*LeoTeach*: STEM Teacher Preparation at A&M-Commerce

In 2011, an ambitious A&M-Commerce STEM initiative was launched. Named LeoTeach by founding director Dr. Frank Hall, an oceanographer, it was supported initially by a Sid Richardson grant. Now housed in the Curriculum & Instruction Department, LeoTeach has close ties to both the College of Education and Human Services (COEHS) and the College of Science, Engineering, and Agriculture (CoSEA). The LeoTeach designation has two important links: The first is to William Leonidas Mayo, who founded Texas A&M University-Commerce (originally East Texas Normal College) in 1889 and gave his name to Lion athletics. Further, it subtly connects with UTeach at UT Austin, a well-established, highly regarded program which recruits, educates, and retains highly-qualified STEM teachers who know and use best practice with their students.

For certification at the high school level (grades 7-12) future teachers at A&M-Commerce must major in a STEM discipline and complete a Professional Development Sequence of courses totaling 27 hours in the College of Education and Human Services (COEHS). Three of the courses in this sequence have recently been revised by LeoTeach educators to be STEM-specific in both content and pedagogy. The course sequence includes recently designed courses modeled after UTeach that are infused with technology and tailored for future STEM teachers. It also includes the field-based apprenticeships which replaced traditional student teaching at the university more than two decades ago. In pursuit of academic rigor, LeoTeachers must maintain a 2.75 GPA overall and in their major.

The courses taken by a typical LeoTeacher who is seeking the most marketable teaching major—chemistry with certification to teach composite science in grades 7-12 includes courses in the following areas: core, physics, chemistry, biology, pedagogy as well as psychology, and reading courses. This certification choice provides foundational knowledge in key science areas and eases the scheduling challenges faced by high school department heads and principals. CoSEA program revisions currently underway align with STEM Prep project goals and promise to make degrees more attractive. For example, the proposed "Physics for Educators" has a redesigned curriculum reducing required credit hours from 132 to 120, while retaining required courses for a major in physics as well as pedagogy courses focused on STEM education for LeoTeachers. Other changes include:

- Two new courses are proposed: Physics 341 & 342 – Higher level physics for teachers I & II. These will be streamlined courses with the majority of higher level physics content necessary to obtain a major in physics, presented in a way that reinforces pedagogical skills.
- Calculus I & II will be a co-requisite for University (Calculus-based) Physics I & II. Collaboration with the math department will ensure the content of both sets of courses mesh well. Evidence suggests that this mutual reinforcement of concepts results in better understanding of the subject matter in both sets of courses, and subsequently a more positive disposition toward the physical sciences.
- Restructuring University Physics I & II from 4-credit hour courses to 2 hours of lecture and 4 hours of labs per week.

The newly re-designed Professional Development Sequence of courses for LeoTeachers includes

- PSY 300. Learning Processes and Development

Measurement, evaluation, applying psychology theories learning within disciplines (i.e., mathematics and science), motivation

- SED 330. Roles and Responsibilities of Professional STEM Educators
  - 1st LeoTeach course includes 30 hours in upper elementary school
  - Foundational knowledge necessary for effective STEM teaching
  - Collaborative planned and evaluated lessons during three math/science days
- SED 331. Instructional Design for Student Engagement in STEM
  - 2nd LeoTeach course includes observing middle school master teachers
  - Competencies: questioning strategies, two teaching models (direct instruction and inquiry learning), using formative assessment data to revise initial lesson plans and further differentiate instruction, and technology (a *Prezi Tutorial Certificate*)
- SED 332. Secondary School STEM Project Based Learning
  - 3rd LeoTeach course includes high school field experiences
  - Exploratory investigation builds competence with the problem based learning model
  - Research design, implementation, and data analysis experiences
- RDG 380. Comprehension and Vocabulary
  - Theoretical foundations of reading and literacy
  - Application of learning strategies to various disciplines and grade levels
- SED 400. Teaching Diverse Learners in Field-Based Settings
  - Seminar course paralleling the residency experience
  - Theoretical foundations for responding to student diversities by professors
  - Translating educational theory into classroom practice by mentors
- SED 401. Curriculum, Instruction, and Assessment in Field Based Environments
  - 2nd seminar course with professors and mentors
  - Technology, lesson delivery including classroom management, discipline theories, and assessment of learning
- SED 404 & 405. Teaching Diverse Learners in Field-Based Settings
  - Taken concurrently with SED 400 and 401
  - Directed teaching as a high school resident teacher, with increasing teaching responsibilities during the semester
  - Collaborative assessment of the impact of lesson on student achievement
  - Teacher Inquiry Project (TIP) in a mentor's class