

INTRODUCTION TO UTEACH

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The *UTeach Operations Manual* serves as a fundamental resource for universities as they begin to implement the UTeach program model. It articulates the crucial details of UTeach program design and translates them into real university practices. Incorporating the experiences of existing programs, the manual covers every aspect of UTeach, including operational standards and procedures, instructional principles and course descriptions, and organizational growth and development. In tandem with the individualized guidance and support provided by UTeach Institute staff, the *UTeach Operations Manual* is intended to make UTeach program implementation a straightforward and achievable task, from planning for the first semester of classes to becoming a mature, self-sustaining program.

This introductory chapter emphasizes key aspects and features of UTeach, as articulated in the *UTeach Elements of Success*. The first section provides a brief overview of the development of UTeach at The University of Texas at Austin, illuminating how the program's origins helped to shape the developers' philosophy and approach to designing what has become a recognized model for science, mathematics, and computer science teacher preparation.

DEVELOPMENT OF UTEACH AT THE UNIVERSITY OF TEXAS AT AUSTIN

UTeach program design was influenced by many considerations, including the evolution of state and national standards for secondary STEM education. This section provides an overview of the circumstances leading to the creation of UTeach at UT Austin, the student-centered philosophy of the program developers, and the collaborative effort of dedicated stakeholders within the university and the community.

Historical Influences

Meaningful discussion about effective teacher preparation among scientists, mathematicians, and education researchers has historically been hindered by a prevalent notion that such programs were not truly consistent with the mission of a research university. This controversy often clouded public perceptions, and it played a role in the passage of Texas Senate Bill 994 in 1987, which was an especially aggressive attempt to transform secondary teacher preparation.

Reacting to warnings about the decay of secondary education in *A Nation at Risk*¹ and other widely circulated reports, Texas Senate Bill 994 required all secondary teachers to earn

a degree in their content area of instruction and *prohibited* more than 18 hours of pedagogy courses, including student teaching. As a result, University of Texas degrees such as Secondary Mathematics Teaching offered by the system's Colleges of Education were immediately eliminated.

Supporters of the legislation argued that greater numbers of bright, content-focused students should be encouraged to enter the teaching profession. Opponents, however, warned that an “unanticipated and detrimental effect of the elimination of education degrees may be the de-emphasis of teaching as a profession at the very time when Texas needs to attract its best and brightest young people into teaching.”² In fact, though some alternative, post-graduate pathways to teacher certification were developed—such as programs offered by the state's Education Service Centers—a significant shortage of highly qualified secondary STEM educators persisted.

Ultimately, it became clear that to successfully recruit STEM majors into teaching, much more had to be done *before* graduation. This was a primary motivation for the development of UTeach, whose innovative approach has produced a dramatic increase in STEM teacher production at The University of Texas at Austin since its inception in 1997.

¹ National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform*. Washington, DC: Author.

² Marder, M., & Confrey, J. (2011, February 5). UTeach. *Discovery: Research and Scholarship at The University of Texas at Austin*, 15(4).

Focusing on Student Success

Many students enter STEM degree programs because they have an affinity for the subject matter, with no particular inclination toward a secondary teaching career. And prior to UTeach, UT Austin STEM graduates who *did* consider teaching faced the requirement of transferring to the College of Education for an additional year of teacher preparation.

The developers of UTeach recognized that to fully tap the potential source of educators, the College of Natural Sciences would need to reach out to incoming freshmen and provide an attractive, streamlined path to certification. Of primary importance was that UTeach be perceived as commensurate with all other highly regarded programs and career options available at UT Austin. In essence, UTeach developers believed that many students would consider a career in secondary teaching if the choice were recognized, valued, and supported throughout their academic studies.

The developers' fundamental commitment to students has resulted in a program that begins with active recruitment of STEM majors. As an incentive to explore teaching as a viable career option, tuition rebates are offered for the first two introductory courses, in which students actually begin implementing lessons in K-12 classrooms. And, to make the program particularly appealing, the STEM major and education requirements are structured so that students can obtain a Bachelor of Science degree with secondary teacher certification in only four years.

During those four years, UTeach staff and faculty do as much as possible to support students in reaching their academic and

career goals. Creating an environment in which students feel they are part of a valued community is crucial in sustaining the commitment to teach, especially in a large university where students may otherwise lack a particular sense of identity. The program actively promotes a UTeach student organization, for example, and collaborative student work areas are intentionally located in close proximity to offices for advisors and master teachers, who maintain a welcoming open-door policy.

