own successful teaching identities. The seminar is an effective forum for students to get the guidance they consistently want on classroom management.

**Field Experience**

Apprentice teachers have taught at various levels in previous UTeach courses, so they assume teaching responsibilities quickly in Apprentice Teaching, their final teaching semester, and maintain
that role for the equivalent of two 6-week grading periods. In addition to their work with the master teachers in the weekly seminar, apprentice teachers are mentored by cooperating teachers at their local schools, and university facilitators observe them and give regular feedback.

**Evaluation**

Each state has unique requirements for teacher certification. In Texas, all observations of an apprentice teacher throughout the semester are based on elements of the *Teacher Development Rubric (TDR)*, which is aligned with the state standards.

Master teachers observe apprentice teachers at least once during the semester. If an apprentice teacher is having difficulties, more visits are required. The goal is to provide whatever coaching is required to ensure that all UTeach students reach a demonstrated minimum level of competence upon the completion of their apprentice teaching experience. Master teachers provide guidance on various needs of apprentice teachers, including help with curriculum, pacing, classroom management strategies, how to work with colleagues in the schools, job interviewing, and selection of compatible school environments as future job sites.

The university also hires experienced, successful teachers to serve as university facilitators who observe and work closely with the apprentice teachers. University facilitators attend training sessions each semester and are given detailed guidance and rubrics on what to look for and emphasize as the semester progresses. Each student is observed a minimum of 10 times by university facilitators. They observe the apprentice teachers weekly, conduct follow-up conferences, and remain in close email contact with the students. University facilitators focus primarily on classroom management and general pedagogical strategies. Occasionally, a university facilitator serves as a resource if an apprentice teacher and the cooperating teacher have difficulties communicating or understanding expectations. A university facilitator also serves as a liaison between the university and the classroom teacher.

Cooperating teachers, in addition to providing content expertise and daily support in the classroom, conduct 4 formal observations: 2 early in the semester, 1 at the midsemester point, and 1 at the end of the semester.

Seminar grades are determined in roughly the following manner:

- Final Portfolio (submitted by the deadline with a passing score): 35%
- Weekly email reflections on portfolio proficiencies and weekly lesson plans: 30%
- Attendance and participation in seminar and successful completion of all in-class assignments: 15%
- School culture assignments: 10%
- Cooperating teacher schedule: 5%
- Time capsule with future address: 5%
A passing grade in the Apprentice Teaching experience requires:

- Teaching the specified number of days in the school
- Completion of the Mid-Semester Evaluation and Focused Observations
- A completed Final Evaluation with Competent scores on all criteria

**Course Topics and Resources on the UTeach Institute Members Website**

Resources for Apprentice Teaching are organized by Course Topics and are available on the UTeach Institute Members Website ([https://www.utexas.edu/uteach-institute](https://www.utexas.edu/uteach-institute)). Topics for this course are as follows:

- Course Overview
- Student Teaching
- Weekly Seminar
Research Methods

Research Methods is a 1-semester, 3-hour course in the required UTeach sequence. It is one of 3 content courses specially designed to meet the needs of future teachers. At The University of Texas at Austin, it is cross-listed in Physics, Chemistry, and Biology and fulfills multiple degree requirements, including both a science and a university substantial writing component requirement. Sections are limited to 30 students. The class meets 2 hours per week for non-traditional, interactive lectures and 2 hours per week for labs.

Research Methods Course Core Components

The course is taught by an instructional team with a broad mix of scientific expertise. A Ph.D. in a scientific discipline is essential for anyone who evaluates the inquiries.

The course is primarily a laboratory course in which students develop and practice skills that are fundamental to the scientific enterprise.

The course is organized around four independent inquiries that UTeach students design and carry out.

The course emphasizes the use of mathematics to model and explain both the natural and man-made worlds.

The course requires a substantial amount of writing. The written inquiries that students produce are evaluated as examples of scientific writing.

The course emphasizes the development of skills that are directly applicable in teaching secondary science and mathematics (e.g., use of equipment, preparation of lab materials, safety issues, and use of technology).

