2007 Mississippi Curriculum Framework

Secondary Diesel Service Technology

(Program CIP: 47.0605 – Diesel Mechanics Technology/Technician)

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Standards in this document are based on information from the following organizations:

Automotive Service Excellence/ National Automotive Technicians Education Foundation	Reprinted with permission from *ASE/NATEF Standards - 2004 Medium/Heavy Truck Certifications (Brakes, Diesel, Steering and Suspension, Electrical)*, 101 Blue Seal Drive, Suite 101 Leesburg, VA 20175, www.natef.org
Academic Standards	Mississippi Department of Education Subject Area Testing Program
21st Century Skills	Reproduced with permission of the Partnership for 21st Century Skills. Further information may be found at www.21stcenturyskills.org

Preface

Secondary Diesel Service Technology Research Synopsis

Articles, books, Web sites, and other materials listed at the end of each unit were considered during the revision process. *ASE Blue Seal Tech News, Automotive Inc., Shoptalk,* and *Tomorrow's Technician* were especially useful in providing insight into trends and issues in the field. These references are suggested for use by instructors and students during the study of the topics outlined.

Industry advisory team members from schools throughout the state were asked to give input related to changes to be made to the curriculum framework. Specific comments related to soft skills needed in this program included having a positive attitude, being at work every day and on time, and having reading and writing skills to complete work orders and other forms. Occupation-specific skills stated included fundamentals of mechanics, mechanical reasoning, identification of basic parts, operation, and troubleshooting. Safety practices emphasized included practicing all safety rules and wearing the proper safety equipment.

Instructors from schools throughout the state were also asked to give input on changes to be made to the curriculum framework. Changes suggested for the curriculum included aligning the curriculum to current industry standards.

Curriculum
The following state/national standards were referenced in each course of the curriculum:

- *Mississippi Department of Education Subject Area Testing Program Academic Standards*
- *21st Century Skills*
- *ASE/NATEF Standards—2004 Medium/Heavy Truck Certifications (Brakes, Diesel, Steering and Suspension, Electrical)*

Industry and instructor comments, along with current research, were considered by the curriculum revision team during the revision process; and changes were made as needed and appropriate. Many of the skills and topics noted in the research were already included in the curriculum framework. Specific changes made to the curriculum at the April, 2006, curriculum revision meeting included:

- The curriculum was aligned with the *2004 Medium/Heavy Truck Certifications (Brakes, Diesel, Steering and Suspension, Electrical).*
- Competencies and objectives were reviewed to ensure accuracy and appropriateness. Some were rewritten to provide broader competencies and more specific, measurable objectives. Where appropriate, competencies were combined to ensure clarity and minimize repetition.
- Suggested teaching and assessment strategies were added that incorporate preassessment, introductory and closure material, varied projects, mastery learning, and the use of various forms of technology. The integration of workplace and academic skills including math, science, English, and history was also documented.
- The Recommended Tools and Equipment list was updated.

Assessment
Students will be assessed using the *Secondary Vehicle and Mobile Diesel Equipment MS-CPAS2 Test*. The test for 2007 is *Secondary Vehicle and Mobile Equipment Mechanics.*

Professional Learning
It is suggested that instructors participate in professional learning related to the following concepts:

- Differentiated instruction – To learn more about differentiated instruction, please go to http://www.paec.org/teacher2teacher/additional_subjects.html and click on Differentiated Instruction. Work through this online course and review the additional resources.
- Computer skills for college credit – To learn more about Computer Skills instruction such as keyboarding, word processing, PowerPoint, etc., please go to http://msvcc.blackboard.com/webapps/portal/frameset.jsp.
- Computer skills for CEU credit – To learn more about Computer Skills instruction such as keyboarding, word processing, PowerPoint, etc., please go to https://cia.rcu.msstate.edu/OnlinePD/.
- Keyboarding skills – To learn to keyboard, please go to http://www.learn2type.com/ for a free typing tutor.
- Blackboard® training – To learn more about Blackboard® training, please go to https://cia.rcu.msstate.edu/OnlinePD/.
- For the latest in online and yearly Connect training provided by the RCU, please go to http://info.rcu.msstate.edu/.

Multiple learning styles inventory training – To learn more about multiple learning styles inventory training please go to:

- http://eduscapes.com/tap/topic68.htm (Technology and Multiple Intelligences)
- http://72.14.209.104/search?q=cache:GXL5y9zPDdAJ:www.gvsu.edu/forms/infolit/TLAhandouts.doc+multiple+learning+styles+online+workshop&hl=en&ct=clnk&cd=3&gl=us (Texas Department of Education's Online PD)
- http://asp.wlv.ac.uk/Level6.asp?UserType=8&Level6=1112 (WLV-Learning Styles)
- http://www.plsweb.com/graduate_courses/full_course_listing/online/miol/ (Purposeful Learning Through Multiple Intelligences® Online)

Foreword

Secondary vocational-technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act III, 1998; and No Child Left Behind Act of 2001).

Each secondary vocational-technical course consists of a series of instructional units which focus on a common theme. All units have been written using a common format which includes the following components:

- Unit Number and Title
- Suggested Time on Task - An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80 percent of the time in the course.
- Competencies and Suggested Objectives
  - A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies.
  - The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.
- Suggested Teaching Strategies - This section of each unit indicates strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies which reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.
- Suggested Assessment Strategies - This section indicates strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.

- Integrated Academic Topics, Workplace Skills, Technology Standards, and Occupational Standards - This section identifies related academic topics as required in the Subject Area Assessment Program (SATP) in Algebra I, Biology I, English II, and U. S. History from 1877, which are integrated into the content of the unit. It also identifies the 21st Century Skills, which were developed by the Partnership for 21st Century Skills, a group of business and education organizations concerned about the gap between the knowledge and skills learned in school and those needed in communities and the workplace. A portion of the 21st Century Skills addresses learning skills needed in the 21st century, including information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills. The need for these types of skills has been recognized for some time and the 21st Century Skills are adapted in part from the 1991 report from the U.S. Secretary of Labor's Commission on Achieving Necessary Skills (SCANS). Another important aspect of learning and working in the 21st century involves technology skills, and the International Society for Technology in Education, developers of the National Educational Technology Standards (NETS), were strategic partners in the Partnership for 21st Century Skills.
- References - A list of suggested references is provided for each unit. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested and the list may be modified or enhanced based on needs and abilities of students and on available resources.

Table of Contents

Program Description

Diesel Service Technology is a two-year secondary program which provides students with a foundation of skills and knowledge related to the service and repair of diesel vehicles and power equipment. Students who complete the program may enter employment in an entry level position, or continue their education in a postsecondary program such as diesel technology, heavy equipment maintenance, or related areas. Students receive instruction in the maintenance and service of a variety of vehicles including small equipment, automobiles, trucks, and tractors/construction equipment.

The first year includes instruction in foundation skills/safety procedures, leadership, tool and equipment usage, measurement, basic vehicle service, brakes/hydraulic service, and electrical system service.

The second year provides students with a review of foundation skills and safety procedures, advanced leadership skills, advanced tool and equipment usage, diesel engine (performance and repair), advanced electrical systems, and steering and suspension.

The program is aligned with ASE/NATEF–2004 Medium/Heavy Truck standards. The student will receive instruction and training in: Brakes, Electrical/Electronics, Diesel, and Steering and Suspension.

Course Outline

Diesel Service Technology I
Course CIP Code: 47.0605

Course Description: Diesel Service Technology I is the entry level course of the secondary Diesel Service Technology program. Students in Diesel Service Technology I will gain foundation competencies related to safety, tool and equipment usage, measurement, brake/hydraulics and basic electrical system service. (2-2½ Carnegie units, depending upon time spent in the course.)

Unit	Title	Hours
Unit 1:	Introduction and Orientation	3-10
Unit 2:	Safety	5-15
Unit 3:	Tools, Technical References, Measurement, and Fasteners	5-15
Unit 4:	Brakes/Basic Hydraulics	87-105
Unit 5:	Basic Electrical/Electronic Systems	170-200

Diesel Service Technology II
Course CIP Code: 47.0609

Course Description: Diesel Service Technology II is a continuing course in the secondary Diesel Service Technology program. Students will gain advanced competencies in foundation skills and safety procedures, advanced leadership skills, advanced tool and equipment usage, diesel engine (performance and repair), advanced electrical systems, and steering and suspension. (2-2½ Carnegie units, depending upon time spent in the course.)

