**Annual Report for Period:** 04/2000 - 03/2001  
**Submitted on:** 12/31/2000  
**Principal Investigator:** Marder, Michael P.  
**Organization:** U of Texas Austin  
**Title:**  
UTeach-A Secondary Pre-service Program in Science and Mathematics  

<table>
<thead>
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<th>Project Participants</th>
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<tr>
<td><strong>Senior Personnel</strong></td>
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<tr>
<td>Name: Marder, Michael</td>
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<tr>
<td>Worked for more than 160 Hours: Yes</td>
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<td>Contribution to Project:</td>
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<tr>
<td>Name: Confrey, Jere</td>
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<tr>
<td>Worked for more than 160 Hours: Yes</td>
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<td>Contribution to Project:</td>
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<tr>
<td>Name: Laude, David</td>
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<tr>
<td>Worked for more than 160 Hours: Yes</td>
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</tbody>
</table>
| Contribution to Project:  
David Laude was the faculty member who taught a new course, Research Methods, that we developed this past semester. No NSF funding was needed to support him. |
| Name: Petrosino, Tony  |
| Worked for more than 160 Hours: Yes |
| Contribution to Project:  
Tony Petrosino last spring taught Project-Based Instruction, one of the courses in the UTeach professional development sequence being developed under this grant. |
| Name: Stroup, Walter  |
| Worked for more than 160 Hours: Yes |
| Contribution to Project:  
Walter Stroup taught Knowing and Learning, one of the UTeach courses under development in this proposal |
| Name: Brand, Jerry  |
| Worked for more than 160 Hours: Yes |
| Contribution to Project:  
Jerry Brand began doing advance work this past summer for a conference we will hold to coordinate with community colleges. |
| **Post-doc** |
| **Graduate Student** |
| **Undergraduate Student** |
| **Technician, Programmer** |
| **Other Participant** |
Name: Dodson, Melissa
Worked for more than 160 Hours: Yes
Contribution to Project:
Melissa Dodson has worked for UTeach full time in two capacities. She is the program evaluator, and has prepared a variety of surveys and other evaluation materials. She is also student advisor.

Name: Kaye, Forgione
Worked for more than 160 Hours: Yes
Contribution to Project:
Kaye Forgione has been working for UTeach by assembling materials for dissemination and improvement, and representing us at conferences. She has prepared the materials on curriculum alignment that occupied many UTeach personnel throughout this past fall.

Name: Long, Mary
Worked for more than 160 Hours: Yes
Contribution to Project:
In addition to teaching UTeach courses, Mary Long participated this semester in developing our model for student teaching.

Name: Walker, Mary
Worked for more than 160 Hours: Yes
Contribution to Project:
Mary Walker assisted with the development of Research Methods, and also assisted in developing our model of student teaching.

Name: Carmack, Gail
Worked for more than 160 Hours: Yes
Contribution to Project:
Gail Carmack was an instructor for Project-Based Instruction, one of the courses being developed under this grant.

Name: Evertson, Gayle
Worked for more than 160 Hours: Yes
Contribution to Project:
In addition to teaching duties in UTeach, Gayle worked on developing a new degree plan for the Middle Grades.

Research Experience for Undergraduates

Research and Education Activities:
Our proposal was built around four thematic areas, with a set of activities described for each one. Although the grant has only been active for six months, we have progress to report on many of them, and
I will recall them in turn, describing what has happened so far.

**ACTIVITIES for GOAL ONE--Continuous Field Experience.**

1. Strengthen recruitment efforts at high schools by sending student ambassadors to recruitment fairs throughout the state.

   Has not happened yet, as grant began after current recruiting cycle. Nevertheless, all introductory courses are enrolled at capacity.

2. Develop and implement a structured framework for identifying, recruiting, and providing on-going staff development for mentor teachers.

   The UTeach Master Teachers meet regularly with mentor teachers and continue to acquire information on excellent area teachers who can serve as mentors for our students.

3. Develop electronic portfolio system to track the pre-teachers' progress toward meeting the State's Learner-Centered Proficiencies.

   We have drafted a portfolio document outlining students' progress towards meeting the Learner-Centered Proficiencies. Students use this document to gauge their progress, and portfolio reviewers use it to evaluate the students. We have not yet implemented an electronic system for monitoring progress.

4. Develop video resources for field-based courses on Classroom Interactions and Project-Based Instruction in Science and Mathematics.

   Resources have been assembled for this task, largely from sources other than this grant, but it has not yet been carried out.

**ACTIVITIES for GOAL TWO--Exemplary Undergraduate Education**

1. Develop exemplary content courses that illustrate the best of Standards-based approaches in content and pedagogy at the undergraduate level.

   The domain course 'Functions and Modeling' continues to be taught and refined. A new course, 'Research Methods,' was first taught in spring 2000, and then in a completely different way in fall 2000. It continues to develop rapidly. A course on biotechnology is scheduled for development in spring 2001.

2. Use internet technology to refine and disseminate the instructional materials developed in these courses.

   Premature, as we will discuss later.

3. Offer sections of these undergraduate courses during evening and summer periods so they are accessible to practicing teachers.

   We are currently stretched to capacity offering our courses to undergraduate majors in UTeach. The College of Natural Sciences offered last summer a Master Teacher Summer Institute, a five-week institute giving graduate credit, and aimed at improving the content knowledge of 75 inservice secondary teachers. This summer the
Institute hopes to expand to nearly double the size. The resources and staff for this Institute are separate from those supported by this grant.

4. Reform selected sections of large service courses in cooperation with parallel efforts in College of Natural Sciences.

The College of Natural Sciences has established a list of constituencies for Small Classroom Experiences, which are relatively small sections of introductory service courses taught by the College's best instructors. Nine courses of this type are now being offered, and more are planned. UTeach students are among those eligible to take these classes.

ACTIVITIES for GOAL THREE--Equity and Excellence in Mathematics and Science Education.

1. Continue early recruitment methods that have proven successful in attracting a diverse group of students to teacher preparation in math and science. Increase early recruitment by sending student ambassadors to urban and rural areas to promote UTeach.

A letter to all incoming freshmen in Natural Sciences continues to be our most effective recruiting tool. Introductory courses are all filled to capacity. These improvements will be implemented in future recruiting cycles.

2. Relieve financial pressures by assisting in application for state funds supporting preteachers, and providing paid internships in the science and math community.

We encourage students to apply for pay-back fellowships made available by the State, and have created an internship program. Each semester between 50 and 60 students work 10-20 hours per week for nonprofit educational organizations in the Austin area. This program has been very popular with area foundations, which have provided all the funding. In addition, we have been informed that a substantial new source of fellowship support will soon be made available, in cooperation with the Austin Independent School District.

3. Relieve academic pressures by providing special sections of service courses, tutoring services, and peer mentoring.

This goal is partly being met through the Small Classroom Experiences provided by the College of Natural Sciences, and through cohort support within UTeach.

4. Address issues of equity within preservice courses, providing students with techniques and strategies for working with diverse student populations.

These issues are addressed in the new courses Knowing and Learning and Classroom Interactions that have are under continuing development for UTeach.

5. Establish field-placement sites with mentor teachers who have been
successful in promoting student success in a full range of urban settings.

UTeach has a close connection to Travis high school, an urban high school also linked to the University of Texas through co-PI Confrey’s Systemic Research Center. Many student placements occur in this school, particularly those associated with the course Classroom Interactions. A range of excellent mentor teachers has been located throughout Austin, many of whom teach in the challenging urban conditions we allude to here.

ACTIVITIES for GOAL FOUR-- Technology Integration:

1. Integrate technology into all innovative content courses and provide pedagogical support to participating faculty through ongoing faculty seminars and workshops.

All the new courses developed for UTeach weave educational technology use into the instruction. For example, Functions and Modeling makes use of motion detectors and Geometer’s Sketchpad. Final projects for Project-Based Instruction involve creating a CD-ROM with interactive instructional material. Many of the courses have a web page with extensive resources that plays an important role in the instruction.

2. Model the use of technology in all subject-matter focused education courses both as demonstration device and learning tool.

As mentioned above, educational technology is employed in this fashion in all the new courses we have created or are creating.

3. Update the technological skills of inservice and mentor teachers through enrollment in the program’s new innovative courses.

Strategies to implement this goal are still in the discussion stage. We note that one week of this past summer’s Master Teacher Summer Institute was devoted to educational technology.

4. Create a set of focused videos that illustrate key concepts in the courses on Knowing and Learning and Classroom Interactions to support professional development.

We have assembled resources needed to create these videos, but they have not yet been produced.

5. As part of portfolio review, evaluate all students against technology benchmarks.

Draft technology benchmark standards can be found in Appendices 2 and 3.

Findings:

As this grant has only been active for six months, it is somewhat premature to speak of major findings. We hope that we are establishing a national model for preservice education in science and mathematics,
and that our program will help serve as a prototype for other institutions that share similar goals.

We are making progress towards the goals we established for ourselves at the beginning of the grant. Total enrollment in UTeach is now over 270 science and mathematics majors. We graduated a first group of seven student teachers this fall, and will have another 30 students entering student teaching in the spring. All of the seven recent graduates will soon start to teach, many of them within the next few weeks. Most of these students have the level of skill in mathematics or science that would allow them to continue to graduate school if they chose.

UTeach is being closely evaluated at a number of levels. The evaluations are arranged by Dr. Melissa Dodson, whom we have employed to oversee these efforts. We are working out a cooperative arrangement with the Southwest Texas CETP in which each program helps evaluate the other to improve objectivity. Another portion of the evaluation has been coordinated by Dr. Kaye Forgione.