Key instructional approaches include intensive coaching of students by Natural Sciences faculty, master teacher and teaching assistants for the development of laboratory or field-based inquiries; individual and independent student investigation and experimentation on inquiries; student collaboration in groups to perform activities that develop scientific thinking and mathematical modeling with instructor as facilitator; student presentations with peer, instructor, master teacher, and teaching assistant feedback; interactive discussions around topics presented through direct teach.

Learning about science includes both learning material that has already been established (e.g., the structure of DNA, how to find forces on blocks being pushed up a ramp, the definition of an acid) and learning how scientists gained this knowledge (e.g., how new discoveries gain authority and are
adopted by the scientific community, how to evaluate scientific claims when they conflict, how to design and carry out investigations to answer new questions). Most high school and undergraduate college science courses are devoted to presenting the first type of knowledge. Education in the second aspect of science has traditionally been left to graduate school. Research Methods simultaneously provides students specific techniques needed to address scientific questions and examples of how to provide this sort of training for students through individualized instruction.

The goals of the course are:

- to provide UTeach students with the tools that scientists use to solve scientific problems;
- to give students the opportunity to use these tools in a laboratory setting;
- to make students aware of how scientists communicate with each other through peer-reviewed scientific literature; and
- to enable students to understand how scientists develop new knowledge and insights, the most important of which are eventually presented in textbooks and taught in conventional science classes.

**Course Objectives**

Students will be able to…

- create their own experiments to answer scientific questions.
- design experiments to reduce systematic and random errors and use statistics to interpret the results.
- use probes and computers to gather and analyze data.
- use statistics to interpret experimental results and deal with sampling errors.
- treat human subjects in an ethical fashion.
- apply safe laboratory procedures.
- find and read articles in the scientific literature.
- create mathematical models of scientific phenomena.
- apply scientific arguments in matters of social importance.
- write scientific papers.
- give oral presentations of scientific work.
**Instructional Emphasis**

Research Methods is primarily a laboratory course, and most of the topics covered are developed in connection with 4 independent inquiries that UTeach students design and carry out. Students design experiments to answer scientific questions and to reduce systematic and random errors. They incorporate statistics to interpret experimental results and deal with sampling errors, and do mathematical modeling of scientific phenomena. They also present their scientific work orally. Thus, the course content is organized into 5 units that correspond to the development of their inquiries and a presentation on a scientific topic of choice:

- Curiosity and Scientific Inquiry
- Experimental Design and Analysis
- Statistics
- Scientific Information
- Modeling

Research Methods is also designed to meet the requirement of a “substantial writing component” course at The University of Texas at Austin. The written inquiries students produce are evaluated as examples of scientific writing.

Research Methods is cross-listed in the departments of Physics, Chemistry, and Biology at The University of Texas at Austin. Mathematics students are encouraged to take the Physics section because connections between mathematics and physics are particularly strong, and the chances of finding a project with substantial mathematical content increase. All cross-listed versions are identical, except that each student must perform the final inquiry in the discipline for which he or she is enrolled.

One or two 20-hour teaching assistants are assigned to the class. They are responsible for grading weekly homework assignments, and they attend all lab sections.

**Assessment**

The majority of a student’s grade, roughly 65%, is based on 4 independent inquiries that are designed, carried out, and written up by the student. The final inquiry must be related to the discipline under which the student is enrolled in the class. Because Research Methods is a course with a “substantial writing component”, inquiries are evaluated both on content and the quality of written expression. There are no formal examinations. Another 25% comes from homework assignments. Student participation is tracked and accounts for 10% of a student’s grade.
Course Topics and Resources on the UTeach Institute Members Website

Resources for Research Methods are organized by Course Topics and are available on the UTeach Institute Members Website (https://www.utexas.edu/uteach-institute). Topics for this course are as follows:

- Course Orientation
- Independent Scientific Inquiries
- Statistics
- Modeling
- Scientific Information
- Experimental Design and Analysis
- Curiosity and Scientific Inquiry
Perspectives on Science and Mathematics

Perspectives on Science and Mathematics is a 3-credit, upper-division History course designed to meet the unique needs of future teachers. It is one of 3 specially designed content courses in the UTeach sequence that fulfills multiple degree requirements. At The University of Texas at Austin, Perspectives fulfills a course requirement in the fine arts or humanities as well as a “substantial writing component” requirement.