Unit	Title	Hours
Unit 1:	Introduction, Orientation, Employability Skills, and Safety	3-10
Unit 2:	Advanced Tools, Technical References, Measurement, and Fasteners	5-15
Unit 3:	Advanced Electrical/Electronic Systems	20-25
Unit 4:	Diesel Systems and Theory	169-205
Unit 5:	Steering and Suspension Systems	73-90

The range of hours gives instructors the flexibility to meet local scheduling requirements. Programs should choose the maximum hours allowed by their schedule.
Minimum hours may be applied to Diesel Service Technology I: Units 1, 2, 3 and Diesel Service Technology II: Units 1 and 2.
Emphasis should be placed on Diesel Service Technology I: Units 4 and 5 and Diesel Service Technology II: Units 3, 4, and 5.

Diesel Service Technology I
Unit 1: Introduction and Orientation **(3-10 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Introduce concepts and terms associated with the diesel equipment industry.	**Teaching:** • Use a multimedia presentation and the Internet to introduce the career field. Discuss job requirements (e.g., certifications, education, etc.), occupation-specific skills, and soft skills needed. • Have students discuss what they already know about the field of diesel service technology, the types of jobs available, and the salaries of those jobs. Have students work as a class to complete a KWL chart (see Appendix D). In the "K" column, have students list information they currently know about the field of diesel service technology, the types of jobs available, and the salaries of those jobs. In the "W" column, have students brainstorm a list of things they want to learn about the field of diesel service technology. Have students work in groups or as individuals to interview industry members to find answers to their "W" list. Have students return to the KWL chart and list everything they learned from the interviews in the "L" column. • Outline the units of the program and how they relate to various jobs in the field. Share with students the Weekly Learning Reflections activity found in Appendix D. Have students complete this activity at the end of each week. Have students discuss with parents their learning, areas of improvements, and goals for the next week. • Use a multiple learning styles inventory to determine students' learning styles and interests. Share with the students their styles and the impact they have. Throughout the year, provide varied projects to meet the learning styles. • Work with the Special Populations instructor to assess the reading, writing,

	and math skills of each student and to provide materials that are appropriate for each student. Plan to reassess students at the end of the year. • Divide students into groups based on learning styles, and have them use the Internet or textbooks to research the development of the field, origination of terms, and the terms used in different countries throughout the world. Have students present their findings by using technology tools to develop a dictionary, writing and conducting a mock training session for new employees, or making a videotape or tape recording. • Have students research the history of diesel services technology. Have each student create a timeline that indicates growth and changes in the industry. • Have students compare and contrast the American automotive industry to the automotive industries in other countries. Have students present their information in a writing summary. Encourage students to use graphs and timelines as graphical summaries. **Assessment:** • Monitor student participation in discussions using the Group Participation Assessment Rubric located in Appendix D. • Evaluate each group's project and presentation for content, clarity, and length. • Use the assessment tools in the Blackboard Learning System® to administer a vocabulary quiz to students. • Evaluate the timeline for content and presentation.
2. Describe local program and vocational/career and technical center policies and procedures. a. Describe local program and vocational/career and technical center policies and procedures including dress code, attendance, academic requirements, discipline, and	**Teaching:** • Present local program and vocational/career and technical center policies and procedures. • Have students read the handbook to become aware of what is expected of them in relation to the policies and procedures of the school. This will include dress code,

transportation regulations. b. Compare and contrast local program policies, procedures, and expectations to industry policies, procedures, and expectations. c. Preview the school technology acceptable use policy.	attendance, academic requirements, discipline, and transportation regulations. Have students work together in pairs. A student with a higher reading ability will team up with a student with a lower reading ability to get a better understanding of the school's program policies and procedures. Have students submit a written report on rules and regulations using technology productivity tools and the Blackboard Learning System®. • Assign students a mentor from a local diesel services technology industry. Have students use a Venn diagram (see Appendix D) to compare and contrast the class and school policies, procedures, and expectations to a local industry's policies, procedures, and expectations. • Show students video clips about Internet safety for teens from http://www.netsmartz.org/resources/reallife.htm#realamy. Divide students into groups of four. Have each group visit http://www.getnetwise.org/ to research one of the following topics: o Keeping children safe online o Stopping unwanted e-mail and spam o Protecting your computer from hackers and viruses o Keeping your personal information private • Ask each group to become experts on their assigned topic. Have each group teach the class about their topic. As a whole group, have students brainstorm guidelines for teen safety on the Internet. Have students compare and contrast their list of guidelines to the school or district's technology acceptable use policy (AUP). • Share with students the Web sites http://www.missingkids.com and http://www.getnetwise.org/. Have students complete a teen safety reference sheet that includes information about the following: o Internet safety guidelines for teens

	○ Strategies to enhance their ability to recognize dangers on the Internet ○ Information about how to report victimizations to a trusted adult • Have students take their teen safety reference sheet and the school's technology AUP home and discuss it with their parents/guardians. **Assessment:** • Assess student orientation, policy, and procedure knowledge through instructor observations and written unit test. File completed test to document student mastery of the school and program policies and procedures. • Evaluate the report for clarity and content.
3. Describe employment opportunities and responsibilities. a. Describe employment opportunities including potential earnings, employee benefits, job availability, place of employment, working conditions, and educational requirements. b. Describe basic employee responsibilities.	**Teaching:** • Use information from the U.S. Department of Labor to describe the major areas of agriculture, related occupations and their expected growth, and salaries of a variety of jobs in the field. • Have each student select a career in a field related to the course and use the Occupational Outlook Handbook (book or Web site), Internet, and other classroom resources to research job titles, educational and skill requirements, expected job growth, and entry-level salaries. Have students compile their research into a spreadsheet and create graphs to describe their data. Have each student report the findings by writing a news report, making a learning center, or creating a job announcement. • Use technology to show students examples of good and bad resumes and cover letters. Have students identify errors and give suggestions for improvement in the bad examples. • Have each student use the Internet or newspapers to choose a job for which he/she is qualified and prepare a resume and cover letter that can be used to apply for the selected job. • Discuss appropriate interview techniques

	and have the students participate in mock interviews with local personnel working in administrative positions. Have students send thank you notes to mock interviewers. • To provide closure to each unit throughout the year, have students summarize what they have learned about the topic covered and place the summaries in a notebook or portfolio. Review the notebooks or portfolios at the end of each unit and reteach as appropriate to ensure mastery. **Assessment:** • Assess career product for content and appearance. • Evaluate the cover letter for clarity and content. • Evaluate the resume and interview using the Resume Rubric and Interview Rubric located in Appendix D. • Review summary of unit for understanding of material and reteach as needed. • Use the assessment tools in the Blackboard Learning System® to administer a workplace skills quiz to students. • Evaluate student's workplace skills weekly by using the Workplace Skills Weekly Checklist found in Appendix D.

STANDARDS

2004 ASE/NATEF Medium/Heavy Truck Technician Standards

MTB1 For every task in Brakes the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MTS1 For every task in Suspension and Steering the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the

handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MTD1 For every task in Diesel the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
A5 Utilize various formulas in problem-solving situations.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E6 Explore cultural contributions to the history of the English language and its literature.
E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.
H1 Explain how geography, economics, and politics have influenced the historical development of the United States in the global economy.
H2 Describe the impact of science and technology on the historical development of the United States in the global communityl
H3 Describe the relationship of people, places, and environments through time.
H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

21st Century Skills

CS1 Global Awareness
CS2 Financial, Economic, and Business Literacy
CS3 Civic Literacy

CS4 Information and Communication Skills
CS5 Thinking and Problem-Solving Skills
CS6 Interpersonal and Self-Directional Skills