The progress of every student is carefully examined, during introductory field-experience course by Mentor and Master teachers, during professional development courses by Education faculty, during review of each student's portfolio, and during the student teaching semester.

We have prepared five documents related to program evaluation so far during this grant.

1.) The progress of every UTeach course is evaluated through formative evaluations given to every student at mid-semester. The results of these evaluations are given to each instructor and to UTeach program directors. The results of these evaluations are confidential, so we will just report the results of two questions, without mentioning the course or instructor to which they apply.

Responses to questions on Overall Course Value for courses developed especially for UTeach.

(Average responses on scale of 1 to 5 with 1 disagree, and 5 strongly agree for 15 courses)

Before this semester I thought
At this point in time I feel this
this course would be of course will be (or already has been
value to me.of value to me.

4.04.5
4.24.7
4.54.5
4.24.6
3.94.2
3.84.4
3.84.0
4.04.2
4.24.2
We include the survey document as Appendix 1.

2.) We have written a Holistic Program Evaluation plan. A good sense of the scope of this plan is provided by the table of contents, which is

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The full report appears as Appendix 2

3.) We have prepared a portfolio review packet. It contains a detailed description of how each student must meet the Texas Learner-Centered Proficiencies in completing his or her portfolio. It appears as Appendix 3.

4.) We have been monitoring the retention and academic success of the UTeach students as a whole. Two statistics particularly worthy of note are that UTeach students have an average GPA of 3.1 versus a College average of 2.8 and University average of 2.9, and that we have so far retained over 60% of the students who began with us as freshmen, compared to a College six-year graduation rate of about 30%. A summary of the retention data appears as Appendix 4.

5.) We spent much of the semester mapping out the curriculum in the UTeach sequence. We examined the syllabus of each of the courses specifically created for UTeach, and had wide-ranging discussions on topics included and omitted. A summary of these discussions has been prepared by Kaye Forgione, and is included as Appendix 5.

**Training and Development:**
The creation of UTeach involves the training and development of four separate groups of people

1. Faculty in the College of Education are developing a completely new professional development sequence for UTeach students. Generic Education courses have been eliminated, and they have been replaced
with new courses specifically devoted to the problems of teaching, learning, and knowing science and mathematics. A recent alteration of certification requirements by the State of Texas requires us to create a new Middle Grades certification program, and this new program will involve two more courses, one on Reading, Writing, and Assessment in Mathematics and Science, and the other on Adolescent Development.

2. Faculty and staff in the College of Natural Sciences are developing a course on Research Methods, have assisted with domain courses on Functions and Modeling, Geometry and Visualization, and will develop additional courses including Biotechnology, and Biostatistics. They are also teaching Small Classroom Experience sections of introductory service courses to UTeach and other students.

3. UTeach students are working towards teaching certificates in secondary and middle grades mathematics and science. In addition, they have the opportunity to work as interns in a wide variety of nonprofit educational ventures throughout Austin.

4. Teachers in the Austin Independent School District have the opportunity to work with UTeach students when our students are interns, during early field-experience courses, and when they are student teachers. When UTeach students bring innovative projects into the classrooms, all parties benefit from the exchange of ideas. We can point to an increasing number of programs throughout Austin beginning to view UTeach interns as an important resource.

**Outreach Activities:**
While UTeach does involve outreach --- particularly the internship program, which places between 50 and 60 students in educational programs each semester --- we feel that the preparation of skilled teachers of science and mathematics is our most important activity. The notion of outreach make most sense in the context of a basic research grant that has education as an auxiliary focus, rather than this one in which education and improvement of the educational system is the primary focus.

**Journal Publications**

**Books or Other One-time Publications**

**Web/Internet Site**

**URL(s):**
http://www.utexas.edu/cons/uteach.html

**Description:**
Our web site has not been updated much since we received the CETP award, and is not terribly complete. We are working to correct this situation.

**Other Specific Products**

**Contributions within Discipline:**
The principal discipline of our project is the preparation of secondary science and mathematics teachers. To the best of our knowledge, with 270 students enrolled, UTeach is now the largest program of this type at any research institution in the United States. We hope we can show other research institutions how colleges of Science and Education can work profitably together for a dramatic increase in the quantity and quality of the certified secondary teachers they prepare.

**Contributions to Other Disciplines:**
Our project has no importance for the other disciplines of science and engineering, except that if there are no qualified teachers of science and mathematics, there will be few US citizens able to enter these fields in the future.

**Contributions to Human Resource Development:**
UTeach is exclusively concerned with the development of human resources, the preparation and support of future secondary science and mathematics teachers, and the professional development of the teachers in the schools with whom they work.

We have 270 students currently enrolled, have just graduated a group of 7 secondary teachers, and will have 30 in student teaching next semester.

**Contributions to Resources for Research and Education:**
The materials for the UTeach courses constitute an information resource upon which it will eventually be possible to build similar programs at other institutions.

We have developed detailed sets of materials for the following courses:

- STEP I (1 hour field course)
- STEP II (1 hour field course)
- Knowing and Learning in Science and Mathematics (3 hours)
- Classroom Interactions (3 hours)
- Project-Based Instruction (3 hours)
- Research Methods (3 hours)

We have not yet decided how to make the materials for these courses available. There is concern, for example, that commercial publishers could take over our materials and then try to prevent us from using them without payment. This scenario would sound fantastic if one of the faculty associated with our program had not already experienced it. We intend to make course materials available in a form that can be disseminated, but whether we settle upon books, CD's, the web, or other media is still a matter of discussion within the faculty. The materials for some of these courses are far from polished, so it would be inappropriate to distribute the materials right now in any event.

**Contributions Beyond Science and Engineering:**
I believe that the deficiencies of the US educational system pose the largest standing threat to the welfare of the country. Many national politicians appear to agree. The current economic expansion has been fueled by the development of the technology sector, which demands workers highly skilled in computer science, engineering, mathematics and science. Despite the generous salaries given these positions, there are not enough trained US citizens to fill them, and around
85,000 skilled foreign workers obtain visas each year to take them. Many business leaders regard the hiring of foreign workers as a quick fix that relies on the relative strength of our economy compared to that of other countries, particularly India and China.

While the dependence of the US economy upon knowledge workers increases, the educational infrastructure to prepare them is decaying. Every level of the educational system demands rapid improvement, but the greatest difficulties lie in the upper elementary and secondary grades. A large group of excellent teachers hired in the 50s and 60s is beginning to retire, and shortages of qualified science and mathematics teachers are widespread and growing. UTeach provides a model for how research universities can attempt to fight these dismaying trends. I hope that the lessons we learn will be of value beyond the boundaries of our campus, and that our efforts are not too little and too late.

Special Requirements

Special reporting requirements: None
Change in Objectives or Scope: None
Unobligated funds: $ 419,450.00

Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:
Organizational Partners
Any Journal
Any Book
Any Product
Appendix I

Formative evaluation, distributed at mid–semester to all UTeach classes.
Course Number and
Instructor: ________________________________

This questionnaire is completely confidential, and your honesty is greatly appreciated.

The major objective of this survey is to aid in improving teaching effectiveness. Your responses provide valuable feedback to instructors, administrators, and other students. Please respond honestly and fairly. Consider the semester up to this point and try not to focus on isolated incidents. Mark (E) the response that most accurately reflects your opinion.

SECTION 1: Course Instruction
So far in this semester, the instructor?

strongly 
agree 
neutral 
agree

1. seems well-prepared for class.
2. shows a thorough knowledge of course material.
3. selects and uses relevant resources (books, handouts, web sites)
4. models effective teaching practices.
5. states class objectives and student expectations.
6. makes the course content relevant.
7. uses a fair grading system.
8. shows genuine concern for the quality of his or her teaching.
9. ensures class meetings are interesting and engaging.
10. is receptive to students’ questions and comments.

SECTION 2: Overall Course Value
11. Before this semester began, I thought this course would be of value to me.
12. At this point in time, I feel this course will be (or already has been) of value to me.

SECTION 3: Open Comments
Please respond to the following questions. Use the back page if necessary.

14. What aspects of the content and instruction for this course are the best?

15. What could the instructor do to improve the course content and his or her instruction?
Note: The Holistic Program Evaluation Model involves different stages of evaluation. These stages are labeled A–E on the following diagram. The focus of each stage is described below:

Stage A: Are the UTeach courses aligned with the proficiencies expected of students?
Stage B: Are we doing what we said we would do to achieve our program goals?
Stage C: Are UTeach students developing the skills, knowledge and attributes we desire?
Stage D: Are students who complete the program meeting the required proficiencies?
Stage E: Are graduates becoming teacher–leaders who meet professional standards?
**MISSION STATEMENT**

This statement represents the ultimate purpose of the program – it should remain constant for the duration of the program.

Through the collaborative partnership of the College of Natural Sciences, the College of Education and the Austin Independent School District, UTeach will provide a high-quality teacher education that will increase the number and diversity of competent UT math, science and computer science students entering the teaching field and assuming positions of educational leadership in their fields.

**DESIRED PRODUCTS**

These are the desired characteristics of our students as they move through various stages of our program. They fall into three categories: desired outcomes (for students who have graduated and are teaching in the schools), desired outputs (for students who are completing the program), and desired behavioral objectives (for students who are moving through the program).