Many mathematics and science students are surprised to learn that math and science have a history at all. So far as they know, math and science have simply been handed down in textbooks. To discover instead that science and mathematics have advanced by the struggles of diverse people, on the basis of often conflicting criteria and interests, can be mind-boggling to students. Students have studied extensively the methods of science and mathematics, but by studying the history of these fields, they learn how such approaches were originally developed, contested, and accepted. They also get a sense of how such approaches will continue to evolve. In this way, the Perspectives course aims to foster an understanding that science and mathematics are not finished or set in stone.

The course has several interlocking purposes:

- It is intended to help future math and science teachers learn how to think about math and science “from the outside”—to ask questions about what scientists and mathematicians do and why, about where science and technology came from and how they got to be so important in the world today, and about what kinds of questions scientists and mathematicians have tried to answer and why.

- It is designed to strengthen students’ skills in the liberal arts, including sophisticated research and information analysis, fluent writing, and substantive argument.

- It requires students to put to work the insights and skills they have learned in science and math pedagogy classes by designing secondary school lesson plans that are built around events and concepts from the history of science and mathematics.

Perspectives explores a selection of topics and episodes in the history of science and mathematics. It illustrates how knowledge has often emerged through torturous struggles, against obstinate resistance, and within cultural, religious, and social structures. Students are brought to understand that science is not merely a body of facts, theories, and techniques; it involves diverse processes by which it is continually generated and reformulated.

Sciences typically discussed in Perspectives include biology, physics, geology, astronomy, and chemistry. The course traces the bumpy development of key notions in these sciences and seeks to correct common myths or defective portrayals of history in science textbooks. Students also discuss the question of whether mathematics is itself a science.

The course provides historical perspectives on how practical needs, social conflicts, and even individual personalities shaped the content and direction of the sciences. Another objective of the course is to convey that scientific and mathematical concepts are not static. The meaning of the term “species,” for example, has changed over time, and even today some biologists disagree about how, or even whether, to define it. The goal, then, is to promote among UTeach students the understanding
that even the most basic ideas of science are dynamic, despite the way this information is presented in K-12 textbooks.

By studying history, students cultivate independence of thought and become progressively aware that many prominent scientists and mathematicians have often disagreed with one another. Such disagreements deserve to be studied because they often produce major breakthroughs. Perspectives also explores how various scientists have actually changed their minds and reached consensus. For example, the course explores why Charles Darwin abandoned the common notion of the fixity of species, and how other scientists too became increasingly convinced by evolutionary theory. Likewise, the course traces how biologists, geologists, and physicists espoused conflicting claims and carried out vigorous debates before finally agreeing on the age of the Earth.

Finally, the Perspectives course prepares future teachers to broaden their approach to mathematics and science instruction so that they might captivate and retain the interest of all students. By conveying particular human stories about why and how various branches of science have originated and evolved, students gain insights into the critical thinking processes that lead to scientific creativity. These stories serve to make science more accessible to K-12 students by revealing the vast array of personalities, experiences, and approaches that have contributed to the historical development of the sciences.

**Perspectives on Science and Mathematics Course Core Components**

The course is taught by a faculty member with expertise and a research background in the history or philosophy of science.

Course content topics and themes are relevant to secondary science and math teaching.

The course emphasizes sophisticated research and information analysis.

The course emphasizes intensive writing.

Students design, present, and revise middle and high school science and math lessons (using the 5E lesson plan model) that incorporate the history of science or math.

Key instructional approaches include modeling of effective direct-teaching and questioning strategies, interactive classroom discussions, and student presentations of inquiry-based lessons in the history of science and/or mathematics with peer, master teacher, instructor and/or teaching assistant feedback provided for improvement.
Course Objectives

Students will be able to…

• describe the historical development of aspects of science and mathematics relevant to future teachers.