Finally, while the goal of UTeach is to increase production of enthusiastic and well-prepared teachers, special effort has been made to ensure that all degree plans permit students to continue in another direction, such as graduate school or a career in the sciences, if they so choose. As a result, the UTeach program expands, rather than limits, graduates' career opportunities. For those who do teach, the UTeach induction program offers personalized support and professional development for the first two to three years of graduates' teaching careers.

This focus on student success, both before and after graduation, is why UTeach is so highly regarded by students and the community and is thus a guiding principle for universities implementing the program.

Collaborative Planning and Implementation

To create a first-class STEM teacher preparation program, UTeach developers at UT Austin relied on extensive collaboration between the College of Education and the College of Natural Sciences, led jointly from the outset by a designated co-director from each school. A UTeach steering committee—

consisting of faculty from each college, master teachers with secondary teaching experience, student advisors, and local school district representatives—was immediately formed to provide general guidance as well as input into key administrative decisions, and the UT provost and the deans of the colleges allocated core funding for the UTeach faculty and course development. All of these initial stakeholders remain essential partners in promoting and sustaining the program.

To ensure a well-articulated instructional program, accomplished faculty from participating colleges worked together to develop the content and objectives of the UTeach curriculum, and courses were carefully arranged in a specific sequence. Developers from the College of Education were active in national discussions about how people learn mathematics and science, and those from the College of Natural Sciences were active in STEM research. Even faculty from the College of Liberal Arts were involved, specifically in the development of the Perspectives on Science and Mathematics course.

In addition to recruiting high-quality faculty, UTeach developers recognized the need to work closely with exceptional former secondary teachers, and thus created the designation of *master teacher*, which is a clinical, non-tenure-track but permanent faculty position. The responsibilities of master teachers have evolved over time to include teaching the initial recruitment courses, co-teaching courses with tenure-track professors, and supervising field experiences, internships, and the UTeach induction program. UTeach also depends on the participation of *mentor teachers*—practicing classroom teachers who work closely with UTeach students in their various field placements. Master teachers and mentor teachers serve as role models for

UTeach students, helping them to connect theory and practice in a real classroom environment.

THE UTEACH ELEMENTS OF SUCCESS

The *UTeach Elements of Success* outline aspects and features of the program that contribute to its effectiveness. As a whole, they articulate the operational structures and instructional philosophies that underlie the UTeach model at The University of Texas at Austin. The nine elements listed here are described in more detail below:

1. Distinctive Program Identity
2. Cross-College and School District Collaboration
3. Long-Term Institutional and Community Support
4. Compact and Flexible Degree Plans
5. Active Student Recruitment and Support
6. Dedicated Master Teachers
7. Rigorous, Research-Based Instruction
8. Early and Intensive Field Experiences
9. Continuous Program Improvement

Underlying the *Elements of Success* is the commitment of UTeach program developers to reform STEM education by reforming STEM teacher preparation. Their enthusiasm is embraced by the UTeach Institute, the organization charged with supporting implementation of UTeach programs at

universities across the United States and leading efforts toward continuous improvement of the UTeach model.

The *Elements of Success* can assist universities in making informed decisions about whether UTeach is a good fit with their own priorities, needs, and local characteristics, and they provide evaluation criteria for implementing UTeach programs.

1. Distinctive Program Identity

UTeach has an established identity as a prestigious secondary STEM teacher preparation program that attracts high-caliber students, experienced and successful master teachers, and tenure-track faculty who are interested in reforming STEM education.

- UTeach is an academic program that functions like a department, employing its own co-directors, program support staff, student advisors, master teachers, and tenure-track faculty.
- UTeach is name-branded and actively promoted through marketing materials, press releases, special announcements, and ceremonies that honor students and faculty.
- UTeach is the only undergraduate program at the university that recommends STEM majors for teaching certification.
- A UTeach website provides a comprehensive program description and ready access to course offerings, program news and reports, and other items of significance.

- A UTeach student organization fosters camaraderie among participants, establishes a presence on campus, and promotes the program to students and within the university community.
- UTeach students are honored for choosing to become teachers through special ceremonies; opportunities to meet with university administrators, program co-directors, and other supporters; and press coverage.

2. Cross-College and School District Collaboration

UTeach is a formally coordinated effort of the equivalents of the College of Education, the College of Liberal Arts, and the college(s) responsible for administering STEM degrees.