**DESIRED OUTCOMES:**

Professional educators who were certified through the UTeach program will perform in a manner consistent with the following professional development standards established by the Texas State Board for Educator Certification (SBEC). These educators will be able to:

1. design instruction appropriate for all students that reflects an understanding of relevant content and is based on continuous and appropriate assessment.
2. create a classroom environment of respect and rapport that fosters a positive climate for learning, equity and excellence.
3. 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.
4. fulfill professional roles and responsibilities and adhere to legal and ethical requirements of the profession.
5. understand the central concepts, tools of inquiry and structures of the discipline and be able to create learning experiences that make the subject matter meaningful to students.

*Data sources (for Evaluation Stage E):*
- induction year self-assessments
- mentor evaluations of induction year students
- administrator evaluations of induction year students
- longitudinal retention data

**DESIRED OUTPUTS**

Upon completion of the program, UTeach students will demonstrate proficiency on two sets of standards: the Learner–Centered Proficiencies, which were established by SBEC, and the Technology Performance Profiles, which were established by the International Society for Technology in Education (ISTE). These standards are summarized in the following portfolio and technology benchmarks established by the UTeach Program:

*Portfolio Benchmarks:*

**UTeach Graduates will be able to:**

1. Design Learner–Centered Instruction, as evidenced by their ability to:
   - Actively engage students in a variety of interesting, challenging and worthwhile activities.
   - Help students connect new content with their prior knowledge and gain insights into their misconceptions.
   - Develop clearly-stated objectives that are age-appropriate and able to be assessed.
   - Guide students in using appropriate technologies to gather, organize and display data.
   - Select or design a variety of worthwhile assessment instruments, some of which involve student self-assessment.

2. Establish a Learner–Centered Classroom, as evidenced by their ability to:
   - Model a respect for diversity and encourage all students to work together cooperatively.
   - Develop learning activities that emphasize collaboration and teamwork.
   - Consistently and effectively enforce high expectations for student behavior.
   - Respond flexibly to students in the classroom, using on-going assessment to adjust instruction.
   - Employ safe practices in designing, planning and implementing all instructional activities.

3. Foster Learner–Centered Communication, as evidenced by their ability to:
   - Ask carefully-framed questions that help students develop higher-order thinking skills and logical reasoning/problem solving abilities.
   - Facilitate reflection and discussion between students about their inquiry experiences.
   - Engage students in tasks that require them to communicate their reasoning using appropriate and precise terminology.
   - Communicate the importance of the instructional content and his/her expectations for high quality work.
   - Provide students with timely feedback that is accurate, constructive, substantive and specific.

4. Practice Learner–Centered Professionalism, as evidenced by their ability to:
   - Engage in collaborative decision-making and problem-solving with other educators.
   - Engage student families in their children’s education and respond appropriately to their concerns.
   - Engage themselves in a variety of activities to continually enhance his/her content and pedagogical knowledge and skills.
### Technology Benchmarks

#### Science Candidate
1. Use terminology related to computers and technology appropriately in communications.
2. Operate a multimedia computer system with a peripheral imaging device, such as a scanner or an educational software package.
3. Demonstrate knowledge of basic troubleshooting techniques to solve routine hardware and software problems that occur in the classroom.
4. Use technology to access and organize data, as evidenced by their ability to:
   - Use database management and spreadsheet applications on the computer.
   - Locate and collect information for lessons using computer-based technologies.
   - Use search engines to locate information on the Internet.
   - Demonstrate knowledge of basic technological techniques to solve routine hardware and software problems that occur in the classroom.

#### Mathematics Candidate
1. Apply both informal and formal mathematical reasoning in problem solving.
2. Identify appropriate technology to explore a mathematical problem, and explain the limits that this technology would place on the knowledge-acquisition process.
3. Generate a mathematical model to represent the situation.
4. Understand and apply connections among mathematical concepts, procedures, and representations.
5. Demonstrate knowledge of the organization and structure of the mathematical sciences, in particular.

### Reflection
1. Reflect on how your teaching impacts others and encourage feedback from students and colleagues.
2. Demonstrate Expertise in the Discipline, as evidenced by their ability to:
   - Identify a refined and focused question for an inquiry investigation, and characterize the way in which the study would be conducted.
   - Illustrate knowledge of the history and philosophy of science; specifically, the changing nature of scientific knowledge and theories.
   - Demonstrate knowledge of the organization and structure of the mathematical sciences, in particular.
   - Apply technology to enhance student-centered learning, as evidenced by their ability to:
     - Identify technology resources that are specifically designed for use by students to meet a specified learning objective.
     - Design, deliver, and assess a student-centered learning activity in which students demonstrate knowledge of technology-related legal and ethical issues, such as copyright, privacy, and security of student data and information.
     - Apply technology to student-centered learning, as evidenced by their ability to:
       - Describe current instructional practices and resources as they relate to the use of computers and technology in the classroom.
       - Describe strategies for using technology to affirm diversity and provide equitable access to resources.
       - Assess the instruction and effectiveness of an electronic information resource used by students.
       - Use technology to facilitate the sharing of ideas and knowledge among classmates.

### Critical Thinking
1. Apply critical thinking to the selection and use of technology in the classroom, as evidenced by their ability to:
   - Describe current instructional practices and resources as they relate to the use of computers and technology in the classroom.
   - Describe strategies for using technology to affirm diversity and provide equitable access to resources.
   - Assess the instruction and effectiveness of an electronic information resource used by students.
   - Use technology to facilitate the sharing of ideas and knowledge among classmates.

### Reflection
1. Reflect on how your teaching impacts others and encourage feedback from students and colleagues.
2. Demonstrate Expertise in the Discipline, as evidenced by their ability to:
   - Identify a refined and focused question for an inquiry investigation, and characterize the way in which the study would be conducted.
   - Illustrate knowledge of the history and philosophy of science; specifically, the changing nature of scientific knowledge and theories.
   - Demonstrate knowledge of the organization and structure of the mathematical sciences, in particular.
4. Demonstrate knowledge of technology-based assessment and evaluation strategies |

5. Identify and/or use assistive technologies to meet the special physical needs of students.

**Data sources (for Evaluation Stage D):**
- Student teaching assessments
- Final portfolio review performance
- Course grades/GPA

**Desired Behaviors**

- Course grading criteria will be established to reflect objectives.
- Students must complete the requirements of their respective majors.

**Data sources (for Evaluation Stage C):**
- Student self-assessments at the end of each course
- Course grades
- Initial portfolio reviews

**Desired Behaviors**

- Students will be guided through these behavioral courses and satisfactorily complete the requirements of their respective majors.
Early and on-going guided field experiences in a variety of public school settings with diverse student populations.

b) Establish a field experience coordinator within the UTeach program.

c) Make expectations of students and mentor teachers clearly understood by both parties.

d) Select well-qualified and committed mentor teachers in schools with diverse student populations.

Early and on-going guided field experiences in a variety of public school settings with diverse student populations.

b) Establish a field experience coordinator within the UTeach program.

c) Make expectations of students and mentor teachers clearly understood by both parties.

d) Select well-qualified and committed mentor teachers in schools with diverse student populations.
e) Provide assistance to COE faculty in establishing field experience sites for their courses.
f) Make sure students have access to teaching materials and transportation to field sites.
g) Maintain open communication with school administrators to monitor quality/concerns.
h) Keep records of student attendance and performance.

Integration of technology competencies in all aspects of the program.

a) Establish a "home" for each technology benchmark in one or more of the UTeach courses.
b) Make students aware of the technology benchmarks associated with each course by placing them on the course syllabi.
c) Make technology benchmarks available to all students early in the program.
d) Ensure that benchmarks are current with the state/national standards.
e) Provide easy and well-monitored student access to computers, software and technological tools.
f) Set up a notebook lending library for students.
g) Maintain grant-writing efforts to obtain monies for updating UTeach technology labs.

Structured assessments throughout the program that actively involve students in an ongoing self-assessment of their own professional growth and development.

a) Obtain student self-assessments on course objectives at the end of each UTeach course.
b) Meet individually with each student prior to student teaching to establish a personalized professional development plan based on their self-assessments.
c) Discuss the portfolio review process early and often, including the importance of reflections.
d) List and discuss the portfolio and technology components associated with each course.
e) Incorporate reflections on field-experiences in STEP 1 and STEP 2.
f) Have students assess each other's teaching, especially during the student teaching semester.

Establishment of a coherent and viable network (electronic, personal, institutional) for continuous professional development of program graduates.

a) Do a preliminary assessment of new-teacher needs to help formulate the induction year program.
b) Set up email accounts and telementoring relationships for all UTeach graduates during the induction year.
c) Bring all UTeach graduates back to campus for a weekend induction year seminar.
d) Facilitate discussion between UTeach graduates who are in their induction year.
e) Establish a "career center" for UTeach students that helps them identify prospective teaching positions.

11. Collaborative governance of the program that is committed to the management of program curriculum, resources and instruction.

a) Maintain a representative steering committee, composed of members from COE, CNS, AISD and a student representative.
b) Establish regular schedule for steering committee.
c) Establish the responsibilities of the steering committee, including the key leadership role in governance and management of curriculum, quality of personnel, and implementation of the assessment system and its results.
d) Keep provost and deans up to date on progress of UTeach.
e) Maintain an aggressive grant-writing schedule to ensure financial stability of program.