• describe several analytic frameworks for understanding the history of science and mathematics.

• analyze the history and content of evolutionary theory.

• express ideas and opinions clearly and effectively in formal writing.

• develop skills in searching for, retrieving, and evaluating the provenance and reliability of source materials, on- and offline, including specific resources available to teachers.

• integrate approaches and material learned in the course with independent research and science or math content to design middle and high school science and math lessons.

• reflect on and critique their own work, particularly lesson plans, and that of others.

Instructional Emphasis

The course is designed to make students think critically; thus it should not be delivered in a purely lecture format. The instructor should make it clear to students that they should be open to viewing the history of science and mathematics, as well as major concepts they have previously studied, with a fresh perspective and an open mind.

In order to connect the historical content of the course with the reality of classroom instruction, students are encouraged to look at how the subject of each topic is presented in current secondary textbooks. That way students readily see how what they are about to learn has a direct bearing on specific topics that they will have to handle as teachers. Moreover, students become aware of the historical inaccuracies and myths often infecting approved textbooks. This often inspires a craving for a more accurate and comprehensive knowledge of history.

This course also emphasizes the development of lesson plans incorporating historical content. Students once again use the 5E lesson plan format they were introduced to in the Step 1 and 2 courses, which emphasized inquiry-based learning.

Owing to the nature of the material itself, there is a greater share of investigation and discussion of historical and conceptual topics than the sort of hands-on activities promoted by the 5E model that UTeach students use for their own lesson plan assignments. Nevertheless, the intent of the Perspectives curriculum overall is to model an inquiry-based approach, and instructors should strive to increase the quantity and quality of whatever activities they may deem appropriate. In all cases, there should be a conscientious attempt to model instructional best practices through use of Socratic questioning, facilitation of student explorations, and inquiry-based activities.
Assessment

Students are required to write two lesson plans in the 5E model format. Thus, students ponder and practice how to incorporate historical knowledge and insights into science or mathematics classrooms. The finalized lesson plans and in-class presentation of the material constitute approximately a third of the students’ final grades. An in-class written midterm exam plus the final exam constitute another third of each student’s grade, and the remaining third is a combination of reading confirmation quizzes and class participation.

Course Topics and Resources on the UTeach Institute Members Website

Resources for Perspectives on Science and Mathematics are organized by Course Topics and are available on the UTeach Institute Members Website (https://www.utexas.edu/uteach-institute). Topics for this course are as follows:

- Course Orientation
- History of Science
- History of Mathematics
- Prepare and Present 5E Lessons
Functions and Modeling

In this course, students engage in explorations and lab activities designed to strengthen and expand their knowledge of secondary mathematics topics. Students collect data and explore a variety of situations that can be modeled using linear, exponential, polynomial, and trigonometric functions. Activities are designed to engage students in a second, deeper look at topics they have been exposed to previously; illuminate the connections between secondary and college mathematics; illustrate good uses of technology in teaching; illuminate the connections between various areas of mathematics; and engage them in serious, non-routine problem solving, problem-based learning, and applications of mathematics.

While there is some discussion of how the content relates to secondary mathematics instruction, with the instructor endeavoring to model high-quality instructional techniques, Functions and Modeling primarily emphasizes mathematics content knowledge and content connections, as well as applications of the mathematics topics covered.

The purpose of this course is for students to deepen and broaden their mathematics content knowledge, with an emphasis on concepts needed to teach secondary mathematics at various levels. The course consists of 3 instructional units: (1) regressions in modeling; (2) functions, rates, and patterns; and (3) functions in other systems.

Specific topics of investigation include function properties and patterns, complex numbers, parametric equations, polar equations, vectors, and exponential growth and decay. Explorations involve the use of multiple representations, transformations, data analysis techniques (e.g., curve fitting) and interconnections among topics in algebra, analytic geometry, statistics, trigonometry, and calculus. Lab investigations include use of various technologies, including computers, calculators, and computer graphing software.