- UTeach co-directors—one representing the STEM college(s) and one representing the College of Education or its equivalent—collaborate to ensure effective program operations and a high-quality teacher preparation experience for students.
- A cross-college steering committee that includes representatives from program faculty and staff meets regularly to develop program policies, monitor curriculum and instructional effectiveness, and manage student affairs and program operations.
- Master teachers and tenure-track faculty from all participating colleges are actively involved in the development

and ongoing implementation of the UTeach program to ensure effective course articulation, explicit connections between mathematics and science, and an appropriate balance of STEM content and pedagogical instruction.

- Administrators, content specialists, and mentor teachers from one or more school districts work collaboratively with UTeach faculty to ensure relevant, high-quality field experiences, feedback, and mentoring throughout the students' UTeach program of study.

3. Long-Term Institutional and Community Support

UTeach is a long-term institutional and community priority that is sustained through ongoing financial support from university and college administrators, as well as a broader range of stakeholders concerned with STEM education reform. UTeach is afforded a level of stability similar to other university departments and is not an outreach effort.

- The university provides a recurring instructional budget, as well as ongoing in-kind support, such as appropriate office space, well-equipped classrooms and laboratories, dedicated student advisors, and an administrative office staff to provide professional services such as purchasing and managing materials, scheduling classes, and processing payments for mentor teachers and student internships.

- UTeach co-directors proactively advocate for programmatic needs and ensure that university leadership is kept informed of program progress and growth.
- Program elements that cannot be paid for by university instructional funds are supported by gifts from individuals, corporations, foundations, and other public and private sources.
- A dedicated task force made up of college development officers, business leaders, and UTeach faculty and staff works to promote the UTeach program and raise funds toward a long-term endowment goal.
- Instructors and staff apply for and administer competitive state and national grants and other awards to provide additional financial support to the program.

4. Compact and Flexible Degree Plans

UTeach offers four-year 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.

- UTeach recognizes that students with limited economic means may not be able to add undergraduate semesters to earn a teaching certification. We also explicitly understand the importance of diversifying the current secondary

STEM teaching force. As a result, UTeach degree plans allow students to earn both a degree in their major and teaching certification in the same amount of time required by equivalent undergraduate STEM degrees, usually between 120 and 126 semester credit hours, without the requirement and cost of additional undergraduate semesters.

- UTeach program degrees are equivalent in rigor to other undergraduate STEM degrees, in addition to being fully coordinated with state and national standards for teacher preparation in these disciplines.
- UTeach degree plans include a limited professional development sequence of specially designed courses in mathematics and science education as well as domain-specific mathematics and science courses that fulfill multiple university requirements.
- UTeach provides various pathways for completing required coursework such that program enrollment is open to students at any point in their undergraduate careers, allowing upperclassmen and post-baccalaureate candidates to complete the program in as few as three academic semesters under certain circumstances.

5. Active Student Recruitment and Support

UTeach actively recruits to attract the greatest possible number of STEM majors and provides

significant resources and encouragement to maximize program and career retention.

- UTeach employs a variety of targeted communication strategies and recruitment events to ensure that all STEM majors, particularly incoming freshmen, are invited to participate in the program and aware of its benefits.
- The first two, one-hour field-based courses allow students to try out teaching in a positive and supportive environment with no demand for commitment to continue in the program. Students are offered a financial incentive, such as a tuition rebate, for completing each of these courses.
- STEM major and UTeach program advisors actively support careers in teaching and are well informed about the wide variety of degree plans leading to certification, ensuring that UTeach pre-service teachers successfully meet all requirements for graduation.
- Students are provided a well-equipped workroom with appropriate meeting space, convenient to UTeach classrooms and master teacher and administrative offices, to build community, encourage collaboration, and develop peer support.
- Students have opportunities, facilitated and paid for by the program, to earn income and gain relevant work experience through flexible internship placements at nonprofit STEM or education-related organizations.
- UTeach graduates who enter the teaching profession receive two years of intensive,

individualized induction support, including classroom visits, regularly scheduled professional development opportunities, online mentoring, and access to a lending library of materials.

6. Dedicated Master Teachers

UTeach master teachers—non-tenured clinical faculty with exemplary secondary teaching experience—are exclusively dedicated to student support and program success.

