

## Science, Technology, Engineering and Mathematics: Science and Mathematics Career Pathway Plan of Study for ▶ Learners ▶ Parents ▶ Counselors ▶ Teachers/Faculty

This Career Pathway Plan of Study (based on the Science and Mathematics Pathway of the Science, Technology, Engineering and Mathematics Career Cluster) can serve as a guide, along with other career planning materials, as learners continue on a career path. Courses listed within this plan are only recommended coursework and should be individualized to meet each learner's educational and career goals. \*This Plan of Study, used for learners at an educational institution, should be customized with course titles and appropriate high school graduation requirements as well as college entrance requirements.

EDUCATION LEVELS	GRADE	English/ Language Arts	Math	Science	Social Studies/ Sciences	Other Required Courses Other Electives Recommended Electives Learner Activities	*Career and Technical Courses and/or Degree Major Courses for Science and Mathematics Pathway	SAMPLE Occupations Relating to This Pathway	
<i>Interest Inventory Administered and Plan of Study Initiated for all Learners</i>									
SECONDARY	9	English/ Language Arts I	Algebra I or Geometry	Biology	State History Civics	All plans of study should meet local and state high school graduation requirements and college entrance requirements. Certain local student organization activities are also important including public speaking, record keeping and work-based experiences.	<ul style="list-style-type: none"> <li>• Introduction to Careers</li> <li>• Laboratory Practices and Biology Laboratory</li> </ul>	<ul style="list-style-type: none"> <li>▶ Analytical Chemist</li> <li>▶ Anthropologist</li> <li>▶ Applied Mathematician</li> <li>▶ Archeologist</li> <li>▶ Astronomer</li> <li>▶ Astrophysicist</li> <li>▶ Atmospheric Scientist</li> <li>▶ Biologist</li> <li>▶ Botanist</li> <li>▶ Chemist</li> <li>▶ Ecologist</li> <li>▶ Economist</li> <li>▶ Environmental Scientist</li> <li>▶ Geneticist</li> <li>▶ Geologist</li> <li>▶ Geophysicist</li> <li>▶ Marine Scientist</li> <li>▶ Math Teacher</li> <li>▶ Mathematician</li> <li>▶ Meteorologist</li> <li>▶ Nanobiologist</li> <li>▶ Nuclear Chemist/Technician</li> <li>▶ Physicist</li> <li>▶ Programmer</li> <li>▶ Quality-Control Scientist</li> <li>▶ Research Technician</li> <li>▶ Science Teacher</li> <li>▶ Scientist</li> <li>▶ Statistician</li> <li>▶ Zoologist</li> </ul>	
	10	English/ Language Arts II	Geometry or Algebra II	Chemistry	U.S. History		<ul style="list-style-type: none"> <li>• Information Technology Applications</li> <li>• Chemistry Laboratory</li> </ul>		
	11	English/ Language Arts III	Algebra II or Trigonometry Pre-Calculus or Statistics	Physics	World History World Geography		<ul style="list-style-type: none"> <li>• Physics Laboratory</li> </ul>		
	<i>College Placement Assessments-Academic/Career Advisement Provided</i>						<ul style="list-style-type: none"> <li>• Scientific Research (Some or all of the following postsecondary courses may be taught at the high school level.)</li> </ul>		
<i>Articulation/Dual Credit Transcribed-Postsecondary courses may be taken/moved to the secondary level for articulation/dual credit purposes.</i>									
POSTSECONDARY	Year 13	English Composition English Literature	Algebra or Trigonometry Calculus I Calculus II	Chemistry Physics	Psychology Global Issues	All plans of study need to meet learners' career goals with regard to required degrees, licenses, certifications or journey worker status. Certain local student organization activities may also be important to include.	<ul style="list-style-type: none"> <li>• Science and Mathematics in the Real World</li> <li>• Advanced Applications of Science and Mathematics</li> </ul>		
	Year 14	Speech/ Oral Communication Professional and Technical Writing	Introduction to Differential Equations Calculus III Statistics	Organic Chemistry Microbiology	American History Sociology Ethics and Legal Issues		<ul style="list-style-type: none"> <li>• Using Science and Mathematics to Solve Problems</li> <li>• Technical Aspects of Science and Mathematics</li> </ul>		
	Year 15	Continue courses in the area of specialization.					<ul style="list-style-type: none"> <li>• Continue Courses in the Area of Specialization</li> </ul>		
	Year 16						<ul style="list-style-type: none"> <li>• Complete Science and Mathematics Major (4-Year Degree Program)</li> </ul>		

## *Creating Your Institution's Own Instructional Plan of Study*

With a team of partners (secondary/postsecondary teachers and faculty, counselors, business/industry representatives, instructional leaders, and administrators), use the following steps to develop your own scope and sequence of career and technical courses as well as degree major courses for your institution's plan of study.