To allow for extended explorations and labs, the course ideally is structured to meet 2 times per week for 90 minutes, rather than 3 times per week for 60 minutes.
The course is taught by a master teacher with secondary classroom experience who is exceptionally qualified to teach university-level mathematics content, or by a mathematics faculty member who has a working knowledge of secondary mathematics curriculum and grade-level expectations.

Course topics are selected for their relevance to secondary mathematics curricula.

Students are consistently encouraged to become seekers of mathematics knowledge who strive to answer content-related questions.

Students are exposed to proper use of technology in the form of calculators, computer software programs, and data collection devices that are currently being used in local school districts.

Student collaboration with problem solving and presentation of findings is emphasized and expected.

Proper use of the language of mathematics is emphasized.

Students are consistently expected to justify all findings and conclusions related to assigned problems, explorations, and labs.

Key instructional approaches include the use of inquiry-based explorations and labs where the instructor acts as a facilitator for student learning rather than a lecturer. Students are consistently expected to collaborate in groups deriving results and/or proofs related to important mathematical concepts. Students present results and justifications. Students are encouraged to modify and question peer presentations in order to clarify logic used and accuracy of the mathematics described with instructor input offered as necessary.

**Essential Questions**

- What mathematics content knowledge is essential to teaching secondary mathematics?
- What constitutes proper use of technology in secondary mathematics instruction?
- How do university mathematics courses relate to and extend secondary mathematics content?
- What are some topics in secondary mathematics curriculum with which secondary students struggle the most?
• What are some of the essential topics in secondary mathematics curriculum that are routinely omitted or not taught in depth?

**Course Objectives**

Students will be able to…

• demonstrate a depth of content knowledge with regard to important secondary mathematics topics such as parametric relations, polar relations, matrices, exponential and logarithmic functions, vectors, and complex numbers.

• generate or work with relevant lab or exploration data and use regression, matrix, function pattern, and systems methods to produce a model of the data.

• present mathematical ideas and topics in a knowledgeable and effective manner.

• demonstrate proficiency in the use of technology in the mathematics classroom.

• identify mathematics content connections between the various levels of secondary mathematics curriculum and between secondary- and university-level curriculum.

**Instructional Emphasis**

The course is designed to include and promote methods of discovery, problem solving, collaboration, and presentation of results. Ultimately, Functions and Modeling is intended to make students think critically; thus, it should not be delivered in a purely lecture format. Students should consistently work in groups of three or four and collaborate in developing results. Groups should be shuffled a few times over the semester to foster new collaborations and fresh ideas. Each exploration of the course presents an opportunity for the instructor to emphasize and connect mathematics content and concepts. The instructor should make it clear to students that they should be open to viewing some of the mathematics they have previously experienced with a new perspective and an open mind.

Although this is not primarily an education course, the instructor should strive to emphasize content connections within the mathematics of secondary curriculum. The instructor should also model the dissemination of mathematics content through use of Socratic questioning, facilitation of student explorations, and inquiry-based activities.

**Assessment**

Four unit tests and a comprehensive final exam make up roughly half of a student’s grade in the course. The other half consists of homework assignments, 4 in-class lab activities, a midterm project, and attendance and participation. Please see the course syllabus, available under Course Resources, for precise percentages assigned to each component.

Homework consists of 4 major unit assignments, considerable in scope and in length, which serve to emphasize important concepts covered in the previous 2- to 3-week period. Smaller assignments may also be graded at the instructor’s discretion. Results and observations of the 4 in-class lab activities are written up in groups.
Additional activities upon which participation may be assessed include explorations, which are in-class, group problem-solving activities. The instructor should check in with groups as they work on explorations to view work and ask probing questions. Typically, 1 or 2 groups will be randomly selected to present their findings, as this is an important component of these activities. Work related to these activities may also be collected and reviewed to see where students may be having trouble.

