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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** | Construction Robotics I - Part 4 - Body |
| **TEKS Student Expectations** | **130.408. (c) Knowledge and Skills**  (7) The student develops an understanding of engineering principles and fundamental physics. The student is expected to:  (A) demonstrate knowledge of Newton's Laws as applied to robotics such as rotational dynamics, torque, weight, friction, and traction factors required for the operation of robotic systems  (B) demonstrate knowledge of motors, gears, gear ratios, and gear trains used in the robotic systems  (11) The student produces a product using the appropriate tools, materials, and techniques. The student is expected to:  (A) identify and describe the steps needed to produce a prototype  (B) identify and use appropriate tools, equipment, machines, and materials to produce the prototype  (C) construct a robotic or automated system to perform specified operations using the design process |
| **Basic Direct Teach Lesson**  (Includes Special Education Modifications/Accommodations and  one English Language Proficiency Standards (ELPS) Strategy) | |
| **Instructional Objectives** | **Performance Objective:**  After completing this lesson, students will be able to lay out, dimension, and construct a basic body and all its mounting parts (wheels, vertical column, arm, grippers, motors, and all working parts), matching the criteria in the How to Construct a Robot Part by Part Rubric.  **Specific Objectives:**   * Explain how to make the parts and why you are looking at the main considerations – construction strength, speed, function, purpose, and weight. * Select the best one, not necessarily the best drawing (that fits its main function) * Calculate surface area, and what function you want the robot to perform. * Analyze if you have enough room to hold all materials (try to have body aid in performance). * Identify that size and speed will be determined by this part. * Explain what materials you are using and why. * Explain what machines and tools you are using and how to use them. * Identify safety required when using the machines and tools. * Prepare a Plan Sheet. |
| **Rationale** | It is critical that students can construct a robot body. |
| **Duration of Lesson** | Teacher’s Discretion |
| **Word Wall/Key Vocabulary**  *(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* | * Mounting Part * Wheel * Vertical Column * Arm * Gripper * DC Motor * Propulsion * Gear * Gear Train * Newton’s Law |
| **Materials/Specialized Equipment Needed** | **Instructional Aids:**   * How to Construct a Robot Part by Part Rubric * Story Board handout * Plan Sheet handout * Computer aided design/drafting software * Internet access   **Materials Needed:**   * Story Board handout for each student * Plan Sheet handout for each student * How to Construct a Robot Part by Part Rubric for each student * Wood, plywood, metal, screws, string, plastic, wire mesh, rubber   **Equipment Needed:**   * Assorted hand tools * Metal cutters * Scroll saw * Drill press * Scratch awl * Compass |
| **Anticipatory Set**  (May include pre-assessment for prior knowledge) | **SAY:** Today we are going to learn how to construct a body to attach all the robot parts.  **ASK:** Does anyone know what the three things you should keep in mind when constructing the body ofthe robot are? (Allow time for answers.)  **SAY:** Yes, weight, speed, and aid in main function of robot to hold all robot parts.  **SAY:** Next, we will look at the Body Plan Sheet.  **SHOW**: Show the Body Plan Sheet and then stop and let the students develop their own robot body.After they have completed one device, continue with the rest to create their own body shape, and its attaching parts.  **ASK:** Which body was best for this Robot and its connecting parts? (Allow time for the students toEXPLAIN their answers.) |
| **Direct Instruction \*** | 1. Body defined as 2. A device used to hold parts 3. A device used to cover and aid in the main function of the robot 4. Problem Solving process for a body 5. Understanding the problem 6. Devising a plan 7. Carrying out the plan 8. Questioning Students 9. Looking back, evaluating 10. Follow procedures 11. Construct by a plan sheet 12. Follow story board 13. Complete Plan sheet 14. Review five body examples 15. Select or revise design 16. Allow students to construct the body 17. Students construct body 18. Students try different challenges with different body shapes 19. Evaluation of challenge (body) 20. Best device for certain tasks 21. Ways to improve each device 22. What to do differently if allowed unlimited materials 23. How to do it differently 24. Last step of the problem-solving process-looking back 25. Evaluate all designs 26. Vote which was best for certain tasks   *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 \*** | Throughout How to Construct a Robot Part 4: Body, students will be taught how to make a body and all its attachments, and to think critically of how to design a body and hold attachments.  *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 will be required to be creative, think critically, and make their own body and its attachments.  *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:** Which body was the best for performance?  **Answer:** (It depends on the body created.) The best answer will most likely be a kind of body that aids inmain function that holds and contributes to all its parts and functions (balance speed, strength, weight) of the robot.  **Question:** Which body could best hold a lot of weight?  **Answer:** (It depends on the body created.) The best answer will most likely be the kind of body that hasenough area surface and structure to perform the task.  **Question:** Which body worked best for combination and multiple tasks? |
| **Summative/End of Lesson Assessment \*** | Construction of a Robot Part by Part Rubric. The students will create a body for different tasks and should be evaluated on the efficiency of the body and design.  *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** | **References:**   * Malcolm, D. R. (1988). *Robotics: An Introduction (Electronics Technology)* (2nd ed.). Albany, NY: Delmar. * Potter, T., & Guild, I. (1983). *Robotics (New Technology)*. London, England: Usborne. * Magazines for mechanics * NASA Robotics * Internet search for gears, problem solving applications   **Teacher Preparation:**   * Prepare Story Board handout for each student * Prepare Plan Sheet handout for each student * Prepare How to Construct Robot Part by Part Rubric for each student * Research books and internet for applications * Have materials and equipment ready for student choice |
| **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) | For more enrichment, students should construct a body that can be operated electronically (moving a platform down, or pulling objects into the body, and loading gate). |
| **Family/Community Connection** |  |
| **CTSO connection(s)** | SkillsUSA  Technology Student Association |
| **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)