SUGGESTED REFERENCES

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Diesel Service Technology I
Unit 2: Safety **(5-15 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Describe general safety rules for working in a shop/lab and industry (ongoing). a. Describe how to avoid on-site accidents. b. Explain the relationship between housekeeping and safety. c. Explain the importance of following all safety rules and company safety policies. d. Explain the importance of reporting all on-the-job injuries and accidents. e. Explain the need for evacuation policies and the importance of following them. f. Explain the employer's substances abuse policy and how it relates to safety. g. Explain the safety procedures when working near pressurized or high temperature.	**Teaching:** **These may be used for the entire unit.** • Show students videos demonstrating examples of accidents in the workplace (http://www.unitedstreaming.com). Pre-assess knowledge of safety by having each student write a summary of the safety violations present in the videos. • Divide students into groups based on learning styles, and assign each group a guideline for personal and laboratory safety (i.e., chemicals, fire, equipment, animals, and electrical) or general laboratory conduct. Have each group role-play, create a multimedia presentation or a rap song, or write a story to discuss the proper and improper procedures related to the guideline. • Use the guidelines provided for personal safety (i.e., clothing, jewelry, hair, eyes, and ears). Divide the students into pairs and assign each pair one of the guidelines. Each pair will demonstrate the "do's and don'ts" of the guideline. • Have an industry speaker present to the class the necessity of safety in the work environment. Have students use the Writing Process (see Appendix D) to develop a summary of the presentation. • Invite the local fire department to lead a fire safety lesson. Have students use fire extinguishers properly. Have students locate all fire extinguishers in the school. Have students determine and select the proper fire extinguisher for different types of fires. • Divide the students into teams and have them develop scenarios of hazards and accidents using the publications and the Internet. This will include tools, spills, working around welding, ladders or scaffolds, use of MSDS information, fires,
2. Identify and apply safety around diesel equipment repair operations (ongoing). a. Use proper safety practices when performing diesel equipment repair operations. b. Recognize and explain personal protective equipment. c. Inspect and care for personal protective equipment.	
3. Apply safety procedures when lifting (ongoing). a. Explain lifting. b. Identify and explain the procedures for lifting heavy objects.	
4. Explain the Material Safety Data Sheet (MSDS) (ongoing). a. Explain the function of the MSDS. b. Interpret the requirements of the MSDS.	
5. Apply safety procedures to fires (ongoing). a. Explain the process by which fires	

start. b. Explain fire prevention of various flammable liquids. c. Explain the classes of fire and the types of extinguishers. d. Select the proper fire extinguisher for different types of fires.	and electrical situations. In a game-type situation, one team will read a scenario and the other teams will compete to be the first to provide the proper safety measures which should have been used to prevent the hazardous situation. Points will be awarded to the teams with the correct answers. • NOTE: SAFETY IS TO BE TAUGHT AS AN ONGOING PART OF THE COURSE THROUGHOUT THE YEAR.
6. Explain safety in and around diesel equipment repair and electrical situations (ongoing). a. Explain injuries when electrical contact occurs. b. Explain safety around diesel equipment repair and electrical hazards. c. Explain action to take when an electrical shock occurs.	**Assessment:** • Required written tests will follow each section of guidelines for safety rules and procedures. When applicable, use the assessment tools found in the Blackboard Learning System®. • Student participation will be monitored by the instructor and the written exam will be graded. The student must achieve 100% accuracy. • The "do's and don'ts" exercise will be critiqued with a peer review. • The summary of the speaker's presentation will be critiqued using the Written Report Assessment Rubric located in Appendix D. • The teams will be rewarded according to the points earned from the game. This could be extra points, classroom privileges, etc. • Written exams will be graded for accuracy.

STANDARDS

2004 ASE/NATEF Medium/Truck Technician Standards

MTB1 For every task in Brakes the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MTB2 Air Brakes Diagnosis and Repair.

MTB3 Hydraulic Brakes System Diagnosis and Repair.

MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper

ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MTE2 General Electrical System Diagnosis.
MTE3 Battery Diagnosis and Service.
MTE4 Starting System Diagnosis and Repair.
MTE5 Charging System Diagnosis and Repair.
MTE6 Lighting Systems Diagnosis and Repair.
MTE7 Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
MTE8 Related Electrical Systems.
MTS1 For every task in Suspension and Steering the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTS2 Steering Systems Diagnosis and Repair.
MTS3 Suspension Systems Diagnosis and Repair.
MTS4 Wheel Alignment Diagnosis, Adjustment, and Repair.
MTS5 Wheel and Tire Diagnosis and Repair.
MTS6 Frame Service and Repair.
MTD1 For every task in Diesel the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTD2 General Engine Diagnosis.
MTD3 Cylinder Head and Valve Train Diagnosis and Repair.
MTD4 Engine Block Diagnosis and Repair.
MTD5 Lubrication Systems Diagnosis and Repair.
MTD6 Cooling System Diagnosis and Repair.
MTD7 Air Induction, and Exhaust Systems Diagnosis and Repair.
MTD8 Fuel System Diagnosis and Repair.
MTD9 Engine Brakes.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.

E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E6 Explore cultural contributions to the history of the English language and its literature.
E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.

21st Century Skills

CS1 Global Awareness
CS2 Financial, Economic, and Business Literacy
CS3 Civic Literacy
CS4 Information and Communication Skills
CS5 Thinking and Problem-Solving Skills
CS6 Interpersonal and Self-Directional Skills

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Diesel Service Technology I
Unit 3: Tools, Technical References, Measurement, and Fasteners (5-15 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Demonstrate safe and proper use and storage of tools and equipment in a diesel equipment repair lab. a. Identify, demonstrate, and determine the safe and proper use of common hand tools including welders (arc/MIG) and oxy/fuel cutting unit, wrenches, sockets, pliers, screwdrivers, and striking tools. b. Identify, demonstrate, and determine the safe and proper use of lifting and hoisting equipment. c. Identify, demonstrate, and determine the safe and proper use of cleaning equipment. d. Identify, demonstrate, and determine the safe and proper use of power equipment including impact wrenches, drills, grinders, and presses. e. Organize and maintain a systematic storage system for hand and power tools.	**Teaching:** • Discuss and demonstrate the safe and proper use and storage of tools and equipment. • Review diesel equipment repair supply catalogs and self-made pictures of tools and equipment that students will use in the program. • Divide the students into groups by learning styles. Have groups demonstrate safety procedures, proper use, and storage of tools and equipment. Assign a specific task to a group of students. Have the group make a list of the proper tools that will be required to complete the task and present their decisions to the class. • Explain and demonstrate the use of software for the specific area of instruction. Have students use the software for tool identification. **Assessment:** • Have students complete a tool identification test. • Evaluate a job sheet for the task. • Evaluate the group using the Group Presentation Rubric located in Appendix D. • Evaluate the printed results from the software test.
2. Locate and apply service specifications and information. a. Locate service specifications and information, using both print and computerized service information references. b. Interpret and apply information to a specific job on a specific vehicle. c. Locate and interpret vehicle and major component identification numbers (VIN, certification, and calibration labels).	**Teaching:** • Discuss the importance of being able to locate and apply the proper service specifications. • Review the text, Internet, manuals, and handouts for locating and applying information. Have students locate specific information using text, Internet, manuals, and handouts for locating and applying for an assigned task. **Assessment:** • Record the information on the job sheet.

3. Demonstrate measurement practices used in the automotive service. a. Measure the length of an object using a rule to the nearest 1/16th of an inch and 1 millimeter. b. Measure the inside diameter, outside diameter, and/or depth to the nearest .001 of an inch and nearest .1 millimeter, using precision measuring instruments (micrometers, calipers, and dial indicators).	**Teaching:** • Ask students the following question: o How good is your eye for measurement? • Give students the following scenario: o The distance from your nose to the outside of your finger tips is about 1 meter. Estimate the distance between you and three objects in the room. Have each member in the class make a data table and record his/her estimates. Have each student verify his/her estimation and compare it with the real measurement. • Lead a class discussion using the following prompts: o Were the estimates reasonably close? o Did one person consistently make accurate estimates? • Use a KWL chart (see Appendix D) to determine students' previous knowledge of measurement. • Have students define and illustrate measurement terminology. • Explain the importance of proper measurement practices, display tools that are used for measurement, and demonstrate how using the techniques are important to the student's career path. • Give students measurement problems to solve in a group and individual setting. • Demonstrate how to measure a given item using a variety of measuring instruments. Have students work in groups to measure given items and record the answers. • Explain and demonstrate software to review measuring skills. Have students use software to complete measurement problems. • Have students practice converting units extensively (i.e., meters/sec to min/hr, cubic inches/day to liters/min). • Have students discuss the importance of measurement with their industry mentor.

	Assessment: • Evaluate student's measurement problems. • Assess students as they measure given items and record the measurements on a job sheet. • Evaluate measurement conversions for accuracy.
4. Identify common fasteners and describe their use. a. Identify the different types of bolts, nuts, and washers; and describe their appropriate uses. b. Identify bolts by grade, diameter, length, and thread pitch. c. Identify different glues and sealants used in automotive service, and describe their appropriate use. d. Restore internal and external threads.	**Teaching:** • Using a multimedia presentation and classroom materials and supplies, discuss fasteners and their use. • Explain and show how fasteners are used. • Display several models that the students can view and manipulate. • Have students analyze the fasteners and apply the proper fasteners. • Have students use technology productivity tools to develop a fastener sheet. The sheet should contain a picture of common fasteners and a description of their uses. **Assessment:** • Evaluate using the Activity Performance Rubric located in Appendix D. • Evaluate the fastener sheet for accuracy and layout.

