



## STEM Academy Objectives

### **Beginning-Student Socialization with STEM Experiences**

#### **Learning Outcomes: Students will...**

#### **1. ... articulate the connections between STEM disciplines, as related to their own academic major and individual identity**

- a. ... *be able to apply gateway-course concepts to one or more topical areas within major field.*

A student's chosen major is not an isolated silo, but has interdisciplinary connections – that's why STEM students are expected to take the many gateway courses. Sometimes the connections are obvious and most times they are not. Making those connections on their own will (a) increase students' motivation and learning in the gateway course outside their major field, and (b) increase the likelihood that they will master the knowledge, concepts, and methods that are going to be used in subsequent courses in their major department – and in their future career.

- b. ... *demonstrate increased science literacy, which is comprehension of and utilization of the conceptual processes employed in understanding the natural world.*

Students should be able to relate even the most abstract concepts to the real world, to seek explanations for real-world phenomena and events; to see the role of science, math, and engineering studies and approaches to problem solving within news events and day-to-day observations. Make STEM real!

- c. ...*be able to connect the knowledge and processes of inquiry in one or more STEM fields with their individual identity and community values.*

Students come from a variety of backgrounds that influence perspectives on issues that are faced in the STEM fields. By recognizing the role that their customs, values, and backgrounds contribute to their perspective on a problem can lead to greater awareness of their own source of understanding as well as other sources of understanding about an issue and the role of science in knowledge creation.

#### **2. ... demonstrate improved mastery of their own learning skills, especially those specific to STEM disciplines**

- a. ... *demonstrate the ability to analyze a problem in order to determine the type of thinking that is required in order to solve the problem.*

The disciplinary major fits within a broader context of a related set of science, technology, engineering and mathematics fields called "STEM". By learning more generally to understand how problems are defined and solved within STEM fields, the types of thinking required, and the ways in which knowledge is constructed and used, students will find it more intuitive to learn critical concepts and information across these disciplines and to connect them to their major field.

- b. ... *become proficient learners.*

Students' current and future successes are tied to being a highly competent learner. Not only do they need to learn in order to get good grades but they will need to continue learning, integrating, applying, and discovering new knowledge in their career without the guidance of a professor. To be a self-guided learner, students need to understand how learning works – the brain is actually physically changed by learning – and how to hone their ability to learn. This learning-to-learn objective is behind "problem solving" but it is richer than the illusion of memorizing problem-solving strategies. It's not about study skills but about developing strategies and habits of mind for learning. Studying focuses on the "whats"; learning focuses on "whys, hows, and what ifs". What is learning? How does it "happen"? What kinds of thinking and knowledge processing are required for different problems?

- c. ...*develop effective time management practices.*

Students' ability to learn efficiently will dictate their success in college and their ability to effectively manage other components of life. Very often students have to juggle classes, work, family obligations, and other responsibilities during the duration of their collegiate career. Time management skills are crucial to successfully manage the aspects of life that concurrently demand attention.

- d. ...*demonstrate an understanding of the academic and technical support services and resources available to them. (eg. CAPS, scholarship, programs, mentors, internships, career services).*

Many students are unaware of the academic-support resources that exist at UNM. Students may not know of the support services available or may not know where to seek additional help. This is particularly true for first-generations students who are navigating the university without parental guidance. An understanding of the available academic and technical support and resources can improve students' academic performance, provide needed financial aid, set the stage for their career, and build a strong sense of community support within the university.

### **3. ... demonstrate stronger connections to their chosen STEM department prior to matriculating into their degree program**

- a. ... *develop a plan for their program of study to complete their STEM degree.*

STEM degree programs are more highly structured than most other majors. There is a greater reliance on sequential completion of courses with fewer electives and a large number of credit hours completed within the degree. The course sequences are built around multiple prerequisite completions, including gateway courses outside of the major-field department. A successful pathway toward timely degree completion requires mapping out these course connections in advance across all undergraduate years and with the guidance of an advisor from the degree program.

- b. ... *understand opportunities to engage in undergraduate research in their STEM major.*

Participation in the act of knowledge discovery and creation within the field is a high-impact practice that is important to STEM-student success because research (a) motivates pursuit of study in the field; (b) integrates classroom/laboratory learning; and (c) develops skills for successful pursuit of graduate/professional school or a career in the field. Most entering undergraduates are unaware that they are welcome to participate alongside faculty and graduate students in mentored, scholarly inquiry in their field. Learning about undergraduate research opportunities, especially from undergraduate researchers, not only motivates learning in STEM gateway courses but opens doors for engagement in the major-field department.

- c. ... *develop goals that define the relationship between their STEM degree and their career.*

Many students chose a major because of some interest in the topic without understanding the career options or the rationale behind the rigorous degree program that leads to those careers. Many STEM careers also require graduate- or professional-school degrees and students are commonly unaware of the additional time and expenditure for these higher degrees or the competitive admission that requires commitment to excellence in undergraduate learning and not simply passing courses. If students are required to explore their future beyond UNM, then they will have clear goals for driving their major choice, their course pathways, and extracurricular and experiential-learning opportunities.

### **4. ...demonstrate how scientific research is conducted as the process of inquiry that builds and applies scientific knowledge**

- a. ...*recognize and apply the scientific method.*

Students' ability to conduct independent research will depend upon a solid foundational knowledge of the scientific method. The scientific method is the process employed to conduct scientific research by experts in their field. This basis of inquiry relies on empirical and measurable evidence to support hypotheses. Students should be familiar with the scientific method, recognize a scientific approach to problem solving and argumentation, and begin to apply the method to work in their field.

- b. ...*explain how to develop research questions, collect, and analyze data.*

The research process requires an ability to pose a question to a problem and determine the necessary data to support or refute a claim. Students aspiring to obtain a degree in a STEM field will need to have a firm understanding of how to develop research questions and find and interpret relevant data. Students should be able to articulate the process for research as preparation for research they will conduct later in their career.

- c. ...*describe the value of the scientific method in performing research.*

It is expected that students use the scientific method when engaging in research because it is a valid and reliable methodology for testing claims. Furthermore, it is the standard process that experts in STEM fields look for when evaluating the work of one another. Students should be able to explain the value of the scientific method to support the methodology used to conduct research of their own in a STEM field.