Texas CTE

Science, Technology, Engineering, and Mathematics (2010): Grade 9

Adopted 2010

Concepts of Engineering and Technology

(1) The student investigates the components of engineering and technology systems. The student is expected to:

- (A) investigate and report on the history of engineering science;
- (B) identify the inputs, processes, and outputs associated with technological systems;
- (C) describe the difference between open and closed systems;
- (D) describe how technological systems interact to achieve common goals;
- (E) compare and contrast engineering, science, and technology careers; and
- (F) conduct and present research on emerging and innovative technology.

(2) The student presents conclusions, research findings, and designs using a variety of media throughout the course. The student is expected to:

- (A) use clear and concise written, verbal, and visual communication techniques;
- (B) maintain a design and computation engineering notebook;
- (C) use sketching and computer-aided drafting and design to present ideas; and
- (D) maintain a portfolio.

(3) The student uses appropriate tools and demonstrates safe work habits. The student is expected to:

- (A) master relevant safety tests;
- (B) follow safety guidelines as described in various manuals, instructions, and regulations;
- (C) recognize the classification of hazardous materials and wastes;
- (D) dispose of hazardous materials and wastes appropriately;
- (E) perform maintenance and safely handle and store laboratory equipment;
- (F) describe the implications of negligent or improper maintenance; and
- (G) demonstrate the use of precision measuring instruments.

(4) The student describes the factors that affect the progression of technology and the potential intended and unintended consequences of technological advances. The student is expected to:

- (A) describe how technology has affected individuals, societies, cultures, economies, and environments;
- (B) describe how the development and use of technology influenced past events;
- (C) describe how and why technology progresses; and
- (D) predict possible changes caused by the advances of technology.

(5) The student describes the importance of teamwork, leadership, integrity, honesty, ethics, work habits, and organizational skills. The student is expected to:

- (A) describe and demonstrate how teams function;
- (B) identify characteristics of good team leaders and team members;
- (C) work in a team face-to-face or in a virtual environment to solve problems;
- (D) discuss the principles of ideation;
- (E) identify employers' expectations and appropriate work habits;
- (F) differentiate between discrimination, harassment, and equality;
- (G) describe ethical behavior and decision making through use of examples;
- (H) use time-management techniques to develop team schedules to meet project objectives; and
- (I) complete projects according to established criteria.

(6) The student thinks critically and applies fundamental principles of system modeling and design to multiple design projects. The student is expected to:

- (A) identify and describe the fundamental processes needed for a project, including design and prototype development;
- (B) identify the chemical, mechanical, and physical properties of engineering materials;
- (C) use problem-solving techniques to develop technological solutions;
- (D) use consistent units for all measurements and computations; and
- (E) assess risks and benefits of a design solution.

(7) The student understands the opportunities and careers in fields related to biotechnology. The student is expected to:

(A) describe the fields of biotechnology;

(B) describe career opportunities in biotechnology;

(C) apply design concepts to problems in biotechnology;

(D) identify fields related to biotechnology; and

(E) identify currently emerging issues in biotechnology.

(8) The student understands the opportunities and careers in fields related to process control and automation systems. The student is expected to:

(A) describe applications of process control and automation systems;

(B) describe career opportunities in process control and automation systems;

(C) apply design concepts to problems in process control and automation systems;

(D) identify fields related to process control and automation systems; and

(E) identify emerging issues in process control and automation systems.

(9) The student understands the opportunities and careers in fields related to physical and mechanical systems. The student is expected to:

(A) describe the applications of physical and mechanical systems;

(B) describe career opportunities in physical and mechanical systems;

(C) apply design concepts to problems in physical and mechanical systems; and

(D) identify emerging issues in physical and mechanical systems.

(10) The student participates in a team-based culminating project. The student is expected to:

(A) apply the design process in a team;

(B) assume different roles as a team member within the project;

(C) maintain an engineering notebook for the project;

(D) develop and test the model for the project; and

(E) present the project using clear and concise communication skills.

Biotechnology

(1) The student explores biotechnology career opportunities. The student is expected to:

(A) determine interests and aptitudes through conversations with biotechnology professionals;

(B) identify career options in the field of biotechnology;

(C) identify reliable sources of career information;

(D) research interests, knowledge, educational level, abilities, and skills needed in a biotechnology-related occupation;

(E) seek a mentor in the biotechnology area;

(F) identify conventional and non-conventional career opportunities that match interests and aptitudes;

(G) research applications of biotechnology and biomaterials in the areas of medicine, the environment, and pharmaceutical, agricultural, and industrial settings; and

(H) use technology to research biotechnology topics, identify pertinent scientific articles, obtain articles of interest, and write a formal research paper in the format used by academic and professional journals and magazines.

(2) The student evaluates ethical and legal issues in biotechnology. The student is expected to:

(A) identify current ethical and legal issues;

(B) describe the history of biotechnology and related current issues;

(C) discuss legal and technology issues for at least two biotechnology related areas; and

(D) compare and contrast examples of objective and subjective scientific, economic, and political data and positions used to defend biotechnology views.

(3) The student examines federal, state, local, and industry regulations as applied to biotechnical processes through library research and Internet research. The student is expected to:

(A) identify local, state, and federal agencies responsible for regulating the biotechnology industry;

(B) identify professional organizations participating in the development of biotechnology policies;

(C) identify and define terms related to biotechnology regulations; and

(D) outline the methods and procedures used in biotechnology laboratories to follow and enforce local, state, and federal regulations, including those in the agricultural and health areas.

(4) The student demonstrates knowledge of the business climate for biotechnology industry sectors in the current market. The student is expected to:

(A) identify professional publications;

(B) identify the various biotechnology industry sectors; and

(C) investigate and report on career opportunities in the biotechnology industry sectors.

(5) The student researches and exhibits employability skills that support a career in the biotechnology industry. The student is expected to:

(A) demonstrate verbal, nonverbal, written, and electronic communication skills;

(B) demonstrate skills used to secure and maintain employment;

(C) demonstrate appropriate workplace etiquette; and

(D) display productive work habits and attitudes.

(6) The student investigates the origins of waste and examines the relationship of biotechnology to resource recovery. The student is expected to:

(A) investigate at least three end products from biotechnology manufacturing processes;

(B) investigate the effects of waste on environmental and biological life cycles;

(C) investigate the impacts of waste on the environment;

(D) analyze the results of manufacturing refuse;

(E) explain the negative impacts of waste with respect to the individual, society, and the global population;

(F) research solutions to biological waste with respect to commercial applications through investigation of various pollution waste treatments using natural organisms;

(G) investigate biotechnology as it relates to health and well-being; and

(H) cite evidence regarding regulations, patents and public policy, design development and testing, and safety.

(7) The student examines the relationship of biotechnology to the development of commercial products. The student is expected to:

(A) identify the ability to change or enhance genetic characteristics;

(B) identify applications of genetic engineering;

(C) identify applications of nanotechnology in biotechnology;

(D) identify applications of bioinformatics in biotechnology;

(E) identify the applications of biotechnology in medicine, forensics, and law enforcement; and

(F) research ethical considerations, laws, and regulations governing genetic engineering and nanotechnology.