STANDARDS

2004 ASE/NATEF Medium/Truck Technician Standards

MTB1 For every task in Brakes the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTB2 Air Brakes Diagnosis and Repair.
MTB3 Hydraulic Brakes System Diagnosis and Repair.
MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTE2 General Electrical System Diagnosis.
MTE3 Battery Diagnosis and Service.
MTE4 Starting System Diagnosis and Repair.
MTE5 Charging System Diagnosis and Repair.

MTE6 Lighting Systems Diagnosis and Repair.
MTE7 Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
MTE8 Related Electrical Systems.
MTS1 For every task in Suspension and Steering the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTS2 Steering Systems Diagnosis and Repair.
MTS3 Suspension Systems Diagnosis and Repair.
MTS4 Wheel Alignment Diagnosis, Adjustment, and Repair.
MTS5 Wheel and Tire Diagnosis and Repair.
MTS6 Frame Service and Repair.
MTD1 For every task in Diesel the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTD2 General Engine Diagnosis.
MTD3 Cylinder Head and Valve Train Diagnosis and Repair.
MTD4 Engine Block Diagnosis and Repair.
MTD5 Lubrication Systems Diagnosis and Repair.
MTD6 Cooling System Diagnosis and Repair.
MTD7 Air Induction, and Exhaust Systems Diagnosis and Repair.
MTD8 Fuel System Diagnosis and Repair.
MTD9 Engine Brakes.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E6 Explore cultural contributions to the history of the English language and its literature.

E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.

21st Century Skills

CS2 Financial, Economic, and Business Literacy
CS4 Information and Communication Skills
CS5 Thinking and Problem-Solving Skills
CS6 Interpersonal and Self-Directional Skills

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Diesel Service Technology I
Unit 4: Brakes/Basic Hydraulics **(87-105 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Explore air brake diagnosis and repair. a. Identify and interpret air brake system concerns; determine necessary action. b. Research applicable service information; locate and interpret identification numbers, certification, and calibration decals.	**Teaching:** • Review and reinforce safety procedures. • Have students write the answers to the following questions in their notebooks: o What should I know and be able to do at the end of this unit or experience? o What do I already know that will be useful in learning this new material or working in this way? o How is this knowledge and how are these skills important in the world outside of school? o When are the important checkpoints and deadlines? o How will I be able to tell when I have done a really outstanding job when applying this new knowledge? • Review student answers and have students discuss their answers when appropriate. • Show a video (http://www.unitedstreaming.com) on the given task and discuss the procedures in completing the task. Have students develop several questions from the video. Lead a group discussion that addresses each question that students listed. • Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class. • Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss their thinking. The discussion between the two students should last two to three minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group.

	• Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into "touring groups" to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have "toured" each chart. When students return to their seats, allow some time for discussion and reactions. • Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources and use technology productivity tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns. • Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task. • Display pictures from the lab and facilitate discussion about the specific task. Have students perform each task assigned. • Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians use appropriate graphic organizers (Cluster Word Web, Fact or Opinion, Step-by-Step Chart, or the Problem Solution Chart found in Appendix D) to evaluate customer's concerns about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action. • Have students complete job shadowing experiences. Have students observe and record notes in a journal about the

	conversations the technician had with customers. • Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit. • After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery. **Assessment:** • Evaluate the questions and answers for content and clarity. • Assess field trip participation using the Field Trip Participation Checklist located in Appendix D. • Evaluate the poster using the Poster Assessment Rubric located in Appendix D. • Assess student participation in role play using the Role-Play Rubric located in Appendix D. • Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D. • Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D. • Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.
2. Explore air supply and service systems. a. Evaluate customer concerns of poor stopping, air leaks, premature wear, pulling, grabbing, or dragging problems caused by supply, and service system malfunctions; determine needed action. b. Check air system build-up time and determine needed action. c. Drain air reservoir tanks; check for oil, water, and foreign material; determine needed action. d. Inspect, adjust, and align compressor	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

drive belts, pulleys, and tensioners; replace as needed. e. Inspect and test system pressure controls: governor, unloader assembly valves, intake screens, filters, lines, hoses, and fittings; replace as needed. f. Inspect air compressor, air cleaner/supply; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed. g. Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed. h. Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check valves, and manual and automatic drain valves; replace as needed. i. Inspect and clean air dryer systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed. j. Inspect and test: o Brake application (foot) valve, fittings, and mounts; adjust or replace as needed. o Stop light circuit switches, wiring, and connectors; repair or replace as needed. o Hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed. o Brake relay valve; replace as needed. o Quick release valves; replace as needed. o Tractor protection valve; replace as needed. o Emergency (spring) brake control/modulator valve(s); replace as needed. o Low pressure warning devices, wiring, and connectors; replace as needed. o Air pressure gauges, lines, and fittings; replace as needed.	

k. Evaluate customer concerns of poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by the foundation brake, slack adjuster, and brake chamber problems; determine needed action. l. Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed. m. Inspect and service manual and automatic slack adjusters; perform needed action. n. Inspect camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; replace as needed. o. Inspect and measure brake shoes, linings, or pads; perform needed action. p. Inspect and measure brake drums and rotors; perform needed action. q. Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations. r. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed. s. Inspect and test parking (spring) brake application and release valve; replace as needed. t. Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations.	

3. Explore hydraulic brakes diagnosis and repair. a. Evaluate customer concerns of poor stopping, premature wear, pulling, dragging or pedal feel problems caused by the hydraulic system; determine needed action. b. Check brake pedal pushrod length; adjust as needed. c. Inspect and test master cylinder for internal/external leaks and damage; replace as needed. d. Inspect for leaks and damage, brake lines, flexible hoses, and fittings; replace as needed. e. Inspect and test brake pressure differential valve and warning light circuit switch, bulbs, wiring, and connectors; repair or replace as needed. f. Inspect and clean wheel cylinders; replace as needed. g. Inspect and clean disc brake caliper assemblies; replace as needed. h. Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type. i. Test and adjust brake stop light switch, bulbs, wiring, and connectors; repair or replace as needed. j. Inspect and measure brake drums and rotors; perform needed action. k. Inspect and measure drum brake shoes and linings; inspect mounting hardware, adjuster mechanisms, and backing plates; perform needed action. l. Inspect and measure disc brake pads/linings; inspect mounting hardware; perform needed action. m. Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.
4. Explore power assist units. a. Evaluate customer concerns of	**Teaching:** • Teaching strategies for this unit can be

stopping problems caused by the brake assist (booster) system; determine needed action. b. Inspect, test, repair, or replace power brake assist (booster), hoses, and control valves; determine proper fluid type.	found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.
5. Explore air and hydraulic antilock brake systems (ABS) and automatic traction control (ATC).	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

STANDARDS

2004 ASE/NATEF Medium/Truck Technician Standards

MTB1 For every task in Brakes the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTB2 Air Brakes Diagnosis and Repair.
MTB3 Hydraulic Brakes System Diagnosis and Repair.
MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTE2 General Electrical System Diagnosis.
MTE3 Battery Diagnosis and Service.
MTE4 Starting System Diagnosis and Repair.
MTE5 Charging System Diagnosis and Repair.
MTE6 Lighting Systems Diagnosis and Repair.
MTE7 Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
MTS1 For every task in Suspension and Steering the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MTS2 Steering Systems Diagnosis and Repair.
MTS3 Suspension Systems Diagnosis and Repair.
MTS4 Wheel Alignment Diagnosis, Adjustment, and Repair.
MTS5 Wheel and Tire Diagnosis and Repair.
MTD1 For every task in Diesel the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTD9 Engine Brakes.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E6 Explore cultural contributions to the history of the English language and its literature.
E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.

21st Century Skills

CS2 Financial, Economic, and Business Literacy
CS4 Information and Communication Skills
CS5 Thinking and Problem-Solving Skills
CS6 Interpersonal and Self-Directional Skills

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Diesel Service Technology I
Unit 5: Basic Electrical/Electronic Systems **(170-200 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Explore general electrical systems diagnosis. a. Read, interpret, and diagnose electrical/electronic circuits using wiring diagrams. b. Check continuity in electrical/electronic circuits using appropriate test equipment. c. Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using a digital multimeter (DMM). d. Check current flow in electrical/electronic circuits and components using a digital multimeter (DMM) or clamp-on ammeter. e. Check resistance in electrical/electronic circuits and components using a digital multimeter (DMM). f. Find shorts, grounds, and opens in electrical/electronic circuits. g. Diagnose parasitic (key-off) battery drain problems. h. Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed. i. Inspect and test spike suppression diodes/resistors; replace as needed.	**Teaching:** • Review and reinforce safety procedures. • Show a video (http://www.unitedstreaming.com) on the given task and discuss the procedures in completing the task. The student will develop several questions from the video. Lead a group discussion that addresses each question that students listed. • Have students write the answers to the following questions in their notebooks: o What should I know and be able to do at the end of this unit or experience? o What do I already know that will be useful in learning this new material or working in this way? o How is this knowledge and how are these skills important in the world outside of school? o When are the important checkpoints and deadlines? o How will I be able to tell when I have done a really outstanding job when applying this new knowledge? • Review student answers and have students discuss their answers when appropriate. • Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class. • Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss their thinking. The discussion between the two students should last two to three minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group.

	• Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into "touring groups" to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have "toured" each chart. When students return to their seats, allow some time for discussion and reactions. • Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources to use technology tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns. • Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task. • Display pictures from the lab and facilitate discussion about the specific task. Have students develop a descriptive paragraph about each picture. Have students perform each task assigned. • Have students work in groups to examine case studies related to task(s) and have students recommend the needed action. • Have students complete job shadowing experiences. • Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians evaluate customer's concerns about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action.

	• Have student observe and record notes in a journal about the conversations the technician has with customers. • Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit. • After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery. **Assessment:** • Evaluate the questions and answers for content and clarity. • Assess field trip participation using the Field Trip Participation Checklist located in Appendix D. • Evaluate the poster using the Poster Assessment Rubric located in Appendix D. • Assess student participation in role play using the Role-Play Rubric located in Appendix D. • Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D. • Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D. • Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.
2. Explore battery diagnosis and repair. a. Perform battery load test and determine needed action. b. Determine battery state of charge using an open circuit voltage test. c. Inspect, clean, and service battery and replace as needed. d. Inspect and clean battery boxes, mounts, and hold downs and repair or replace as needed. e. Charge battery using slow or fast charge method as appropriate.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

f. Inspect, test, and clean battery cables and connectors and repair or replace as needed. g. Jump start a vehicle using jumper cables and a booster battery or auxiliary power supply using proper safety procedures.	
3. Explore starting system diagnosis and repair. a. Perform starter circuit cranking voltage and voltage drop tests and determine needed action. b. Inspect and test components (key switch, pushbutton, and/or magnetic switch) and wires in the starter control circuit and replace as needed. c. Inspect and test starter relays and solenoids/switches and replace as needed. d. Remove and replace starter and inspect flywheel ring gear or flex plate.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.
4. Explore charging system diagnosis and repair. a. Diagnose instrument panel mounted voltmeters and/or indicator lamps that show a no charge, low charge, or overcharge condition and determine needed action. b. Diagnose the cause of a no charge, low charge, or overcharge condition and determine needed action. c. Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets and adjust drive belts and check alignment. d. Perform charging system voltage and amperage output tests and determine needed action. e. Perform charging circuit voltage drop tests and determine needed action. f. Remove and replace alternator. g. Inspect, repair, or replace connectors and wires in the charging circuit.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.
5. Explore lighting system diagnosis and repair (headlights; daytime running lights;	**Teaching:** • Teaching strategies for this unit can be

parking, clearance, tail, cab, and instrument panel lights). a. Diagnose the cause of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation. b. Test, aim, and replace headlights. c. Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components; repair or replace as needed. d. Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays and wires of parking, clearance, and taillight circuits; repair or replace as needed. e. Inspect and test instrument panel light circuit switches, relays, bulbs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed. f. Inspect and test interior cab light circuit switches, bulbs, sockets, connectors, terminals, and wires; repair or replace as needed. g. Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.	found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

STANDARDS

2004 ASE/NATEF Medium/Truck Technician Standards

MTB1 For every task in Brakes the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MTB2 Air Brakes Diagnosis and Repair.

MTB3 Hydraulic Brakes System Diagnosis and Repair.

MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MTE2 General Electrical System Diagnosis.
MTE3 Battery Diagnosis and Service.
MTE4 Starting System Diagnosis and Repair.
MTE5 Charging System Diagnosis and Repair.
MTE6 Lighting Systems Diagnosis and Repair.
MTE7 Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
MTE8 Related Electrical Systems.
MTS1 For every task in Suspension and Steering the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTS2 Steering Systems Diagnosis and Repair.
MTS3 Suspension Systems Diagnosis and Repair.
MTS4 Wheel Alignment Diagnosis, Adjustment, and Repair.
MTS5 Wheel and Tire Diagnosis and Repair.
MTS6 Frame Service and Repair.
MTD1 For every task in Diesel the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTD2 General Engine Diagnosis.
MTD3 Cylinder Head and Valve Train Diagnosis and Repair.
MTD4 Engine Block Diagnosis and Repair.
MTD5 Lubrication Systems Diagnosis and Repair.
MTD6 Cooling System Diagnosis and Repair.
MTD7 Air Induction, and Exhaust Systems Diagnosis and Repair.
MTD8 Fuel System Diagnosis and Repair.
MTD9 Engine Brakes.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
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E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
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E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.

21st Century Skills

CS2 Financial, Economic, and Business Literacy
CS4 Information and Communication Skills
CS5 Thinking and Problem-Solving Skills
CS6 Interpersonal and Self-Directional Skills

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Diesel Service Technology II
Unit 1: Introduction, Orientation, Employability Skills, and Safety (3-10 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Describe local program and vocational/career and technical center policies and procedures. a. Describe local program and vocational/career and technical center policies and procedures including dress code, attendance, academic requirements, discipline, and transportation regulations.	**Teaching:** • Use technology tools and classroom resources to present local program and vocational/career and technical center policies and procedures. • Have students read the handbook to become aware of what is expected of them in relation to the policies and procedures of the school. This will include dress code, attendance, academic requirements, discipline, and transportation regulations. Have students work together in pairs. Have a student with a higher reading ability team up with a student with a lower reading ability to help them get a better understanding of the school's program policies and procedures. • Discuss workplace skills related to team building. Have students participate in team building activities and critique their roles and actions within the team. **Assessment:** • Assess with a written test on applicable policies and procedures. • Assess student orientation knowledge through instructor observations and written unit test. File completed test to document student mastery of the school and program policies and procedures.
2. Describe employment opportunities and responsibilities (ongoing). a. Describe employment opportunities including potential earnings, employee benefits, job availability, place of employment, working conditions, and educational requirements. b. Describe basic employee responsibilities. c. Design a resume and complete a job application.	**Teaching:** • Have students use technology tools and classroom resources to define and illustrate trade terms related to basic employability skills. • Have students interview individuals in the automotive industry. Provide students with sample questions they can ask the industry expert. Have students use technology tools and the Writing Process (see Appendix D) to develop a summary report of the interview. Have students present the report to the class.

	• Have students research the phone book (yellow pages), Internet, and newspapers for employment opportunities. • Have students participate in a mock interview. Have industry representatives interview students and give constructive feedback for improvement. • Invite a guest speaker from industry to present industry-related information to the class. • Explain the contents of a cover letter and a resume. Give examples of cover letters and resumes to students. Have students design a cover letter and a resume. • Discuss the components of a job application. Have students obtain and complete a job application from a local business. • Have students use career software, such as Choices®, to measure their aptitudes and abilities for particular careers. • Have students use the Internet to research a list of careers for which they will be qualified to apply for upon program completion. • Have students use available resources, such as college catalogs and college Web sites, to research information about postsecondary educational opportunities. Have a recruiter or instructor from the local community college visit the classroom and discuss opportunities and expectations at the community college level. • Have students select a career in the field and outline educational and skill requirements, expected job growth, and entry-level salaries. Have students use technology tools to create a graph showing the growth of salaries with experience. **Assessment:** • Assess matching test for definitions. Use assessment tools in the Blackboard Learning System® when appropriate. Lessons involving writing and math skills will be integrated with the appropriate department.