Data sources (for Evaluation Stages A & B):
- Checklist of stated process objectives (by UTeach personnel)
- Formative course evaluations
- UT course evaluations
- Annual student program evaluations (random sample)
- Advisor records of student grades/portfolio reviews
- UTeach budget and expense accounts
- Steering committee minutes
- Annual curriculum mapping
- Student exit surveys
- Student graduate surveys
- Induction year evaluations

Continual refinement of the UTeach program and curriculum based on evaluation data and educational research.

a) Establish an internal evaluator position for the UTeach program.
b) Set up a regular evaluation schedule (semester and annual assessments).
c) Evaluate data expeditiously and post student evaluation data on the web.
d) Do a complete internal program evaluation each summer.
e) Hire an external program evaluator once every 3 years.
f) Discuss evaluation results at steering committee meeting and proceed with recommendations.
### Data Collection Calendar

**Collected Each Semester:**

<table>
<thead>
<tr>
<th>Data Source</th>
<th>When Assessed</th>
<th>Who Completed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field teaching reviews:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson reviews</td>
<td>After each lesson (5X)</td>
<td>Mentor teacher</td>
</tr>
<tr>
<td>Summative reviews</td>
<td>End of semester</td>
<td>Mentor teacher</td>
</tr>
<tr>
<td>Student teaching reviews:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson reviews</td>
<td>3X during semester</td>
<td>UT supervisor</td>
</tr>
<tr>
<td>Mid-semester review</td>
<td>Mid-semester</td>
<td>Mentor teacher</td>
</tr>
<tr>
<td>End of year review</td>
<td>End of semester</td>
<td>UT supervisor</td>
</tr>
<tr>
<td>Mentor Teacher Survey</td>
<td>End of semester</td>
<td>Mentor Teacher</td>
</tr>
<tr>
<td>Formative course evaluations</td>
<td>Mid-semester, each course</td>
<td>Students</td>
</tr>
<tr>
<td>End of semester, each course</td>
<td>Students</td>
<td>Students</td>
</tr>
<tr>
<td>Student self-assessments</td>
<td>End of semester, each course</td>
<td>Students</td>
</tr>
<tr>
<td>UT course evaluations</td>
<td>End of semester, each course</td>
<td>Faculty</td>
</tr>
<tr>
<td>Technology benchmarks</td>
<td>End of semester</td>
<td>Students</td>
</tr>
<tr>
<td>Program graduate surveys</td>
<td>End of each month</td>
<td>Administrative</td>
</tr>
<tr>
<td>Budget/Expense Accounts</td>
<td>Monthly</td>
<td>Associate</td>
</tr>
<tr>
<td>Steering Committee Minutes</td>
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<td>Internal Evaluator</td>
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**Collected Annually:**

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<tr>
<th>Data Source</th>
<th>When Assessed</th>
<th>Who Completed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio Reviews</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First portfolio</td>
<td>Early November or April</td>
<td>Portfolio review committee</td>
</tr>
<tr>
<td>Final portfolio</td>
<td>Early November or April</td>
<td>Portfolio review committee</td>
</tr>
<tr>
<td>Induction Year Reviews</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self- assessments</td>
<td>Late spring</td>
<td>Program graduates</td>
</tr>
<tr>
<td>Admin. Assessment</td>
<td>Late spring</td>
<td>School administrators</td>
</tr>
<tr>
<td>Mentor Assessment</td>
<td>Late spring</td>
<td>Induction year mentors</td>
</tr>
<tr>
<td>Review of Course Grades</td>
<td>Late spring</td>
<td>Advisor</td>
</tr>
<tr>
<td>Checklists of Processes</td>
<td>Summer</td>
<td>UT teach staff/personnel</td>
</tr>
<tr>
<td>Student exit surveys</td>
<td>Late spring/fall</td>
<td>Students</td>
</tr>
<tr>
<td>ExCET exam scores</td>
<td>When available</td>
<td>Texas Education Agency</td>
</tr>
<tr>
<td>Faculty vita</td>
<td>Summer</td>
<td>Faculty</td>
</tr>
<tr>
<td>Program Evaluation</td>
<td>February</td>
<td>25% of student population</td>
</tr>
</tbody>
</table>

### Data Compilations Reviewed Each Summer:

<table>
<thead>
<tr>
<th>Focus</th>
<th>Summarizes data from</th>
<th>Compiled by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student performance</td>
<td>Student self-assessments</td>
<td>Internal evaluator</td>
</tr>
<tr>
<td></td>
<td>Student teacher evaluations</td>
<td></td>
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<td></td>
<td>Graduate surveys</td>
<td></td>
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<td></td>
<td>Student course grades</td>
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<td></td>
<td>ExCET scores</td>
<td></td>
</tr>
<tr>
<td>Academic program</td>
<td>Course evaluations</td>
<td>Internal evaluator</td>
</tr>
<tr>
<td></td>
<td>Student self-assessments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Portfolio/technology reviews</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Curriculum mapping</td>
<td></td>
</tr>
<tr>
<td>Program management</td>
<td>Steering committee minutes</td>
<td>Internal evaluator</td>
</tr>
<tr>
<td></td>
<td>Retention</td>
<td></td>
</tr>
<tr>
<td></td>
<td>data/demographics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Projections/scheduling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overview of budget/spending</td>
<td></td>
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<td></td>
<td>Student program evaluations</td>
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<td></td>
<td>Exit surveys</td>
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<td>Exit surveys</td>
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<tr>
<td></td>
<td>Exit surveys</td>
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</tbody>
</table>
Natural Language Questions from Stakeholders
The natural language questions below represent the specific questions raised by those
who have an interest in the program expressed in everyday, common sense language.
Also included are the variables to measure, the measurement instruments, and the data
analysis procedure. Data analysis procedures represent those qualitative and quantitative
methods used to answer each natural language questions. These procedures can include
any combination of naturalistic (i.e., case study, observations), descriptive (i.e., mean,
variance), associational (i.e., correlation, multiple regression), and cause and effect
(ANOVA, MANOVA) techniques.

Future Parents
Q1: Will my child learn math and science better with this teacher in the classroom?
Q2: Will this teacher turn my child onto math and science?
Q3: Will this teacher come to my school and remain there for a while?

State of Texas School Districts
Q4: Will there be a supply of new teachers to fill Texas school classrooms?
Q5: Will these teachers help to raise state-achievement scores in math and science?
Q6: Will these teachers have the skills and the desire to remain in the teaching
profession?
Q7: Will these teachers be able to teach a variety of subjects to diverse populations?
Q8: Will these teachers be able and willing to assume a leadership position in their
schools?

Accreditation SBEC/NCATE
Q9: Does the program meet state/national standards adequately to merit state/national
accreditation?
Q10: Is the program able to produce candidates who meet the state/national standards for
teaching?
Q11: Is the program able to assess and document the preparedness of candidates for
certification?

Contributing Foundations and Agencies
Q12: Is the program successful in addressing a goal that I value?
Q13: Does the program have the resources and leadership necessary to sustain a
successful operation?

University Provost/President
Q14: Does the UTeach program have the resources and leadership necessary to sustain a
successful operation?

Variable Categories and Measurement Instruments

### 1. Ability of the Program to Produce Good Teachers
(Q. 1, 2, 5, 7, 8, 10, 27)

<table>
<thead>
<tr>
<th>Variables:</th>
<th>Instruments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) secondary students’ math and science ability</td>
<td>State Test Scores/TAAS</td>
</tr>
<tr>
<td>b) secondary students’ interest in math and science</td>
<td>Mentor Teacher Surveys</td>
</tr>
<tr>
<td>c) ability of UTeach graduate to teach variety of courses</td>
<td>ExCET, GPA, portfolio, follow-ups</td>
</tr>
<tr>
<td>d) ability of UTeach graduate to teach diverse populations</td>
<td></td>
</tr>
</tbody>
</table>
2. Ability of the Program to Attract and Keep Students in the Teaching Pipeline

(Q. 3, 4, 6, 17, 30)

variables:
1. ability of program to attract math and science majors
2. ability of program to keep math and science majors in the program
3. ability of program to get graduates into (Texas) schools
4. ability of program to get graduates to stay in (Texas) schools
5. ability of program to assist graduates in getting teaching jobs they want

3. Ability of the Program to Provide Effective and Meaningful Instruction

(Q. 9, 15, 23, 25, 29)

variables:
1. ability of program to meet goals of COE, CNS in the classroom
2. alignment of the professional development courses
3. meaningfulness and usefulness of the courses to students
4. impact of courses on the students’ ability to teach
5. ability of courses to meet the state standards for teacher preparation programs

4. Ability of the Program to Maintain a True Collaboration

(Q. 13, 14, 15, 18)

variables:
A. ability of the program to meet vision of COE, CNS and AISD
B. effective leadership that sustains the program
C. effective sharing of resources to sustain the program
D. effectiveness of steering committee forum

5. Ability of the Program to Maintain a Smoothly Functioning Program

(Q. 11, 13, 14, 16, 19, 20, 21, 22, 24, 26, 28)

variables:
A. ability of program to assess and document preparedness of candidates
B. ability of program to obtain and smartly manage its resources
C. ability of program to carry out steering committee decisions
D. positive impact of UTeach students in AISD classrooms
E. ease of working with UTeach students in AISD classrooms
F. desire of AISD teachers to work with the program
G. ability of program to help students decide if teaching is for them
H. ability of program to make getting certified manageable for students
### Instruments: Natural Language Questions to include:

