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| **TEXAS CTE LESSON PLAN**  [www.txcte.org](http://www.txcte.org) | |
| **Lesson Identification and TEKS Addressed** | |
| **Career Cluster** | Science, Technology, Engineering, and Mathematics |
| **Course Name** | Robotics I |
| **Lesson/Unit Title** | Intro to Robotics I - Part 1 - Overview |
| **TEKS Student Expectations** | **130.408.(c) Knowledge and Skills**  (1) The student demonstrates professional standards/employability skills as required by business and industry.  (D) The student is expected to demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results  (3) The student participates in team projects in various roles.  (A) The student is expected to explain the importance of teamwork in the field of robotics  (4) The student develops skills for managing a project.  (B) The student is expected to develop a project schedule and complete work according to established criteria |
| **Basic Direct Teach Lesson**  (Includes Special Education Modifications/Accommodations and  one English Language Proficiency Standards (ELPS) Strategy) | |
| **Instructional Objectives** | **Performance Objective:**  At the end of this lesson, students will be able to demonstrate they have developed an appropriate knowledge of robotic systems by passing the Introduction to Robotics Part 1 quiz.  **Specific Objectives:**   * Define what a robot is. * Describe common robot applications. * List and discuss three types of robotic controls (remote, autonomous, tethered). * Identify the different parts and pieces and how the different robot sub-systems relate to each other. * Name the parts of a robot. * Describe feedback as used in a robot system. * Explain the difference between Electrical Engineers, Mechanical Engineers, and Industrial Engineers. |
| **Rationale** | It is critical that students have a basic knowledge of robotic systems and explore careers in the highly diverse technical fields that are evolving. |
| **Duration of Lesson** | Teacher’s Discretion |
| **Word Wall/Key Vocabulary**  *(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* | * Robotic Control – Remote * Robotic Control – Autonomous * Robotic Control – Tethered * Electrical Engineers * Mechanical Engineer * Industrial Engineers |
| **Materials/Specialized Equipment Needed** | **Instructional Aids:**   1. Introduction to Robotics Part 1: Overview Quiz answer key 2. Pictures of various robots   **Equipment Needed:**   1. Computer with internet access 2. Overhead projector and screen   **Materials Needed:**   1. Paper and pen/pencil 2. Introduction to Robotics Part 1: Overview Quiz for each student |
| **Anticipatory Set**  (May include pre-assessment for prior knowledge) | **SAY:** Today we are going to learn how to build a robot. Before we do, we must go over a fewbasics.  **ASK:** Does anyone know what a robot is? (Allow time for the students to answer.)  **SHOW:** Pictures of a robot from researched websites and other resources**.**  **ASK:** Is this a robot? (for each one) Is this what you think a robot is? What about this?  **SHOW:** Point to a printer.  **ASK:** What about that?  **SAY:** Technically, it is. It is not something that we generally consider a robot, but it senses andmanipulates its environment, it is electronic, and it has a brain and a computer program.  **SAY:** So, a robot is not always what we think it is. |
| **Direct Instruction \*** | |  | | --- | | I. Brief History | | A. Robots are a relatively new concept. | | B. The first robots were imaginary products of | | fiction writers until the 1960s. | | C. Real robots are primarily used in industry and | | are nothing like fictional robots. |   II. Factors in Robot Use  A. Robots can be used in environments that humans are not suited for.  B. Industrial environments need to be designed for robot use (instead of humans).  C. For many years robots were designed and built based on their own capabilities. and NOT based on industry requirements.  D. Electrical and mechanical engineers dominated the design and construction of early robots.  E. They still do (to some degree) but major breakthroughs in robot use came when Industrial Engineers influenced the design of both robots and manufacturing processes to optimize productivity.  III. Robots Eliminate and Create Jobs  A. Some types of jobs are eliminated (routine, manual labor).  B. Other types of jobs are created (technical, skilled).  C. Many jobs are available in the robotic industry because robotics requires creativity and improves the quality of life.  IV. Introduce Robotics by Covering some of the  Definitions  A. “What is a robot” does not have a single definition.  B. View and discuss some of the pictures given.  C. Compare and contrast industrial versus humanoid.  D. Our focus will be on student robots suitable for a high school class.   |  |  | | --- | --- | | V. Robot System Categories |  |  1. Systems are sometimes called subsystems. 