	• Evaluate the presentation using the Presentation Rubric located in Appendix D. • Evaluate the resume and interview using the Resume Rubric and Interview Rubric located in Appendix D • Evaluate the job application for clarity and content. • Review career software printout to assess student aptitudes and abilities.
3. Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA (ongoing). a. Demonstrate effective teambuilding and leadership skills. b. Practice appropriate work ethics.	**Teaching:** • Find two or three journal or Internet articles that have information related to different leadership styles; the importance of positive attitudes, decision making skills, and communication skills; etc. Divide students into home-base groups of three to five members depending on the number of texts to be read. Assign each student to a base group and a section of the article(s) to read (10 to 15 minutes of independent reading). Have students who have read the same section form small expert groups to discuss key aspects from their portion of the article (15 – 20 minutes). Have student experts return to their base groups and invite each person to share the key points from their reading and discussion with others of the group (20 – 30 minutes). Then, facilitate a large group discussion identifying key concepts from the information that was read. • Discuss the role of a team member and leader. Assign students roles within a team and have them role-play a situation in which there is a conflict which must be resolved. Utilize the lessons from Skills USA or other resources to provide additional training. • Discuss appropriate work ethics standards. Have the students list what they believe to be the most common problems within the automotive profession. **Assessment:** • Assess student participation in role play using the Role-Play Rubric located in

	Appendix D. • Assess lessons from other resources according to the recommended resource guide.
4. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations (ongoing). a. Define effective written, oral, and nonverbal communication skills. b. Identify the impact of effective communication. c. Analyze personal strengths/weaknesses in communication. d. Develop a plan to improve written, oral, and nonverbal communication.	**Teaching:** • Divide students into four groups. Assign each group an article related to effective communication skills (nonverbal, verbal, written, body language, etc.). Give each group a set of markers and chart/bulletin board paper. Have each group read their article and present the information to the class using the markers and chart/bulletin board paper. Ask student not to use words, but to use pictures on their chart/bulletin board paper. Have students work as a whole group to create a single list combining elements from the entire article. • Based on the information from the articles, have students create a survey that evaluates their communication skills. Ask students to use the survey to evaluate their personal communication skills. Ask students to give the survey to peers, family members, and teachers. Have students input data into a spreadsheet application program. Have students compare and contrast their personal evaluation to the evaluation from peers, family members, and teachers. • Have students develop an action plan to improve written, oral, and nonverbal communication skills. • Have the students perform an activity involving verbal instructions. Divide students into groups and have one team be the customer and the other be the service advisor. Have the customers describe the concern and the service advisor will provide an explanation of the processes that will need to be followed for them to properly diagnose the concern. Have the groups switch roles and repeat the process. • Give students a work order. The work order should contain written instructions of a specific job. Have students complete the work order.

	Assessment: • Evaluate the presentation using the Presentation Rubric located in Appendix D. • Evaluate the work order for clarity and content.
5. Discuss the history of the diesel equipment repair industry to include materials, terminology, and techniques.	**Teaching:** • Discuss the history of the diesel equipment repair industry. Have the students research the history of the diesel equipment repair industry and develop a short presentation. Have students present their information to the class. The presentation should include spreadsheet graphs describing how the automotive and diesel industries have grown over the years. **Assessment:** • Evaluate the presentation using the Presentation Rubric located in Appendix D.
6. Describe general safety rules for working in a shop/lab and industry (ongoing). a. Describe how to avoid on-site accidents. b. Explain the relationship between housekeeping and safety. c. Explain the importance of following all safety rules and company safety policies. d. Explain the importance of reporting all on-the-job injuries and accidents. e. Explain the need for evacuation policies and the importance of following them. f. Explain the employer's substances abuse policy and how it relates to safety. g. Explain the safety procedures when working near pressurized or high temperature.	**Teaching:** **These may be used for Competencies 6-10.** • Identify, discuss, and demonstrate terms, rules, and procedures related to laboratory and industry safety. • Have students complete study guides that will prepare them for written tests that will follow each section of guidelines for safety rules and procedures. • Provide the students with a list of terms and have them define and illustrate the terms. Have students divide into pairs and quiz each other on the definitions in preparation for a written exam. • Use the guidelines provided for personal safety (i.e., clothing, jewelry, hair, eyes, and ears.) Divide the students into pairs and assign each pair one of the guidelines. Each pair will demonstrate the "do's and don'ts" of the guideline.

7. Identify and apply safety around automotive operations (ongoing). a. Use proper safety practices when performing automotive operations. b. Recognize and explain personal protective equipment. c. Inspect and care for personal protective equipment.	• Have an industry speaker present to the class the necessity of safety in the work environment. Have students write a summary of the presentation. • Divide students into teams and have teams use publications and the Internet to develop scenarios of hazards and accidents. This should include tools, spills, working around welding, improper use of barriers, ladders or scaffolds, use of MSDS information, fires, and electrical situations. • Divide students into teams. Have one team read a scenario. Have the other team(s) compete to be the first to provide the proper safety measures which should have been used to prevent the hazardous situation or accident. Award points to the teams with the correct answers. • Required written tests will follow each section of guidelines for safety rules and procedures. • NOTE: SAFETY IS TO BE TAUGHT AS AN ONGOING PART OF THE COURSE THROUGHOUT THE YEAR. **Assessment:** • Monitor student participation. • Assess a written exam. The student must achieve 100% accuracy. • Have students peer review and critique the "do's and don'ts" exercise. • Reward teams according to the points earned from the game. This could be extra points, classroom privileges, etc. • Use the Blackboard Learning System® to administer exams.
8. Explain lifting. a. Identify and explain the procedures for lifting heavy objects.	
9. Explain the Material Safety Data Sheet (MSDS). a. Explain the function of the MSDS. b. Interpret the requirements of the MSDS.	
10. Explain fires. a. Explain the process by which fires start. b. Explain fire prevention of various flammable liquids. c. Explain the classes of fire and the types of extinguishers.	

STANDARDS

2004 ASE/NATEF Medium/Heavy Truck Technician Standards

MTB1 For every task in Brakes the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

MTB2 Air Brakes Diagnosis and Repair.

MTB3 Hydraulic Brakes System Diagnosis and Repair.
MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTE2 General Electrical System Diagnosis.
MTE3 Battery Diagnosis and Service.
MTE4 Starting System Diagnosis and Repair.
MTE5 Charging System Diagnosis and Repair.
MTE6 Lighting Systems Diagnosis and Repair.
MTE7 Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
MTE8 Related Electrical Systems.
MTS1 For every task in Suspension and Steering the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTS2 Steering Systems Diagnosis and Repair.
MTS3 Suspension Systems Diagnosis and Repair.
MTS4 Wheel Alignment Diagnosis, Adjustment, and Repair.
MTS5 Wheel and Tire Diagnosis and Repair.
MTS6 Frame Service and Repair.
MTD1 For every task in Diesel the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTD2 General Engine Diagnosis.
MTD3 Cylinder Head and Valve Train Diagnosis and Repair.
MTD4 Engine Block Diagnosis and Repair.
MTD5 Lubrication Systems Diagnosis and Repair.
MTD6 Cooling System Diagnosis and Repair.
MTD7 Air Induction, and Exhaust Systems Diagnosis and Repair.
MTD8 Fuel System Diagnosis and Repair.
MTD9 Engine Brakes.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.

Secondary Diesel Service Technology

E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E6 Explore cultural contributions to the history of the English language and its literature.
E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.

21st Century Skills

CS1 Global Awareness
CS2 Financial, Economic, and Business Literacy
CS3 Civic Literacy
CS4 Information and Communication Skills
CS5 Thinking and Problem-Solving Skills
CS6 Interpersonal and Self-Directional Skills

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Diesel Service Technology II
Unit 2: Advanced Tools, Technical References, Measurement, and Fasteners (5-15 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Demonstrate safe and proper use and storage of tools and equipment in an automotive shop. a. Identify and demonstrate the safe and proper use of common hand tools including welders (arc/MIG) and oxy/fuel cutting unit, wrenches, sockets, pliers, screwdrivers, striking tools, etc. b. Identify and demonstrate the safe and proper use of lifting and hoisting equipment. c. Identify and demonstrate the safe and proper use of cleaning equipment. d. Identify and demonstrate the safe and proper use of power equipment including impact wrenches, drills, grinders, and presses. e. Organize and maintain a systematic storage system for hand and power tools.	**Teaching:** • Review automotive supply catalogs and self-made pictures of tools and equipment that students will use in the program. • Discuss and demonstrate safety procedures, proper use, and storage of tools and equipment. Have students demonstrate safety procedures, proper use, and storage of tools and equipment. Assign a specific task to a group of students. Have groups make a list of the proper tools that will be required to complete the task and present their decisions to the class. • Explain and demonstrate the use of software for the specific area of instruction. Have students use technology software for tool identification. **Assessment:** • Assess a tool identification test. • Evaluate students using the Activity Performance Rubric located in Appendix D. • Evaluate student presentations using the Group Presentation Rubric located in Appendix D. • Evaluate the printed results from the software test.
2. Locate and apply service specifications and information. a. Locate service specifications and information, using both print and computerized service information references. b. Interpret and apply information to a specific job on a specific vehicle. c. Locate and interpret vehicle and major component identification numbers (VIN, certification, and calibration labels).	**Teaching:** • Review the text, Internet, manuals, and handouts for locating and applying information. Have students locate specific information using text, Internet, manuals, and handouts for locating and information for an assigned task. **Assessment:** • Assess the information recorded on the job sheet.