<table>
<thead>
<tr>
<th>Category</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field teaching reviews</td>
<td>• Secondary students are interested in math &amp; science?</td>
</tr>
<tr>
<td></td>
<td>• Ability of UTeach graduate to teach a variety of topics?</td>
</tr>
<tr>
<td></td>
<td>• Ability of UTeach students to teach diverse populations?</td>
</tr>
<tr>
<td>Student teaching reviews</td>
<td>• Secondary students are interested in math &amp; science?</td>
</tr>
<tr>
<td>Lesson reviews</td>
<td>• Ability of UTeach graduate to teach a variety of topics?</td>
</tr>
<tr>
<td>Mid-semester review</td>
<td>• Ability of UTeach students to teach diverse populations?</td>
</tr>
<tr>
<td>End of year review</td>
<td></td>
</tr>
<tr>
<td>Mentor Teacher Surveys</td>
<td>• Positive impact of UTeach students in AISD classrooms?</td>
</tr>
<tr>
<td></td>
<td>• Ease of working with UTeach students in AISD classrooms?</td>
</tr>
<tr>
<td></td>
<td>• Desire of AISD teachers to work with the program?</td>
</tr>
<tr>
<td>Formative course evaluations</td>
<td>• Alignment of Professional Development courses?</td>
</tr>
<tr>
<td></td>
<td>• Meaningfulness and usefulness of the courses?</td>
</tr>
<tr>
<td>Student self-assessments</td>
<td>• Self-confidence of UTeach students to teach well?</td>
</tr>
<tr>
<td></td>
<td>• Alignment of professional development courses?</td>
</tr>
<tr>
<td></td>
<td>• Meaningfulness and usefulness of the courses?</td>
</tr>
<tr>
<td></td>
<td>• In Step 1 &amp; 2, ability of the courses to decide if teaching is for them?</td>
</tr>
<tr>
<td>UT course evaluations</td>
<td>N/A</td>
</tr>
<tr>
<td>Technology benchmarks</td>
<td>N/A</td>
</tr>
<tr>
<td>Program graduate surveys</td>
<td>• Ability of UTeach student to accept leadership position?</td>
</tr>
<tr>
<td>As they graduate</td>
<td>• Teaching in Texas schools?</td>
</tr>
<tr>
<td>Follow-up</td>
<td>• How long?</td>
</tr>
<tr>
<td></td>
<td>• Get the job wanted?</td>
</tr>
<tr>
<td>Budget/Expense Accounts</td>
<td>• Effective sharing of resources?</td>
</tr>
<tr>
<td></td>
<td>• Ability of program to obtain and manage resources?</td>
</tr>
<tr>
<td>Steering Committee Minutes</td>
<td>• Ability of program to meet vision of colleges and AISD?</td>
</tr>
<tr>
<td></td>
<td>• Effective leadership?</td>
</tr>
<tr>
<td></td>
<td>• Effectiveness of Steering Committee Forum?</td>
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<td></td>
<td>• Ability of program to carry out Steering Committee decisions?</td>
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<td>Portfolio Reviews</td>
<td>Ability to teach a variety of courses?</td>
</tr>
<tr>
<td></td>
<td>• Ability to teach diverse populations?</td>
</tr>
<tr>
<td></td>
<td>• Ability to meet state standards?</td>
</tr>
<tr>
<td>First portfolio</td>
<td></td>
</tr>
<tr>
<td>Final portfolio</td>
<td></td>
</tr>
<tr>
<td>Induction Year Reviews</td>
<td>• Ability of UTeach student to accept leadership position?</td>
</tr>
<tr>
<td></td>
<td>• Teaching in Texas schools?</td>
</tr>
<tr>
<td></td>
<td>• How long?</td>
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<tr>
<td></td>
<td>• Get the job wanted?</td>
</tr>
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<td>Self-assessments</td>
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<td>Admin. Assessment</td>
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<td>Mentor Assessment</td>
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<td>Review of Course Grades</td>
<td>Ability of the program to attract math and science majors?</td>
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<tr>
<td>Application</td>
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<td>Checklists of Processes</td>
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<tr>
<td>Student exit surveys</td>
<td>• Ability of program to retain math and science majors?</td>
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<td>ExCET exam scores</td>
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<td>Faculty vita</td>
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<td>Student program evaluations</td>
<td>• Meaningfulness and usefulness of the courses?</td>
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<tr>
<td></td>
<td>• Ability of program to help students decide if teaching is for them?</td>
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<td></td>
<td>• Ability of program to make certifying manageable?</td>
</tr>
<tr>
<td>Student performance</td>
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<td>Academic program</td>
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<tr>
<td>Program management</td>
<td></td>
</tr>
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</table>
Appendix III
Portfolio Review
Frequently Asked Questions

**Q:** What is a teaching portfolio?

**A:** A teaching portfolio is a *purposeful collection of work* arranged to demonstrate your successful preparation for certification. Your goal is to demonstrate that you have acquired the skills and knowledge necessary to meet the State’s teaching standards. These standards, called the Learner–Centered Proficiencies, focus on your ability to make the students (or the learners) the center of your teaching efforts. They require that all teachers be able to: (1) design learner–centered instruction, (2) establish a learner–centered classroom, (3) use learner–centered communication, (4) practice learner–centered professionalism, and (5) demonstrate proficiency in the discipline. Your portfolio will consist of *five sections*, one for each of the Learner–Centered Proficiencies. It will also include evidence that you have met the Technology *Benchmarks* required of all preservice teachers.

**Q:** What do I put into a teaching portfolio?

**A:** Your portfolio is both *selective* and *reflective*. This means that you will choose which samples of work to include and then discuss your reasons for choosing each particular item of work. Your choice of what to include is almost limitless. Although you will be expected to include samples of lesson plans, teaching reviews and your use of technology, there is ample room for you to document your unique personal accomplishments. The guidelines on the following pages will help you select and organize items of work so you can best demonstrate your skills and knowledge.

**Q:** When will I submit my portfolio for review?

**A:** You will submit your portfolio for review *twice* during your tenure in the program: (1) before you begin student teaching and (2) when you are ready to apply for certification. A team of faculty, public school teachers and education policy makers will review your materials, looking for evidence that you “clearly demonstrate” your growing proficiency in each of the five areas. After each portfolio review, your advisor will help you identify your strengths and assist you in designing a professional development plan to satisfy any deficiencies. You will be expected to have met or exceeded all required proficiencies by the time you finish your time in UTeach. Some facts about portfolio reviews:

- Portfolio reviews occur twice a year, early in the Fall and the Spring semesters.
- You may submit your first portfolio when you have completed STEP 1, STEP 2, and Knowing & Learning. And no later than the year before you student teach.
- If your first portfolio is not accepted, you must resubmit it and have it approved before student teaching begins.
**Guidelines for Constructing Your Portfolio**

1. Select a Three–Ring Binder. Label the front with your name, your major, and the certification that you are seeking.

2. In the very front of your portfolio, include the following materials (examples are included at the end of this package): (1) your resume, with teaching experiences and job history; (2) your 1–2 paragraph teaching philosophy, (3) an official UT transcript; and (4) your technology benchmarks checklist.

3. Use Dividers to separate each Section. Label each section with the name of the learner–centered proficiency.

4. Create an index for each Section. Then place your reflection (typed and spell-checked!!) and all supporting items in order. Be sure all items are clearly labeled and, if you include any disks or videotapes, make sure they are firmly secured.

1) Select a 3–Ring Binder . . .

2) Put in your personal materials and 3) Use dividers for each section . . .

   Inside your Binder,
   - resume
   - teaching philosophy (1–2 paragraphs)
   - official UT transcript
   - technology checklist
   Then, begin Section 1 . . .

4) In each Section, place your items in the following order:

   INDEX
   Name of Section
   For example,
   - Teaching Review
   - Student Work Sample

   Followed by . . .

   REFLECTION
   TYPED !!
   1–2 PAGES !!
   SPELL–CHECKED !!

   Each Item of WORK
   Separate page for each item. Be sure that the item is clearly labeled (i.e., a lesson plan should indicate student age level, date of lesson, UTeach course, etc.)

   Followed by . . .

**Q:** When should I start compiling my portfolio?

**A:** The earlier, the better! It is best to begin thinking about your portfolio early in the program so that you can begin collecting materials from each of your UTeach courses. Read over the Learner–Centered Proficiencies now and pay attention to the technology benchmarks that will be expected of you. Remember that a well-constructed portfolio will help you earn your teaching certificate, keep a record of your finest work, impress your future employers, and help prepare you for your first teaching job.

**Q:** Do you have any hints for successful portfolios?

**A:** Experience has shown that reflections are an essential component of successful portfolios. Each section of your portfolio will be preceded by a 1–2 page reflection. It is your reflection that explains why you have selected each item and how you believe that item demonstrates the required proficiencies. The most successful portfolios include reflections that meet the following criteria:

- They carefully identify which item demonstrates which proficiency.
- They describe as clearly as possible HOW an item demonstrates that proficiency.
- They share personal information that helps the reviewer understand your point of view and the context of your experience.
- They share examples of how you have grown and learned from your experiences.

**Q:** If I have problems with my portfolio, who can I see for help?

**A:** Once you have read through this portfolio package, you may want to see a sample portfolio that has been put together by a former UTeach student. Ask your advisor if you can view an example of a successful portfolio. Your advisor will also be visiting your STEP classes later in the semester to talk to you about upcoming portfolio reviews. Whenever you have a question about UTeach, feel free to email or stop by the UTeach office. We are here to help!
Technology Benchmarks

Proficiency in technology is an essential component of teacher preparation. Your UTeach courses will help prepare you to meet each of the following technology proficiencies. Your portfolio will include the following checklist, indicating which of the proficiencies you have met. Upon completion of the course, you will receive a certificate to demonstrate your competency to future employers.

