TNCore

Historical Development of Mechatronics

Tennessee State Standards for Literacy in CTE Aligned Activity

This resource is best for:

Teachers of:	Mechatronics I*	**Career Cluster:**	Manufacturing
Addressing Standard(s):	Mechatronics I: Standard 1	**Grade-Band:**	9-10, 11-12
In alignment with CTSO:	TSA – Technology Student Association www.tntsa.org	**CTSO Event: (if applicable)**	Essays on Technology

*Teachers can use this activity to develop an understanding of various technological issues to meet standards covered in this course as well as others. This lesson can be adapted for use in other courses with other standards requiring research and presentation of issues in an informative or explanatory manner.

Learning Objective: The goal of this activity is to develop a student's knowledge of the historical development of mechatronic systems and their impact on current society while practicing the skills necessary to become proficient in the Tennessee State Standards for Literacy in Technical Subjects. Discussions in class, readings, researching activities, and writing exercises are coordinated in class to help students construct a technical meaning of their research in a way that "sticks."

The following should be used during this teaching:

- Essays should be evaluated using the Tennessee 9-12 ELA Informative/Explanatory Rubric, found at http://tncore.org/sites/www/Uploads/TNCORE/Rubrics/InfExpRubric-Gr9-12-Literacy.pdf.

CTSO Competition Overview: Participants conduct research on specified subtopics of a broader technological area and, using the knowledge and resources gained through that research, write a comprehensive essay on the one subtopic that is designated onsite.

The competitive event guidelines needed for this activity are:

- **Essays on Technology:** These guidelines are available on the national TSA website through the chapter advisor management system. Chapters must be affiliated members of TSA in order to access the event guidelines.

Tennessee State Standards for Literacy in Technical Subjects addressed by this activity	
Strand	**Grades 11-12**
TN Reading for Technical Subjects: Key Ideas and Details	**1**. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
	2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
TN Writing for Technical Subjects: Text Types and Purposes	**2.** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **2a**. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. **2b**. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. **2c**. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. **2d.** Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. **2e.** Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. **2f**. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
Tennessee CTE Standards addressed by this activity	
Mechatronics I	**Mechatronics Overview** 1. Drawing on various media, including visual, quantitative, and written resources, trace the historical development of the four facets (mechanical systems, electronic systems, computers, and control systems) of a mechatronic system and explain their chief applications in modern society, citing specific textual evidence. (TN Reading 1, 2; TN Writing 2)

What key insights should students take from this activity?

1. The mechatronics industry is an emerging industry that is constantly evolving to meet the needs of our modern society.
2. The field of mechatronics involves the integration of mechanical systems with electronic systems, utilizing computers and various control systems to enhance all activities in production technology and manufacturing including product design, productivity, and product quality.
3. The design of future products involves an understanding of historical developments mechanical and electronic systems, computers, and control systems in order to utilize the combination of precision mechanical and electronic systems in the young field of mechatronics as the basis for all applications in manufacturing and production technology.

Discussion Questions
Questions to consider may include but are not limited to: 1. Why is it important that we understand the historical development of the four facets of a mechatronic system: mechanical systems, electronic systems, computers, and control systems? 2. Summarize some of the chief applications of mechatronic systems in modern society and describe how these applications have improved manufacturing and production. 3. Outline the major influences over the decades and explain the impact that each had on the development of ever-improving technologies in the area of mechatronics? 4. What other technological advancements do you think were enhanced by the historical development of mechatronic systems and why are these important?

Writing Mode	Topic
Informative	Students will thoroughly conduct research on the topic addressed by Standard 1 of the Mechatronics I course and use the knowledge and personal insights gained from this research to write an informative essay that effectively addresses the topic: Explain the historical development of the four facets of a mechatronic system and their chief applications in modern society. 1. Mechanical systems 2. Electronic systems 3. Computers 4. Control Systems (In the actual TSA Essays on Technology competitive event, the student will thoroughly research all subtopics and then will write an essay in a one hour time period on a subtopic selected from two or three related subtopics designated onsite at the TSA event.)