3. Demonstrate measurement practices used in the automotive service. a. Measure the length of an object using a rule to the nearest 1/16th of an inch and 1 millimeter. b. Measure the inside diameter, outside diameter, and/or depth to the nearest .001 of an inch and nearest .1 millimeter, using precision measuring instruments (micrometers, calipers, and dial indicators). c. Convert measurements.	**Teaching:** • Invite an industry representative to discuss the importance of proper measurement techniques in the real world. Allow students to ask questions. • Have students write a summary describing the importance of proper measurement techniques. • Demonstrate how to measure a given item using a variety of measuring instruments. Have students measure given items and record the answers. • Give students case studies or scenarios where they must solve measurement problems. • Explain and demonstrate software to review measuring skills. Have students use software to complete measurement activities. **Assessment:** • Evaluate student summaries using the Written Report Assessment Rubric found in Appendix D. • Evaluate case studies or scenarios for accuracy. • Assess students measuring given items and recording information on a job sheet.
4. Identify common fasteners and describe their use. a. Identify the different types of bolts, nuts, and washers and describe their appropriate uses. b. Identify bolts by grade, diameter, length, and thread pitch. c. Identify different glues and sealants used in automotive service, and describe their appropriate use. d. Restore internal and external threads.	**Teaching:** • Have students brainstorm prior knowledge related to fasteners using a KWL chart (Appendix D). • Explain and show fasteners using catalogs. Display several models that the students can view and manipulate. Have students analyze the fasteners, apply the proper fasteners, and present the decisions to the class. • Give individual students sample problems and/or situations where they must decide which fastener to use. Have students use the Writing Process (see Appendix D) to describe their choice, give the reasons they made that choice, and whether they think they made the right choice. **Assessment:** • Evaluate the presentation using the

	Presentation Rubric located in Appendix D. • Evaluate individual assignments for accuracy.

STANDARDS

2004 ASE/NATEF Medium/Heavy Truck Technician Standards

MTB1 For every task in Brakes the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTB2 Air Brakes Diagnosis and Repair.
MTB3 Hydraulic Brakes System Diagnosis and Repair.
MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTE2 General Electrical System Diagnosis.
MTE3 Battery Diagnosis and Service.
MTE4 Starting System Diagnosis and Repair.
MTE5 Charging System Diagnosis and Repair.
MTE6 Lighting Systems Diagnosis and Repair.
MTE7 Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
MTE8 Related Electrical Systems.
MTS1 For every task in Suspension and Steering the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTS2 Steering Systems Diagnosis and Repair.
MTS3 Suspension Systems Diagnosis and Repair.
MTS4 Wheel Alignment Diagnosis, Adjustment, and Repair.
MTS5 Wheel and Tire Diagnosis and Repair.
MTS6 Frame Service and Repair.
MTD1 For every task in Diesel the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTD2 General Engine Diagnosis.
MTD3 Cylinder Head and Valve Train Diagnosis and Repair.
MTD4 Engine Block Diagnosis and Repair.

MTD5 Lubrication Systems Diagnosis and Repair.
MTD6 Cooling System Diagnosis and Repair.
MTD7 Air Induction, and Exhaust Systems Diagnosis and Repair.
MTD8 Fuel System Diagnosis and Repair.
MTD9 Engine Brakes.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E6 Explore cultural contributions to the history of the English language and its literature.
E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.

21st Century Skills

CS2 Financial, Economic, and Business Literacy
CS4 Information and Communication Skills
CS5 Thinking and Problem-Solving Skills
CS6 Interpersonal and Self-Directional Skills

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Diesel Service Technology II
Unit 3: Advanced Electrical/Electronic Systems **(20-25 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Explore stoplights, turn signals, hazard lights, and backup lights. a. Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, and wires; repair or replace as needed. b. Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, and wires; repair or replace as needed. c. Inspect, test, and adjust backup lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, and wires; repair or replace as needed.	**Teaching:** • Show a video (http://www.unitedstreaming.com) on the given task and discuss the procedures in completing the task. • Review and reinforce safety procedures. • Have students write the answers to the following questions in their notebooks: o What should I know and be able to do at the end of this unit or experience? o What do I already know that will be useful in learning this new material or working in this way? o How is this knowledge and how are these skills important in the world outside of school? o When are the important checkpoints and deadlines? o How will I be able to tell when I have done a really outstanding job when applying this new knowledge? • Review student answers and have students discuss their answers when appropriate. • Show a video (http://www.unitedstreaming.com) on the given task and discuss the procedures in completing the task. Have students develop several questions and answers from the video and the discussion or develop a video anticipation guide for students to complete as they watch the video. • Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class. • Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss their thinking.

	The discussion between the two students should last two to three minutes. Ask students to share their responses with the whole group or with a table group. Not all students have to share their answers with the large group. • Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into "touring groups" to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have "toured" each chart. When students return to their seats, allow some time for discussion and reactions. • Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources and use technology productivity tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns. • Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task. • Display pictures from the lab and facilitate discussion about the specific task. Have students perform each task assigned. • Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians evaluate customer's concerns about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action. • Have students complete job shadowing

	experiences. Have students observe and record notes in a journal about the conversations the technician had with customers. • Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit. • After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery. **Assessment:** • Evaluate the questions and answers for content and clarity. • Assess field trip participation using the Field Trip Participation Checklist located in Appendix D. • Evaluate the poster using the Poster Assessment Rubric located in Appendix D. • Assess student participation in role play using the Role-Play Rubric located in Appendix D. • Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D. • Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D. • Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.
2. Explore gauges and warning devices diagnosis and repair. a. Interface with vehicle's on-board computer, perform diagnostic procedure using recommended electronic diagnostic equipment and tools (including PC-based software and/or data scan tools), and determine needed action. b. Diagnose the cause of intermittent, high, low, or no gauge readings and	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

determine needed action. c. Inspect and test gauge circuit sending units, gauges, connectors, terminals, and wires and repair or replace as needed. d. Inspect and test warning devices (lights and audible) circuit sending units, bulbs/LED's, sockets, connectors, wires, and printed circuits/control modules; repair or replace as needed.	
3. Explore related electrical systems. a. Diagnose the cause of constant, intermittent, or no horn operation; determine needed action. b. Inspect and test horn circuit relays, horns, switches, connectors, and wires; repair or replace as needed. c. Diagnose the cause of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action. d. Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, and wires; repair or replace as needed. e. Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed. f. Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, and wires; repair or replace as needed. g. Inspect and test heater and A/C electrical components including A/C clutches, motors, resistors, relays, switches, connectors, terminals, and wires; repair or replace as needed. h. Diagnose the cause of slow, intermittent, or no power side window operation; determine needed action. i. Inspect and test motors, switches, relays, connectors, terminals, and wires of power side window circuits; repair or replace as needed.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

j. Inspect block heaters; determine needed repairs. k. Inspect and test engine cooling fan electrical control components; repair or replace as needed.	

STANDARDS

2004 ASE/NATEF Medium/Heavy Truck Technician Standards

MTB1 For every task in Brakes the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTB2 Air Brakes Diagnosis and Repair.
MTB3 Hydraulic Brakes System Diagnosis and Repair.
MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTE2 General Electrical System Diagnosis.
MTE3 Battery Diagnosis and Service.
MTE4 Starting System Diagnosis and Repair.
MTE5 Charging System Diagnosis and Repair.
MTE6 Lighting Systems Diagnosis and Repair.
MTE7 Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
MTE8 Related Electrical Systems.
MTS1 For every task in Suspension and Steering the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTS2 Steering Systems Diagnosis and Repair.
MTS3 Suspension Systems Diagnosis and Repair.
MTS4 Wheel Alignment Diagnosis, Adjustment, and Repair.
MTS5 Wheel and Tire Diagnosis and Repair.
MTS6 Frame Service and Repair.
MTD1 For every task in Diesel the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTD2 General Engine Diagnosis.
MTD3 Cylinder Head and Valve Train Diagnosis and Repair.

MTD4 Engine Block Diagnosis and Repair.
MTD5 Lubrication Systems Diagnosis and Repair.
MTD6 Cooling System Diagnosis and Repair.
MTD7 Air Induction, and Exhaust Systems Diagnosis and Repair.
MTD8 Fuel System Diagnosis and Repair.
MTD9 Engine Brakes.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.
A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E6 Explore cultural contributions to the history of the English language and its literature.
E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.