**Course Topics and Resources on the UTeach Institute Members Website**

Resources for Functions and Modeling are organized by Course Topics and are available on the UTeach Institute Members Website (https://www.utexas.edu/uteach-institute). Topics for this course are as follows:

- Course Orientation
- Regressions in Modeling
- Functions, Rates, and Patterns
- Other Systems
- Mathematics and Art
Student Assessment

Assessment is a vitally important part of a UTeach program. Carefully targeted evaluation and feedback helps ensure that students are flourishing and that they can modify and improve their classroom instruction. A UTeach program should assess student progress in a number of ways—not just at the end of the program but at many points throughout the program. In most programs, students are assessed using the following data sources:

- GPA
- observation and feedback
- portfolio

GPA

All UTeach programs require students to maintain a minimum GPA to complete the professional development sequence and to be recommended for certification.

At UTeach Austin, the minimum required GPA is 2.75. Though the average GPA is usually around 3.08, around 15 percent of students in the program fall below the minimum requirement in any given semester. UTeach advisors meet with these students to caution them that they may not be allowed to take the last three courses in the professional development sequence unless they raise their GPAs. Students who reach the point of registering the last three courses with an inadequate GPA are encouraged to start the appeals process, through which they can request an exception to the policy.

The UTeach Austin appeals committee, which is made up of the UTeach co-directors and a UTeach faculty member, handles GPA appeals on a case-by-case basis. (The appeals committee is described from a staffing perspective in Chapter 3.) This is the process for GPA appeals at UTeach Austin:

1. A student writes a letter to the appeals committee, explaining his or her request and why it should be granted. The appeals coordinator—a UTeach advisor—asks comments from two UTeach instructors who taught the student recently. One of these instructors must have observed the student’s teaching.

2. To gain a more complete picture of the student’s academic performance, the UTeach advisor recalculates the student’s GPA using different criteria (for example, excluding failed courses that were retaken for at least a C grade, excluding courses that do not count toward the current major and were taken while the student was in a previous major, excluding elective courses that do not count toward the current major). The advisor also calculates the student’s UTeach GPA, which includes only professional development and supporting courses, and the student’s math or science GPA.

3. The appeals committee reviews and discusses the advisor’s GPA calculations, the student’s letter to the committee, and the instructor comments to determine whether the student’s situation warrants an exception to the policy. The appeals committee takes special note of the quality of the student’s performance during teaching experiences and is more inclined to be lenient with students who have demonstrated the ability to teach well.
4. When the committee reaches consensus, it notifies the advisor of its decision, and the advisor notifies the student.

**Observation and Feedback**

Before UTeach students reach Apprentice Teaching, they are required to prepare and teach lessons in the field as part of several courses. Students receive intensive coaching around these experiences, including instructor review and peer review before a lesson, as well as verbal and written feedback at the conclusion of each lesson.

**Rubrics**

UTeach programs should use a rubric for formative and summative assessment and make the rubric public for all students to see. Though programs may create their own rubrics, the UTeach Observation Protocol (UTOP) is well suited for use in UTeach programs.

The UTOP is an observational instrument that can be used to assess the overall quality of classroom instruction in math and science from kindergarten to the undergraduate level. It was designed to allow individuals to evaluate teaching effectiveness while valuing different modes of instruction.

The UTOP was created and piloted by faculty, master teachers, and research assistants in the UTeach College of Natural Sciences program at the University of Texas Austin.

It can be used to evaluate quality of instruction and provide meaningful feedback for improvement at any level of education, in a variety of settings. It is composed of 26 items rated on a 5-point Likert scale (1 to 5), with an NA (Not Applicable) rating option for a few items where sufficient information may not be accessible during the observation session.

We recommend that programs consider using the UTOP. The UTOP is a criterion-referenced instrument, requiring training and recalibration to maintain the integrity and fair use of the instrument. The Institute offers in-person or online UTOP trainings through the year. The UTOP and an accompanying training manual are available at http://utop.uteach.utexas.edu.

**Course Observations**

UTeach students write and deliver lessons in the five courses where they are required to work in school classrooms. For each lesson UTeach students teach, a mentor teacher uses part or all of the UTeach program’s rubric to evaluate performance. Master teachers observe at least one lesson for each student per semester and use the program’s rubric as well.