**UTEACH Graduates will be able to:**

(A) **Operate basic computer systems and troubleshoot:**
- use terminology related to computers and technology appropriately in communications
- operate a multimedia computer system with a peripheral imaging device, such as a scanner or digital/video camera
- install and use an educational software package
- create a multimedia presentation for a designated audience
- demonstrate knowledge of basic troubleshooting techniques to solve routine hardware and software problems that occur in the classroom

(B) **Use technology to access and organize data:**
- use database management and spreadsheet applications on the computer
- locate and collect information for lessons using computer-based technologies
- use technology tools to manage and communicate student information (e.g., schedules, grade books, correspondence, etc.)
- operate a content-specific technological tool (e.g., CBI, lab simulation, graphing calculator, etc.)
- engage in an online collaboration with peers and/or professionals in your field

(C) **Apply critical thinking to the selection and use of technology in the classroom:**
- describe current instructional principles and practices as they relate to the use of computers and technology resources in the classroom
- describe strategies for using technology to affirm diversity and provide equitable access to resources
- research and evaluate the accuracy, relevance, appropriateness, and comprehensiveness of an electronic information resource used by students
- identify technology resources available in a school and analyze how accessibility to those resources could affect planning for instruction
- demonstrate knowledge of technology-related legal and ethical issues, such as copyright, privacy, and security of technology systems, data, and information

(D) **Apply technology to enhance student-centered learning:**
- identify technology resources that are specifically designed for use by students to meet a specified learning objective
- design, deliver, and assess a student-centered learning activity in which students apply a technological tool
- demonstrate how your technology-enhanced lesson facilitates higher order thinking skills, such as problem solving, informed decision making or creativity
- demonstrate knowledge of technology-based assessment and evaluation strategies
- identify and/or use assistive technologies to meet the special physical needs of students

**Section 1: Designing Learner-Centered Instruction**

**PROFICIENCY:**
The teacher designs instruction appropriate for all students that reflects an understanding of relevant content and is based on continuous and appropriate assessment.

**PERFORMANCE OBJECTIVES:**
Choose 3–5 samples of work that demonstrate your ability to meet all of the following objectives. (One item may be used to satisfy multiple objectives.) Be sure to specify how each item meets a particular objective in your reflection.

**We will be looking for evidence that . . .**

**You might demonstrate this skill with:**

1. You engage students in a variety of interesting, challenging and worthwhile activities.
   - Lesson plans that involve hands-on investigation
   - Student projects that require creative, independent research

2. You help students link new content with their prior knowledge and gain insights into their misconceptions.
   - A transcript of classroom dialogue with students about their math/science beliefs
   - A lesson that connects new content to concepts from students' daily lives

3. You develop clearly-stated objectives for your lessons that are age-appropriate and able to be assessed.
   - Lesson objectives you have written for specific age-groups of students
   - Assessments you have designed to test student understanding of your lesson's objective

4. You guide students in using appropriate technology to gather organize, and display data.
   - A webpage you have designed for students to explore math/science concepts
   - A description of your interactions with student groups as they use technology (CBLs, graphing calculators, etc.)

5. You select or design a variety of worthwhile assessment instruments, some of which involve student self-assessment.
   - Your analysis of a student's performance on a test or quiz you designed
   - A description of different ways in which you assessed students before, during and after a particular lesson
Section 2: Establishing a Learner-Centered Classroom

PROFICIENCY:
The teacher creates a classroom environment of respect and rapport that fosters a positive climate for learning, equity and excellence.

PERFORMANCE OBJECTIVES:
Choose 3–5 samples of work that demonstrate your ability to meet all of the following objectives. (One item may be used to satisfy multiple objectives.) Be sure to specify how each item meets a particular objective in your reflection.

We will be looking for evidence that . . You might demonstrate this skill with:

1. You model respect for student diversity and encourage all students to work together cooperatively.
   - A mentor teacher’s evaluation of your teaching and your response to his/her comments.
   - A collection of your ideas for how to manage group work effectively.

2. You create learning activities that emphasize collaboration and teamwork.
   - Lesson plans that involve group work around a common goal.
   - Ideas for equitable group grading.

3. You consistently and effectively enforce high expectations for student behavior.
   - A videotape of your teaching with a written description of your performance.
   - Your classroom rules and a description of how you plan to enforce them.

4. You respond flexibly to students during a lesson, adjusting your instruction as needed depending on student progress.
   - A description of a lesson in which you had to change pace or direction to address student needs or problems.
   - An engagement activity that you conducted before a lesson, and a description of what it told you about the students’ level of understanding.

5. You employ safe practices in designing, planning and implementing all instructional activities (i.e. lab, field, demos).
   - Classroom strategies for ensuring safety during particular labs or activities.
   - Your ideas for how to teach students about classroom rules for hands-on activities.

In this section, you must include a teaching review and your response to it. (For final portfolios, include a student teaching review and your analysis of it.)

Section 3: Using Learner-Centered Communication

PROFICIENCY:
The teacher promotes 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.

PERFORMANCE OBJECTIVES:
Choose 3–5 samples of work that demonstrate your ability to meet all of the following objectives. (One item may be used to satisfy multiple objectives.) Be sure to specify how each item meets a particular objective in your reflection.

We will be looking for evidence that . . You might demonstrate this skill with:

1. You ask carefully-framed questions to foster the development of higher-order thinking skills and logical reasoning/problem solving.
   - A collection of questions you designed to prompt student discussion.
   - Transcripts of your dialogue with a group of students during a problem-solving event.

2. You facilitate reflection and discussion between students about their inquiry experiences.
   - Your strategies for getting students to discuss and question what they have learned.
   - A videotape of your teaching and an analysis of the student discussion.

3. You engage students in tasks that require them to communicate their reasoning using appropriate and precise terminology.
   - Your strategies for including reading and writing in your content area.
   - Samples of student assignments or presentations that involve the use of vocabulary.

4. You communicate the importance of your instructional content and your expectations for high quality work.
   - A description of how you inform students of your expectations.
   - Activities that ask students to consider and communicate their understanding of the importance of math/science reasoning in their daily lives.

5. You provide students with timely feedback that is accurate, constructive, substantive and specific.
   - Samples of your assessment tools.
   - Samples of your verbal feedback to students during and after lessons.

For final portfolios, this section must include a videotape of your teaching and your analysis of it.
Section 4: Practicing Learner-Centered Professionalism

PROFICIENCY:
The teacher fulfills professional roles and responsibilities and adheres to legal and ethical requirements of the profession.

PERFORMANCE OBJECTIVES:
Choose 3–5 samples of work that demonstrate your ability to meet all of the following objectives. (One item may be used to satisfy multiple objectives.) Be sure to specify how each item meets a particular objective in your reflection.

We will be looking for evidence that...

1. You engage in collaborative decision making and problem solving with other educators.
   You might demonstrate this skill with:
   - A summary of your experiences working with other educators to design lessons.
   - A description of how you interacted with a school counselor about your concerns for a student.

2. You engage student families in their children’s education and respond appropriately to their concerns.
   You might demonstrate this skill with:
   - A lesson that requires parental involvement.
   - Samples of teacher–parent communication and your analysis of them.

3. You engage in a variety of activities to continually enhance both your content and your pedagogical knowledge and skills.
   You might demonstrate this skill with:
   - Titles of educational or content-focused journals that you regularly read.
   - Conferences or professional development activities that you have attended.

4. You encourage feedback from students and colleagues and reflect on how you can improve your teaching performance.
   You might demonstrate this skill with:
   - A discussion of what you have learned from your mentor teacher.
   - Teaching reviews from peers, mentors or students and a description of how you responded to them.

5. You interact with students in a way that is consistent with the legal and ethical guidelines for your profession.
   You might demonstrate this skill with:
   - Teaching reviews that address this proficiency.
   - Your knowledge of the professional code of ethics.

For final portfolios, this section must include a focused observation of your teaching and your reaction to it.

Section 5: Engaging in Learner-Centered Science

These proficiencies measure your skills as a practitioner of your discipline, above and beyond the content knowledge mastered in your college courses. The emphasis of this section is on your understanding of the domain you will teach, not on the teaching practices you will employ.

PROFICIENCY:
The science teacher understands the central concepts of science, the structure of the discipline and the tools of scientific inquiry, and is able to create learning experiences that make the subject matter meaningful to students.

PERFORMANCE OBJECTIVES:
Choose 3–5 samples of work that demonstrate your ability to meet all of the following objectives. (One item may be used to satisfy multiple objectives.) Be sure to specify how each item meets a particular objective in your reflection.

We will be looking for evidence that you can?

1. Identify a refined and focused question for an inquiry investigation, and characterize the way in which the study would be conducted.
   You might demonstrate this skill with:
   - A short proposal for an inquiry-based activity that you could perform to investigate a scientific phenomenon.
   - A description of a research project you helped design and/or conduct.

2. Identify appropriate technology to gather and analyze data for a defined task, and explain the limits this technology places on the knowledge you acquire.
   You might demonstrate this skill with:
   - Your analysis of the technology you used to conduct a particular lab in one of your courses.
   - A description of how you have used various technological tools in a research environment.

3. Critically evaluate a scientific explanation or hypothesis using scientific evidence and methodology.
   You might demonstrate this skill with:
   - A critique of a recently published idea in a science journal or newspaper.
   - A well-argued and supported conclusion that you drew from your own research experiences.

4. Generate a model to represent a real-world situation and evaluate how well the model represents the situation.
   You might demonstrate this skill with:
   - A description of a verbal, mathematical or pictorial model you could create to explain a natural phenomenon to others.
   - A model you designed to help yourself better understand something you were studying in class.

5. Illustrate knowledge of the history/philosophy of science; specifically, the changing nature of scientific knowledge and its implications.
   You might demonstrate this skill with:
   - An essay discussing your knowledge of a particular scientific theory and plausible economic or social implications of its changing nature.
Section 5: Engaging in Learner-Centered Mathematics

These proficiencies measure your skills as a practitioner of your discipline, above and beyond the content knowledge mastered in your college courses. The emphasis of this section is on your understanding of the domain you will teach, not on the teaching practices you will employ.