Potential Lesson Plan Design: This lesson plan was created for 90 minute class periods using Standard 1 of the Mechatronics I course as the topic of the TSA Essays on Technology competitive event, but any topic related to mechatronics or technology in general can be substituted in this activity. The number of days or amount of time allotted for the activities can be adjusted at the discretion of the teacher.

Day 1

A. Warm up activity: (10 minutes)
- Before students enter the classroom, write this question on the board: "List what you already know about mechatronic systems in our modern society."
- The instructor should allow students three to five minutes to think and write about the topic.
- After students are finished, the instructor should ask for volunteers to share what they have written.

B. Introduce activity and topic: (10 minutes)
- Provide students with a brief overview of the TSA Essays on Technology competitive event, the guidelines the teacher would like the students to follow, and the teacher's expectations of the students for this activity. The teacher should provide students with a copy of the rubric used to score the essays, the Tennessee 9-12 ELA Informative/Explanatory Rubric (available at http://tncore.org/sites/www/Uploads/TNCORE/Rubrics/InfExpRubric-Gr9-12-Literacy.pdf). Keep in mind that in the actual TSA competitive event, the rubric available to affiliated chapters in the competitive event guidelines should be the one with which students should be prepared to be judged.

C. Research: (60 minutes)
- The teacher will assign the topic that students should research for information to include in their essays.

- The students will begin individual research for information from multiple authoritative print and digital sources, assess the usefulness of the sources, and cite sources using a standard format. (MLA format is suggested for the TSA competitive event and guidelines for its use are included in the event guidelines.) The instructor may wish to offer specific resources that have already been vetted to the students for use in their research rather than have them do complete searches on their own.
- Students will continue their individual research as the teacher supervises and assists as needed to ensure students are progressing appropriately.

Day 2

A. Create the Outlines: (60 minutes)
   - Using the research conducted on the subtopic, students should create an outline for their essays.
   - The TSA Essays on Technology competition guidelines require the outlines be handwritten on 3" x 5" note cards, one for each subtopic, with the subtopic outline on one side of the card and the corresponding supporting details, sources and references on the other side of the card. For the sake of this lesson, the teacher may use his/her discretion as to the format for the outline.

B. Cite the Sources: (20 minutes)
   - Review selected format for a bibliography with students. Create a bibliography citing the sources that will be used in the essay using a standard format such as MLA.

Day 3

A. Write the Essay: (80 minutes)
   - Prepare students for the essay assignment by ensuring student readiness and organization for the task and answering questions as needed.
   - Within a 60 minute time frame, students will construct an essay using evidence from the research to include relevant facts, definitions, concrete details, quotations, or other information and examples pertaining to the topic: The historical development of the four facets of a mechatronic system and their chief applications in modern society, including mechanical systems, electronic systems, computers, and control systems.
   - The teacher must determine whether students should handwrite or type the essays and what an appropriate length should be, based on the depth desired and encountered in this lesson. The essay may be a two-day assignment, depending on the length of the class and the depth desired by the teacher. This can also be a take-home assignment if desired.
   - Students should submit their outlines, essays, and bibliographies for grading.
   - The teacher will score essays using the ELA Informative/Explanatory Rubric.
   - To further prepare students for the TSA Essays on Technology competition, the teacher may extend this lesson another day and assign each student only one subtopic upon entering the classroom. Each student would then spend the class period using his/her self-created outline on that subtopic to create an essay that addresses only that subtopic.

Scaffolding and support for special education students, English language learners, and struggling readers: Consider pre-teaching synonyms of difficult vocabulary words. Lower-level readers and ELL students can still be challenged without being overloaded with difficulty. This strategy

can also be used to differentiate for stronger readers by introducing new, and more challenging, vocabulary. Struggling readers would also benefit from visual aids to illustrate many of the ideas presented. A few pre-selected references, pictures, diagrams, and charts alongside the text will go far to aid students as they dissect these resources provided by the teacher.

Note: Social, ethnic, racial, religious, and gender bias is best determined at the local level where educators have in-depth knowledge of the culture and values of the community in which students live. TDOE asks local districts to review these materials for social, ethnic, racial, religious, and gender bias before use in local schools.