**Step 1 and Step 2**

In these first two courses, students practice their lessons in class and modify them based on feedback from their peers and the instructor. For each lesson students teach, mentor teachers complete evaluations, assessing the skills UTeach students are expected to demonstrate. In addition, a master teacher observes each student teaching in the classroom at least once, and they offer verbal and formal written feedback. If an instructor sees problems with a student’s teaching, he or she observes the student teach a second lesson. At the end of the semester, a mentor teacher completes a final evaluation form for each student.
Classroom Interactions

In Classroom Interactions, students again receive feedback on their teaching from several sources. First, master teachers review all lesson plans and provide feedback. Students pilot portions of the lessons they plan to teach with their fellow class members and receive feedback directly from them, as well as from instructors and master teachers.

When they are actually teaching in high school classrooms, UTeach students supply the high school students with either standard or self-developed evaluation forms to gather feedback on their lessons. In addition, mentor teachers provide extensive feedback. On a rotating basis, course instructors and master teachers observe UTeach students as they teach, though it’s generally not possible to observe all three days of teaching for each student.

Finally, students are required to video all three days of teaching, and both the student and instructor review and comment on the video. Students select segments of the video to review with the entire class.

Perspectives on Mathematics and Science

In Perspectives, UTeach students deliver lessons to their own classmates. Instructors can use the program rubric to assess the lessons, and it may also be useful to have the other students in class use the rubric so they can both offer advice to their classmates and have a clearer understanding of how they are evaluated by mentor teachers and master teachers.

Project-Based Instruction

In Project-Based Instruction, students choose to teach science and applied mathematics lessons in field- or school-based situations. The lessons are videoed in both cases. The course instructor gives feedback to the students verbally at the time of the lesson and again in writing and verbally when the course instructor and the UTeach students analyze the video together.

Apprentice Teaching

A university facilitator—an experienced, successful teacher contracted by UTeach—observes an apprentice teacher once a week, conducts follow-up conferences, and remains in close email contact with the apprentice teacher. UTeach depends on the classroom mentor teachers to provide content expertise; the university facilitators focus primarily on classroom management and general pedagogical strategies. A university facilitator provides a minimum of 10 documented evaluations on each student. The university facilitators provide verbal and written feedback for each lesson they observe. The program rubric is used for formative evaluation throughout the semester and for summative evaluation at the end.

Portfolio Assessment

The final component of assessment in all UTeach programs is the student portfolio. Each program develops different ways of approaching the portfolio, but the central concept is the same across programs: The portfolio provides benchmarks by which to assess student progress.

Portfolios are typically organized according to benchmarks the program provides, and students include evidence supporting their mastery or understanding of each benchmark.
It is crucial for students to start building their portfolios as early as Step 1. Every master teacher and professor should address the needs of portfolio, reminding students to collect their work and pointing out work that would be a valuable part of the portfolio.

At UTeach Austin, two versions of the student portfolios come under review:

- A preliminary portfolio, which must be approved before the student begins Apprentice Teaching.
- A final portfolio, which must be approved before students leave the program.

UTeach Austin portfolios are divided into seven sections, each with several subsections:

- **Personal Profile**: Components are the student’s teaching philosophy, sample cover letter for employment, résumé, and evidence of professionalism (a professional development plan, response to feedback, and plan for communicating with parents).
- **Classroom Environment**: Students document classroom management plans, describe how they create a rapport with their students, and describe how they maintain a safe learning environment.
- **Lesson Structure**: Students include evidence of how they design an organized lesson to explore concepts, keep students actively engaged, and assess understanding.
- **Implementation**: Students discuss effective questioning strategies, time management strategies, and responding to formative assessment during lesson implementation.
- **Content**: Students include evidence that they know the subject matter and can connect the content to other disciplines.

More information about UTeach Austin’s portfolio requirements is available on their website at https://uteach.utexas.edu/Students/Resources/Portfolio%20Requirements.

**Evidence and Evaluation**

Many kinds of material can be used as evidence for the preliminary portfolio: lesson plans, reflection assignments, observation feedback forms, video of the student’s teaching, copies or photographs of student work (with any identifying information redacted), exams, papers, homework assignments, and lab reports. They can also reflect on work they have done through an internship or other outside educational work.