PROFICIENCY:
The mathematics teacher understands the central concepts of mathematics, the structure of the discipline and its tools of inquiry, and is able to create learning experiences that make the subject matter meaningful to students.

PERFORMANCE OBJECTIVES:
Choose 3–5 samples of work that demonstrate your ability to meet all of the following objectives. (One item may be used to satisfy multiple objectives.) Be sure to specify how each item meets a particular objective in your reflection. Be sure to specify how each item meets a particular objective in your reflection.

We will be looking for evidence that you can?
1. Apply both informal and formal reasoning in problem solving.
   - A logically precise mathematical proof together with an intuitive explanation of what is going on in the proof and how it might have been discovered.
   - A logically precise explanation of a problem you have solved together with a discussion of the informal reasoning (including the conjecturing process) which led you to the solution.
2. Identify appropriate technology to explore a mathematical problem and explain the limits this technology places on the knowledge you acquire.
   - Your analysis of the technology you used to conduct a mathematical investigation in one of your courses.
   - A description of how you have used various technological tools in problem solving and the strengths and limitations of each tool.
3. Generate a mathematical model to represent a real-world situation and evaluate how well the model represents the situation.
   - A mathematical model that you could develop to assist others in understanding a natural or human-made phenomenon.
   - A mathematical model you developed in a course, internship, or job to assist your own understanding.
4. Understand and use connections among mathematical concepts, procedure, and representations.
   - A discussion of various representations of a particular problem and how different representations lead to different solution, methods, or blind alleys.
   - A discussion of the connections between two areas of mathematics.
5. Illustrate knowledge of the history and cultural context of mathematics; in particular, the evolution of mathematical concepts.
   - An essay discussing your knowledge of a particular mathematical concept and how it has been modified over time.

Section 5: Engaging in Learner-Centered Computer Science

These proficiencies measure your skills as a practitioner of your discipline, above and beyond the content knowledge mastered in your college courses. The emphasis of this section is on your understanding of the domain you will teach, not on the teaching practices you will employ.

PROFICIENCY:
The computer science teacher understands the central concepts of computer science, the structure of the discipline and its tools of inquiry, and is able to create learning experiences that make the subject matter meaningful to students.

PERFORMANCE OBJECTIVES:
Choose 3–5 samples of work that demonstrate your ability to meet all of the following objectives. (One item may be used to satisfy multiple objectives.) Be sure to specify how each item meets a particular objective in your reflection.

We will be looking for evidence that you can?
1. Identify an area in which technology may be used to improve an existing operation and characterize the approach or plan of action you would implement.
   - A short proposal of a software requirements analysis and your recommendations.
   - A description of a consultation which you have performed for an outside group.
2. Select appropriate software to accomplish a specific task on the basis of its quality, effectiveness and efficiency.
   - A summary of software you selected to solve a problem and your rationale for each choice.
   - A critique of recently developed software.
3. Determine methods to evaluate the accuracy and validity of electronic information.
   - Your strategies for effectively evaluating data sources on the web.
   - An example of an investigation you did to evaluate electronic information.
4. Demonstrate knowledge of the organizational structure of computing systems from the most basic components up to a network.
   - An analysis of compatibility issues such as cross-platform connectivity.
   - A comparison/contrast of analogue and digital technology systems.
5. Illustrate knowledge of the history/philosophy of computer science; specifically, the impact of technology applications on human society.
   - An essay discussing your informed stance on the future economical, educational or social implications of technology use.
Criterion 1: Designing Learner-Centered Instruction

1. Engages students in a variety of interesting, challenging, and worthwhile activities.
2. Helps students link new content with their prior knowledge and gain insights into their misconceptions.
3. Develops clearly-stated objectives that are age-appropriate and able to be assessed.
4. Guides students in using appropriate technology to gather, organize, and display data.
5. Selects or designs a variety of worthwhile assessment instruments, some of which involve student self-assessment.

Criterion 2: Establishing a Learner-Centered Classroom

1. Models respect for student diversity and encourages all students to cooperate.
2. Creates learning activities that emphasize collaboration and teamwork.
3. Consistently and effectively enforces high expectations for student behavior.
4. Responds flexibly to students during a lesson, adjusting instruction as needed depending on student progress.
5. Employs safe practices in designing, planning, and implementing all instructional activities.

Criterion 3: Using Learner-Centered Communication

1. Asks carefully framed questions that foster the development of higher-order thinking skills and logical reasoning/problem solving.
2. Facilitates reflection and discussion between students about their inquiry experiences.
3. Engages students in tasks that require them to communicate their reasoning using appropriate and precise terminology.
4. Communicates the importance of instructional content and their expectations for high quality work.
5. Provides students with timely feedback that is accurate, constructive, substantive, and specific.

Criterion 4: Practicing Learner-Centered Professionalism

1. Engages in collaborative decision making and problem solving with other educators.
2. Engages student families in their children’s education and responds appropriately to their concerns.
3. Engages in a variety of activities to continually enhance their content and pedagogical skills.
4. Encourages feedback from students and colleagues and reflects on how he/she can improve his/her teaching performance.
5. Interacts with students in a manner that is consistent with the legal and ethical guidelines of the profession.
Criterion 5: Engaging in Learner-Centered Science

1. Identifies a refined and focused question for an inquiry investigation, and characterizes the way in which the study would be conducted.

2. Identifies appropriate technology to gather and analyze data for a defined task, and explains the limits this technology places on the knowledge acquired.

3. Critically evaluates a scientific explanation or hypothesis using scientific evidence and methodology.

4. Generates a model to represent a real-world situation and evaluates how well the model represents the situation.

5. Illustrates knowledge of the history/philosophy of science; specifically, the changing nature of scientific knowledge and theories.

Criterion 5: Engaging in Learner-Centered Mathematics

1. Applies both informal and formal mathematical reasoning in problem solving.

2. Identifies appropriate technology to explore a mathematical problem and explains the limits this technology places on the knowledge acquired.

3. Generates a mathematical model to represent a real-world situation and evaluates how well the model represents the situation.

4. Understands and uses connections among the mathematical concepts, procedures, and representations.

5. Illustrates knowledge of the history and cultural context of mathematics; in particular, the evolution of mathematical concepts.

Final Comments

Reviewer: ____________________________  Date: ________

Student Name: ____________________________

Type of Certification: ______________

Rating: 5

Average progress rating: ______    Portfolio is ______ accepted. ______ requires revision.

Proficiencies Satisfied

Required Passing Average:

First Review: 3

Final Review: 4

Portfolio Comments: ____________________________

Criterion 5: Engaging in Learner-Centered Science

1. __________

2. __________

3. __________

4. __________

5. __________

Criterion 5: Engaging in Learner-Centered Mathematics

1. __________

2. __________

3. __________

4. __________

5. __________
Criterion 5: Engaging in Learner-Centered Computer Science

1. Identifies an area in which technology may be used to improve an existing operation and characterizes the approach or plan of action you would implement.

2. Selects appropriate software to accomplish a specific task on the basis of its quality, effectiveness, and efficiency.


4. Demonstrates knowledge of the organizational structure of computing systems from the most basic components up to a network.

5. Illustrates knowledge of the history/philosophy of computer science; specifically, the impact of technology on human society.

Progress Rating: ________

Final Comments

Reviewer ____________________________ Date: ________

Student Name: _____________________

Type of Certification: __________________

Required Passing Average: 1st Review: 3 2nd Review: 4

Proficiencies Satisfied

1. No

2. Yes

3. Almost Yes

4. Yes, with a warning

5. Yes, with a caution

Portfolio: Final portfolio

Rating

1 2 3 4 5

Average progress rating: ______

Portfolio is accepted. Requires revision.
Summary of Retention Data, Cohorts F97–F99

A. History of Enrollment in UTeach
The recruitment of outstanding science and mathematics undergraduates and post-baccalaureates is a top priority of the UTeach Program. In the Fall of 1997, 28 College of Natural Science freshmen entered the UTeach program. Since then the program has grown to include over 250 students with a variety of majors and standings who are all in the pipeline for math and science secondary certification. These students are entering the program at various levels in their coursework. Some enter as freshmen while others enter later in their undergraduate career. In the Spring of 2000, the first two UTeach students graduated and completed the program both with Composite Science Certification. For the fall of 2000, seven more students will complete their student teaching experience. Projections for Spring 2001 indicate that over 30 UTeach students are expected to complete student teaching and graduate with secondary math & science certification.

B. Overall Retention:
The overall retention rate of students in the UTeach program is 71%. This is considerably higher than the overall college (CNS) retention rate of 30.0%.

<table>
<thead>
<tr>
<th>Entered As:</th>
<th>N Enrolled</th>
<th>N Departed</th>
<th>% Departed</th>
<th>% Retained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>151</td>
<td>56</td>
<td>37%</td>
<td>63%</td>
</tr>
<tr>
<td>Sophomores</td>
<td>74</td>
<td>24</td>
<td>32%</td>
<td>68%</td>
</tr>
<tr>
<td>Juniors</td>
<td>57</td>
<td>10</td>
<td>18%</td>
<td>82%</td>
</tr>
<tr>
<td>Seniors</td>
<td>42</td>
<td>8</td>
<td>19%</td>
<td>81%</td>
</tr>
<tr>
<td>Post Bac</td>
<td>22</td>
<td>3</td>
<td>14%</td>
<td>86%</td>
</tr>
<tr>
<td>Overall</td>
<td>346</td>
<td>101</td>
<td>29%</td>
<td>71%</td>
</tr>
</tbody>
</table>

C. When Students Leave the Program:
Overall, 41% of all students who enroll in UTeach leave after STEP 1. Students who go on to the EDC courses are more likely to stay with the program.