- 1** Crosswalk the Cluster Foundation Knowledge and Skills (available at <http://www.careerclusters.org/goto.cfm?id=96>) to the content of your existing secondary and postsecondary programs/courses.
- 2** Crosswalk the Pathway Knowledge and Skills (available at <http://www.careerclusters.org/goto.cfm?id=74>) to the content of your existing secondary/postsecondary programs and courses.
- 3** Based on the crosswalks in steps 1 and 2, determine which existing programs/courses would adequately align to (cover) the knowledge and skills. These programs/courses would be revised to tighten up any alignment weaknesses and would become a part of a sequence of courses to address this pathway.
- 4** Based on the crosswalks in steps 1 and 2, determine what new courses need to be added to address any alignment weaknesses.
- 5** Sequence the **content** and **learner outcomes** of the existing programs/courses identified in step 3 and new courses identified in step 4 into a course sequence leading to preparation for all occupations within this pathway. (See list of occupations on page 1 of this document.)
- 6** The goal of this process would be a series of courses and their descriptions. The names of these courses would be inserted into the *Career and Technical Courses* column on the Plan of Study on page 1 of this document.
- 7** Below is a **sample result** of steps 1-6, and these course titles are inserted into the Plan of Study on page 1 of this document.
- 8** Crosswalk your state academic standards and applicable national standards (e.g., for mathematics, science, history, language arts, etc.) to the sequence of courses formulated in step 6.

**Science, Technology, Engineering and Mathematics: Science and Mathematics**  
**SAMPLE Sequence of Courses for ► Instructional Leaders ► Administrators ► Counselors ► Teachers/Faculty**

**SAMPLE**

*Below are suggested courses that could result from steps 1-6 above. However, as an educational institution, course titles, descriptions and the sequence will be your own. This is a good model of courses for you to use as an example and to help you jump-start your process. Course content may be taught as concepts within other courses, or as modules or units of instruction.*

**The following courses are based on the Cluster Foundation Knowledge and Skills found at <http://www.careerclusters.org/goto.cfm?id=96>. These skills are reinforced through participation in student organization activities.**

**#1**

*Introduction to Careers:* This course will introduce students to basic skill development in a wide variety of subject matter and career areas. Students will be exposed to a variety of basic skills and job-related activities to help them make more informed decisions. All aspects of careers in science and mathematics including teaching will be explored. This may be taught as a career exploration course in conjunction with other foundation Career Cluster courses.

**#2**

*Laboratory Practices and Biology Laboratory:* This course introduces students to problem-based learning experiences obtained in a laboratory setting. Students will become acquainted with facilities, equipment, testing and lab procedures; practice laboratory procedures that maintain a healthy and safe environment; and ensure that work is performed effectively and efficiently. Students will solve issues and problems by sharing their ideas, questions, skills, knowledge, and experiences with other students. The laboratory practices will be used in the biology laboratory to reinforce the concepts taught in the biology classroom.

**The following courses are based on the Cluster Foundation Knowledge and Skills as well as the Pathway Knowledge and Skills found at <http://www.careerclusters.org/goto.cfm?id=74>. These skills are reinforced through participation in student organization activities.**

**#3**

*Information Technology Applications:* Students will use technology tools to manage personal schedules and contact information, create memos and notes, prepare simple reports and other business communications, manage computer operations and file storage, and use electronic mail, Internet applications and GIS to communicate, search for and access information. Students will develop skills related to word processing, database management and spreadsheet applications.

**#4**

*Chemistry Laboratory:* The laboratory practices will be used in the chemistry laboratory to reinforce the concepts taught in the chemistry classroom.

**#5**

*Physics Laboratory:* The laboratory practices will be used in the physics laboratory to reinforce the concepts taught in the physics classroom.

**The following courses expose students to Pathway Knowledge and Skills found at <http://www.careerclusters.org/goto.cfm?id=74> and should include appropriate student activities.**

**#6**

*Scientific Research:* Students will work in teams with an adult mentor to identify a science or mathematics research topic, conduct the research, write a scientific paper and defend the team conclusions and recommendations to a panel of outside reviewers.

**#7**

*Science and Mathematics in the Real World:* Students will develop an understanding of how science and mathematics function as an active component of the real world. Students will apply science and mathematics concepts and principles of inquiry; use a broad knowledge of science and mathematics to communicate with the global community; integrate science, mathematics, technology, and engineering concepts and content; and learn to access, share and use data. Students will also assess the impact that science and mathematics have on society.

**#8**

*Advanced Applications of Science and Mathematics:* Students will apply essential concepts and skills including using the scientific method, differentiating between science and pseudoscience, using observations to draw conclusions, and recognizing measurable attributes of objects, units, systems and processes. Students will analyze change in various contexts, research and problems; use qualitative and quantitative skills to conduct a simple scientific survey; predict outcomes of an experiment and defend opinions using fact.

**#9**

*Using Science and Mathematics to Solve Problems:* Students will use effective problem-solving and critical-thinking skills to produce viable solutions including using scientific methodology, analytical tools and techniques to solve problems, construct tests and evaluate data. These skills will be used to translate, interpret and summarize research and statistical data.

**#10**

*Technical Aspects of Science and Mathematics:* Students will design, operate, and maintain technological systems and equipment; collect information; change/modify materials; and use appropriate tools to conduct experiments to demonstrate an application of technical skills needed in a chosen scientific and mathematical field.



# Notes

---

A large rectangular area filled with horizontal stripes, alternating between light purple and light yellow, intended for writing notes.