2. This is just one example of a general way to categorize robot systems 3. The block diagram is an overview of functions. 4. Focus on the feedback loop from output back to input. This feedback can either be positive (recognition and identification) or negative (error correction). 5. Sensors provide input, actuators provide output.   VI. Types of Control   1. We will be using one of these types at one point or another in the class 2. Most high school robotic contests are assumed to use autonomous control, but the reality is they generally use remote control   C. Tethered control might seem to be a  contradiction to the way a robot is generally  perceived, but virtually all industrial robots are  fixed in place and hard wired to a power source.   1. The offshore oil and gas industry also uses a large number of tethered robots for their work   VII. Power   1. Batteries are the primary source for student robots 2. batteries have limitations, one being the amount of power they can provide, another being that they are relatively heavy   C. Heavy, meaning they are one of the heaviest  parts of the robot.  D. Motors will require the most power and the  highest voltage; the electronic control systems  (microcontroller and joystick) use less power and  lower voltage.  VIII. Evolution  A. The evolution in sensing and control is the  evolution of robots  B. Robots are not intelligent the way humans are.  Robotic intelligence is related to the ability of a  computer program to recognize and respond to its sensed input  lar  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  NONE |
| **Guided Practice \*** | The teacher will guide the instruction about robotic definitions and assemblies.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  NONE |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | Students are expected to be able to discuss characteristics of real robots and compare them to imaginary or fictional robots  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  NONE |
| **Lesson Closure** | **Question:** What is a robot?  **Answer:** Usually an electromechanical machine which is shown what to do by computer andelectronic programming  **Question:** What is the difference between a motor and a servo?  **Answer:** A motor rotates continuously 360 degrees; and a servo goes to a position and holdsthere. |
| **Summative/End of Lesson Assessment \*** | Introduction to Robotics Part 1: Overview Quiz, and definitions.  *Individualized Education Plan (IEP) for all special education students must be followed. Examples of accommodations may include, but are not limited to:*  NONE |
| **References/Resources/**  **Teacher Preparation** | 1. Student Competition websites    1. BEST Robotics Inc.: [www.bestinc.org](http://www.bestinc.org)    2. FIRST: [www.usfirst.org](http://www.usfirst.org)    3. MATE: [www.marinetech.org](http://www.marinetech.org) 2. Industry websites 3. Textbooks:    1. Pearson (2002) Introduction to Robotics in CIM Systems**,** 5TH edition (IRSA) by James Rehg    2. Glencoe, McGraw-Hill (2004) Glencoe Technology Today and Tomorrow (Teacher Annotated Edition)    3. E.D.C. Publishing (1984-05) Robotics (Usborne New Technology) by Tony Potter    4. Delmar Publishers (1988-12) Robotics: An Introduction (Electronics Technology) by Douglas R., Jr. Malcolm    5. McGraw-Hill Companies (1994-06) The McGraw-Hill Illustrated Encyclopedia of Robotics & Artificial Intelligence    6. Prentice Hall (1998-06) Robotics: Introduction, Programming, and Projects (2nd Edition) by James L. Fuller   **Teacher Preparation:**  Review the lesson and preview the Introduction to Robotics Part 1: Overview.  Research websites and other resources to obtain pictures of various robots to show students. |
| **Additional Required Components** | |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** |  |
| **Recommended Strategies** | |
| **Reading Strategies** |  |
| **Quotes** |  |
| **Multimedia/Visual Strategy**  **Presentation Slides + One Additional Technology Connection** |  |
| **Graphic Organizers/Handout** |  |
| **Writing Strategies**  **Journal Entries + 1 Additional Writing Strategy** |  |
| **Communication**  **90 Second Speech Topics** |  |
| **Other Essential Lesson Components** | |
| **Enrichment Activity**  (e.g., homework assignment) | Have students research and write a report on important robots, either those used in industry or found in popular media. Have students focus on what technologies were necessary to build the robot, or those technologies that we currently do not have that would be necessary for that particular robot. |
| **Family/Community Connection** |  |
| **CTSO connection(s)** | TSA, SkillsUSA |
| **Service Learning Projects** |  |
| **Lesson Notes** |  |

1. Visit the Texas College and Career Readiness Standards at <http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>, Texas Higher Education Coordinating Board (THECB), 2009. [↑](#footnote-ref-1)