<table>
<thead>
<tr>
<th>Entered As:</th>
<th>Percentage of those originally enrolled who departed after taking:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STEP 1 (only)</td>
</tr>
<tr>
<td>Freshmen</td>
<td>39%</td>
</tr>
<tr>
<td>Sophomores</td>
<td>50%</td>
</tr>
<tr>
<td>Juniors</td>
<td>20%</td>
</tr>
<tr>
<td>Seniors</td>
<td>38%</td>
</tr>
<tr>
<td>Post Bac</td>
<td>0%</td>
</tr>
<tr>
<td>Overall</td>
<td>41%</td>
</tr>
</tbody>
</table>

1. GPA Information
Overall GPA for F99 UTeach Students =3.1213
Overall GPA for F98 College of Natural Sciences =2.84*
Overall GPA for F98 Total UT Austin =2.94*
*from UT Office of Institutional Studies’ Statistical Handbook 1999–2000
Curriculum Mapping of UTeach Courses

The purpose of the UTeach Curriculum Mapping Project is to:

- Define the objectives of each UTeach course;
- Coordinate the objectives across courses so as to avoid duplication and ensure content coverage. Content to be covered will be defined, in part, by state standards, augmented by additional content defined by the UTeach Executive Committee and UTeach faculty as important;
- Create a system that aligns course objectives, instruction, and the UTeach portfolio system;
- Create a system that facilitates clear communication about the UTeach course structure and content;
- Define what it means to become a teacher.

STEP 1: Inquiry Approaches to Teaching

Course Objectives – Students will:

1. Assess whether they want to pursue teaching as a career.
2. Interact with experienced and successful master and mentor teachers who serve as models of teachers who have survived and excelled.
3. Observe classes taught by master and mentor teachers.
4. Use compelling literature in the field to see the richness and variety of student thinking.
5. Discuss state and national mathematics and science standards and their implications for curriculum decisions.
6. Plan and deliver four inquiry–based hands–on mathematics and science lessons (from such curricula as FOSS and Investigations) in local elementary school classrooms.
7. Experience diverse student populations and school settings to gain an appreciation of the variety and range of student thinking.
8. Understand the child development issues that exist at the elementary level and incorporate instructional strategies that meet the needs of students with multiple temperaments and learning styles.
9. Reflect on their progress as teachers and use these reflections to improve their practice.
10. Use feedback from master and mentor teachers to improve their teaching.
11. Become familiar with teaching certification requirements, including course sequence, UTeach portfolio requirements, state certification exams, and minimum grade point average to be eligible for student teaching.
12. Write performance objectives for each lesson, including mathematics and science connections, and appropriate assessments for those objectives.
13. Use technology to collaborate and communicate (e.g., e-mail, sending and receiving messages, and word processing).
14. Use technology and the Internet to enhance classroom lessons (e.g., information exchanges, pooled data analysis, online collaborations, and information searches).

STEP 2: Inquiry Lesson Design

Course Objectives – Students will:

1. Identify common components of the middle school culture.
2. Use a structured approach to observe middle school classrooms.
3. Distinguish between inquiry–based and other instructional approaches and decide which approach best fits instructional goals.
4. Identify and use sources of excellent inquiry–based mathematics and science lessons (e.g., Connected Mathematics).
5. Develop lesson plans using the "5–E" model (i.e., engagement, exploration, explanation, elaboration, and evaluation).
6. Identify their content weaknesses within the context of selected lessons, and work with master and mentor teachers and peers to enhance that content knowledge.
7. Participate in peer coaching in which they present lessons to their Step 2 peers and offer suggestions to others who also present lessons.
8. Plan and deliver three inquiry–based lessons in either mathematics or science in local middle or junior high schools.
9. Use technology (e.g., CBLs, internet searchers, software packages) in delivering mathematics or science lessons.
10. Implement a variety of methods to assess learner outcomes formatively, summatively, and informally.
11. Reflect on teaching experiences to revise lesson plans and improve teaching.
12. Assess their commitment to pursuing a teaching career.

Knowing and Learning

Course Objectives – Students will:

Learning

1. Become knowledgeable and critical about various theories of learning including behaviorism, cognitive science (information processing/artificial intelligence), constructivism, and developmental theories including Skinner, Piaget, Vygotsky, Anderson, and Chi.
2. Understand the importance of and be able to conduct and analyze clinical interviews with learners to see how basic concepts can be understood differently by young learners.
3. Observe and reflect on their own learning in a way that can inform their interactions with topics in their majors.
4. Develop and articulate their own evolving epistemologies related to teaching and learning.

Knowing

5. Examine the development of fundamental concepts in mathematics and science.
7. Examine how task construction reflects underlying theories of knowledge and learning.
8. Analyze their own engagement in activities to understand and illustrate conceptual development.
9. Develop an understanding of how activity and discourse interact as one coordinates multiple forms of representation.
10. Examine the role of argumentation and proof in the process of conceptual development.
11. Develop insight into how computational and technological media influence the task and activity.

Assessment
12. Learn to identify how different forms of assessment reflect underlying assumptions about teaching and learning.
13. Examine how high stakes assessment and formative assessment can reflect different underlying theories.

Community
14. Examine how theories of learning and knowledge interact with issues of equity and access.
15. Examine how conceptual development evolves through expectations and social and cultural discourse.

Classroom Interactions

Course Objectives – Students will:

1. Understand, discuss, and judge the merits of multiple models of teaching (including direct instruction, inquiry teaching and use of small groups) and what each model requires of teachers.
2. Observe and reflect on videotapes of unedited instruction in mathematics and science to understand how teachers can set the task, what students understand about the task, and how students' conceptual knowledge can be built using a variety of instructional strategies.
3. Become keen observers and analysts of classroom instruction along the dimension of content development.
4. Become keen observers and analysts of classroom instruction along the dimension of equitable and diverse participation.
5. Plan and teach, with a small group of peers, a 2–day high school mathematics/science lesson on an assigned topic.
6. Submit a videotape of the 2–day lesson for community review by peers and instructor.
7. Use content and equity dimensions to analyze and reflect on their own teaching and their own learning interactions.
8. Use student work as evidence of classroom results.
9. Examine data on student participation and performance and learn to consider a variety of lenses (including psychological deficit models, the role of culture, issues of multicultural education, and the role of family, institution, and community) used in equity debates.
10. Understand and model how curriculum and technology (e.g., Geometer's Sketchpad, Interactive Physics, Fathom) are used in classroom settings to build interrelationships among teachers and students.

Project–Based Instruction

Course Objectives – Students will:

Theoretical Implications
1. Discuss the importance of project–based instruction in terms of students' cognitive development, equity, and motivation;
2. Reflect on applications of educational theory as it relates to classroom practice in the area of project–based instruction;
3. Distinguish between project–based and other instructional approaches and decide which approach best fits instructional goals based on benefits and limitations of each;
4. 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;
5. Describe examples of project–based instruction in math or science and analyze those examples in terms of Krajčí's and Morsound's models of project–based instruction.

Field Experiences
6. Use inquiry methods with high school students in a project–based setting;
7. Compare and contrast observations of "real" project–based classrooms with those presented in readings and with theoretical models;
8. Demonstrate skill in setting up and managing wet lab and field project–based environments including set up, safety, and assessment.

Practical Application
9. Use design principles to develop interdisciplinary, two to three–week project–based units for high school classes;
10. Develop alternative assessments appropriate for project–based instruction;
11. 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.).

Technological Competencies
12. Use relevant technology to develop projects (e.g., webographer, concept mapping software, video editing software, etc.);
13. Integrate relevant technology into curricular units (e.g., Internet, simulations, data analysis packages, modeling software, etc.).
Perspectives on Science and Mathematics

Course Objectives – Students will:
1. Examine episodes in the history of science and mathematics that are of surpassing significance to our cultural heritage by reading and discussing works by and about some of the scientists and mathematicians involved. (Darwin’s Theory of Evolution by Natural Selection is a required episode; other examples might include Galileo and the physics of motion, Newton and the mathematization of the world, the making of the atomic bomb, and heredity and genetics).
2. Understand science and mathematics as a product of historical processes and a factor in further historical change.
3. Plan and develop science and/or mathematics lessons that include the application of an historical perspective to enrich and supplement curricular treatments of topics.
4. Understand and appreciate the cultural and humanistic aspects of science and mathematics.
5. Understand and explain the genesis of scientific ideas by tracing their evolution and discussing competing theories and schools of thought.
6. Understand multiple perspectives in different cultures about science and mathematics.
7. Examine the underlying assumptions about the nature of scientific reasoning, e.g., Popper, Kuhn, Lakatos.

Research Methods

Course Objectives – Students will:
1. Carry out simple projects, inquiries, and/or investigations that illustrate the process that transforms curiosity into scientific research.
2. Learn about the various forms of research ranging from deductive to inductive, from controlled environments to observations, from pure to applied, and from theoretical to experimental and computational.
3. Employ statistics in a research setting.
4. Design a small-scale research investigation, interacting with instructors, but without the explicit guidance typically provided by laboratory manuals.
5. Learn about the social context of research, including the research literature, research communities, the funding process, the publication process, and the way scientific communities react to new ideas.
6. Incorporate knowledge from earlier courses into flexible, independent, scientific problem-solving ability.