- Master teachers are widely recognized for their educational leadership and secondary mathematics, science, or computer science teaching experience; have earned at least a master’s degree; and demonstrate their skill and passion for working with students and novice teachers.
 - Master teachers are appointed as non-tenured clinical faculty and are paid from the university instructional budget, hired at a ratio of approximately one per 50 students in a mature program.
 - Master teachers co-teach or formally support field-based courses, observing and providing written and oral feedback to evaluate and help students improve their skills throughout the program.
 - Master teachers manage field experiences, working with local school district teachers and administrators to ensure appropriate field placements and productive teaching experiences for UTeach students.
- Master teachers maintain an “open door” policy, making themselves available to students on demand (within reason).
 - Master teachers are active in program recruitment, manage student internships, and participate in a variety of other student support activities, including tracking students and identifying and following up with any students in danger of not completing the program.
 - Master teachers are knowledgeable about what new teachers encounter and provide ongoing and just in time career support for UTeach graduates, particularly during their first two years of induction into the profession.

7. Rigorous, Research-Based Instruction

UTeach courses are 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.

- 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. Students are required to demonstrate competency across domains ranging from STEM content knowledge to equitable instruction and

professional responsibility in order to be recommended for certification.

- UTeach faculty actively involved in STEM research teach content courses such as Functions and Modeling and Research Methods that address topics of particular importance for future STEM teachers, including the processes by which scientists and mathematicians arrive at new knowledge and methods.
- UTeach science and mathematics education faculty teach STEM pedagogy courses and are active in research related to STEM teaching and learning, including how students learn mathematics and science, how to assess what students know, and how to incorporate learning technologies to enhance student learning.
- UTeach faculty actively involved in research on the history or philosophy of science or mathematics teach Perspectives on Science and Mathematics, a content course that develops students' conceptions about the historical and philosophical development of STEM disciplines.
- Pedagogical instruction throughout the program is discipline specific, focusing on research-based best practices in STEM teaching and learning and the connections between mathematics and science and among the sciences.
- Course instructors—both master teachers and tenure-track faculty—purposefully model effective STEM instruction as students learn to employ research-based pedagogical methods

and strategies ranging from inquiry to direct instruction, connecting theory to practice throughout the program.

- Courses emphasize the underlying interconnections between mathematics and science and among the sciences, while making explicit what research in the learning sciences implies about the similarities and differences in how each is taught and learned. Science, mathematics, and computer science majors take UTeach courses together and collaborate whenever possible.
- All UTeach courses integrate research-based themes important to STEM education, including research on and strategies to ensure equitable instruction, how to create and analyze authentic assessments, and pedagogically effective uses of a wide variety of technological tools.

8. Early and Intensive Field Experiences

In order to promote confidence and accelerate professional development, UTeach students begin a carefully scaffolded sequence of intensive teaching opportunities in their first semester of the program and continue these field experiences throughout.

- Field experiences are domain specific, tightly articulated with the UTeach curriculum, and closely supervised by course instructors to promote full integration of critical knowledge and skills.

- Students develop their own lesson plans, using research-based instructional materials and strategies, with intensive coaching and feedback from both master teachers and tenure-track faculty who are experts in STEM content and pedagogy, in order to ensure UTeach expectations for accuracy and inquiry-based practice are met.
- Students experience multiple STEM teaching opportunities in high-need and diverse elementary, middle, and high school settings to gain an understanding of current K-12 public school environments and student populations.
- Beginning in their first semester and throughout the program, students' time in classrooms is carefully structured, from focused observations of authentic teaching to clinical interviews of students regarding problem-solving strategies to their own experiences teaching, receiving formative feedback, and revising and re-teaching lessons.
- Mentor teachers—host K-12 teachers who receive stipends for their collaboration—create supportive classroom environments, review lesson plans, and provide oral and written feedback to UTeach students after observing them teach.

9. Continuous Program Improvement

UTeach systematically collects and analyzes both student- and program-level data to make informed decisions about program development and improvement.

- UTeach systematically gathers and reports data on the characteristics of its students and graduates, including numbers of students, grade point average distributions, demographic information, graduation rates, and retention rates in teaching.
- UTeach program co-directors, master teachers, tenure-track faculty, and administrative staff regularly review data on program indicators, reflect on successes and challenges, plan for upcoming semesters, and continue to refine program components.
- The UTeach curriculum is regularly reviewed by the steering committee and instructional teams of faculty and refined to ensure course alignment, minimize redundancies, and update content in accordance with current research on best practices and state and national guidelines.
- Students provide formal, anonymous feedback on the UTeach program and courses through a variety of surveys and are given the opportunity to voice opinions in the presence of program decision-makers at regularly scheduled events and activities.

- UTeach program co-directors, master teachers, tenure-track faculty, and administrative staff interact regularly with colleagues from universities replicating UTeach and other institutions to share information on program development, management, and general concerns related to STEM teacher preparation and support.