Artifacts from UTeach courses can include specific assignments, like a generative lesson plan from Knowing and Learning or responses to a forum prompt from Classroom Interactions. Drafts of assignments can also be valuable. For example, students must describe the process of developing a learning experience that promotes student learning through inquiry. A lesson plan from Step 2 in draft form with instructor comments, then in final form, can be a solid example of that process.

Artifacts from Apprentice Teaching are used in the final portfolio.
Trained evaluators with content knowledge, often UTeach graduates, review each portfolio and score them on a four-point scale: 0 = unsatisfactory, 1 = beginning competent, 2 or 3 = competent, 4 = advanced competent. They must earn a score of at least 1 on each proficiency for the preliminary portfolio, and a score of 2 on each proficiency for the final portfolio.

The portfolio advisor handles minor portfolio revisions, such as missing evidence or an off-topic response. Master teachers reevaluate a portfolio when more major revisions—particularly content revisions—are required. Rarely, a portfolio is so poor that it must be entirely redone; when such a portfolio is redone, a professional evaluator assesses it as if it were an original submission.

**Portfolio Management**

Most UTeach programs use a packaged portfolio management system that keeps student work organized and follows a rigorous security protocol. At UTeach Austin, portfolios are logged in when they are submitted and stored securely until a student is notified of the status of his or her portfolio—either “requires revision” or “passed without necessary revision.”

Some programs find it useful to hold portfolio workshops each semester, showing samples of exemplary portfolios as models and inviting students who have successfully completed the preliminary portfolio to describe their experiences. Some programs partner with university writing centers so that students can get help with the required teaching philosophy essay.
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### Goals
- Prepare, practice, and reflect on RE lessons based on identified activities.
- Prepare, practice, implement, and reflect on RE lessons aligned with district math and science curriculum.
- Explore the implications of teaching through individual learning, social constructivism, and within the context of larger social justice issues.
- Apply theoretical and practical frameworks to analyze various instructional activities, focusing on content development through teacher-student, student-student, and group interactions.
- Design, implement, and evaluate problem- and project-based curriculum and practices.
- Engage in an immersive, culminating experience that equips UTech students with the tools needed for their first teaching experience.

### Design of Field Experience
- Individual 선택, clone math or science lessons delivered in middle school classroom
- Individual math or science lessons based on district curriculum delivered in middle school classroom
- Individual clinical experiences of learners solving mathematics problems
- Multi-day connected to math or science lessons based on a district curriculum delivered in a high school classroom
- Multi-day connected to project based lessons delivered in secondary classroom and culminating in outside-classroom, field-based student experience
- 10 day math or science teaching assignment for 12 weeks

### Final Portfolio Including
- Personal Profile: Teaching philosophy, cover letter for employment, resume, academic record
- Evidence of subject matter knowledge, including evaluation of a model of content information, answer to pre-requisites, future and cross-disciplinary connections to a chosen topic
- Evidence of inclusive design and awareness of equity issues, including development and implementation of an individualized learning plan and resulting assessment artifacts
- Evidence of ability to plan effective lessons, including selected lessons and assessments designed to promote learning for all students
- Evidence of effective classroom environment, including a management plan
- Evidence of effective instruction and delivery, including video evidence of students engaged in inquiry learning, effective assessment and differentiation strategies, and integration of technology to enhance learning
- Evidence of professional responsibility, including a professional development plan and parent communication plan

### KEY ARTIFACTS
- 2C Lesson plans
- Written reflections of classroom experiences
- 2C Lesson plans
- Final project
- Written reflections and drafts based on pre- and post-assessment results
- Writing reflections of classroom experiences

### Key Artifacts
- Independent inquiries in four categories: historical, laboratory investigation, survey and statistical analysis, and experiment in student's discipline
- Written explorations and demonstrations of mathematical connections between important topics
- Written explorations and demonstrations of content knowledge relating to the context of "functions" topics such as state of change, units and accumulation
- Inquiry unit project including the leading lesson plans

### Notes
- NA
- NA
- NA
- NA
- NA
- NA
- NA
- NA
- NA
- NA