21st Century Skills

CS2 Financial, Economic, and Business Literacy
CS4 Information and Communication Skills
CS5 Thinking and Problem-Solving Skills
CS6 Interpersonal and Self-Directional Skills

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Diesel Service Technology II
Unit 4: Diesel Systems and Theory **(169-205 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Explore general diesel engine diagnosis by inspecting fuel, oil, and coolant levels, condition, and consumption; and determine needed action. a. Diagnose causes of engine fuel, oil, coolant, air, and other leaks; determine needed action. b. Interpret engine noises; determine needed action. c. Observe engine exhaust smoke color and quantity; determine needed action. d. Perform air intake system restriction and leakage tests; determine needed action. e. Perform intake manifold pressure (boost) test; determine needed action. f. Perform exhaust back pressure test; determine needed action. g. Perform crankcase pressure test; determine needed action. h. Diagnose no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action. i. Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action. j. Diagnose engine vibration problems; determine needed action. k. Check, record, and clear electronic diagnostic (fault) codes; monitor electronic data; determine needed action. l. Perform cylinder compression test; determine needed action.	**Teaching:** • Show a video (http://www.unitedstreaming.com) on the given task and discuss the procedures in completing the task. • Review and reinforce safety procedures. • Have students write the answers to the following questions in their notebooks: o What should I know and be able to do at the end of this unit or experience? o What do I already know that will be useful in learning this new material or working in this way? o How is this knowledge and how are these skills important in the world outside of school? o When are the important checkpoints and deadlines? o How will I be able to tell when I have done a really outstanding job when applying this new knowledge? • Review student answers and have students discuss their answer when appropriate. • Show a video (http://www.unitedstreaming.com) on the given task and discuss the procedures in completing the task. Have students develop several questions and answers from the video and the discussion or develop a video anticipation guide for students to complete as they watch the video. • Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class. • Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss

	their thinking. The discussion between the two students should last two to three minutes. Ask students to share their responses with the whole group of with a table group. Not all students have to share their answers with the large group. • Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into "touring groups" to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have "toured" each chart. When students return to their seats, allow some time for discussion and reactions. • Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources and use technology productivity tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns. • Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task. • Display pictures from the lab and facilitate discussion about the specific task. Have students perform each task assigned. • Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians evaluate customer's concerns about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action. • Have students complete job shadowing

	experiences. Have students observe and record notes in a journal about the conversations the technician had with customers. • Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit. • After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery. **Assessment:** • Evaluate the questions and answers for content and clarity. • Assess field trip participation using the Field Trip Participation Checklist located in Appendix D. • Evaluate the poster using the Poster Assessment Rubric located in Appendix D. • Assess student participation in role-play using the Role-Play Rubric located in Appendix D. • Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D. • Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D. • Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.
2. Explore cylinder head and valve train diagnosis and repair. a. Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly. b. Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action. c. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

passages; inspect core/expansion and gallery plugs; determine needed action. d. Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action. e. Measure valve head height relative to deck and valve face-to-seat contact; determine needed action. f. Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; perform needed action. g. Reassemble cylinder head. h. Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash. i. Inspect pushrods, rocker arms, rocker arm shafts, electronic wiring harness, and brackets for wear, bending, cracks, looseness, and blocked oil passages; perform needed action. j. Inspect cam followers; perform needed action. k. Adjust valve clearance.	
3. Explore engine block diagnosis and repair. a. Remove, inspect, service, and install pans, covers, vents, gaskets, seals, and wear rings. b. Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion, and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action. c. Inspect cylinder sleeve counterbore and lower bore; check bore distortion; determine needed action. d. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action. e. Replace/reinstall cylinder liners and seals; check and adjust liner height	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

(protrusion). f. Inspect in-block camshaft bearings for wear and damage; determine needed action. g. Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play. h. Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action. i. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and adjust crankshaft end play. j. Inspect, install, and time gear train; measure gear backlash; determine needed action. k. Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action. l. Determine piston-to-cylinder wall clearance; check ring-to-groove clearance and end gap; install rings on pistons. m. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances. n. Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action. o. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.	

4. Explore lubrication systems diagnosis and repair. a. Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; determine needed action. b. Check engine oil level, condition, and consumption; determine needed action. c. Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; determine needed action. d. Inspect, clean, and test oil cooler and components; determine needed action. e. Inspect turbocharger lubrication system; determine needed action. f. Determine proper lubricant and perform oil and filter change.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.
5. Explore cooling system diagnosis and repair. a. Check engine coolant type, level, condition, and consumption; determine needed action. b. Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit; determine needed action. c. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment. d. Inspect thermostat(s), bypasses, housing(s), and seals; replace as needed. e. Test coolant for freeze protection and additive package concentration; adjust as needed. f. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system. g. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. h. Inspect water pump and hoses; replace as needed. i. Inspect, clean, and pressure test radiator, pressure cap, tank(s), and	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

recovery systems; determine needed action. j. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.	
6. Explore air induction and exhaust systems diagnosis and repair. a. Check air induction system (piping, hoses, clamps, and mounting); check for air restrictions and leaks; service or replace air filter as needed. b. Inspect intake manifold, gaskets, and connections; replace as needed. c. Inspect exhaust manifold, piping, mufflers, exhaust after-treatment device(s), and mounting hardware; repair or replace as needed. d. Inspect and test preheater/inlet air heater or glow plug system and controls; perform needed action. e. Inspect and test exhaust gas recirculation (EGR) system; determine needed action.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.
7. Explore fuel system diagnosis and repair. a. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply, and return lines and fittings; determine needed action. b. Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action. c. Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action. d. Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.
8. Explore mechanical fuel injection diagnosis and repair. a. Inspect and adjust throttle control linkage; determine needed action.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during

b. Inspect, test, and adjust engine fuel shut-down devices and controls; determine needed action. c. Inspect high pressure injection lines, hold downs, fittings, and seals; replace as needed.	the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.
9. Explore electronic fuel management system diagnosis and repair. a. Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM); determine needed action. b. Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (to include PC-based software and/or data scan tools); determine needed action. c. Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams). d. Inspect and replace electrical connector terminals, seals, and locks. e. Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed. f. Using recommended electronic diagnostic tools (to include PC-based software and/or data scan tools), access and change customer parameters. g. Inspect, test, and adjust electronic unit injectors (EUI); determine needed action. h. Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable). i. Perform cylinder contribution test utilizing recommended electronic diagnostic tool.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

j. Perform on-engine inspections and tests on hydraulic electronic unit injectors and system electronic controls; determine needed action. k. Perform on-engine inspections and tests on distributor-type injection pump electronic controls; determine needed action. l. Perform on-engine inspections and tests on in-line type injection pump electronic controls; determine needed action. m. Perform on-engine inspections and tests on common rail type injection systems; determine needed action. n. Discuss engine compression/exhaust brakes; determine needed action.	
10. Explore small engines. a. Describe the operation of a small gasoline engines. b. Perform service and repair of small gasoline engines.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

STANDARDS

2004 ASE/NATEF Medium/Heavy Truck Technician Standards

MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTE2 General Electrical System Diagnosis.
MTE3 Battery Diagnosis and Service.
MTE4 Starting System Diagnosis and Repair.
MTE5 Charging System Diagnosis and Repair.
MTE6 Lighting Systems Diagnosis and Repair.
MTE7 Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
MTE8 Related Electrical Systems.

MTD1 For every task in Diesel the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTD2 General Engine Diagnosis.
MTD3 Cylinder Head and Valve Train Diagnosis and Repair.
MTD4 Engine Block Diagnosis and Repair.
MTD5 Lubrication Systems Diagnosis and Repair.
MTD6 Cooling System Diagnosis and Repair.
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A1 Recognize, classify, and use real numbers and their properties.
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E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E6 Explore cultural contributions to the history of the English language and its literature.
E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
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Diesel Service Technology II
Unit 5: Steering and Suspension Systems **(73-90 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Explore steering systems diagnosis and repair. a. Diagnose fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action. b. Inspect steering shaft U-joint(s), slip joints, bearings, bushings, and seals; inspect phase shaft U-joints; determine needed action. c. Check and adjust cab mounting and ride height. d. Center the steering wheel as needed. e. Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures. f. Diagnose power steering system noise, steering binding, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed action. g. Determine recommended type of power steering fluid; check level and condition; determine needed action. h. Flush and refill power steering system; purge air from system. i. Inspect, service, or replace power steering reservoir including filter, seals, and gaskets. j. Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment. k. Inspect, adjust, or replace power steering pump, mountings, and brackets. l. Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings. m. Inspect, adjust, or replace linkage-assist type power steering cylinder or gear (dual system).	**Teaching:** • Show a video (http://www.unitedstreaming.com) on the given task and discuss the procedures in completing the task. • Review and reinforce safety procedures. • Have students write the answers to the following questions in their notebooks: o What should I know and be able to do at the end of this unit or experience? o What do I already know that will be useful in learning this new material or working in this way? o How is this knowledge and how are these skills important in the world outside of school? o When are the important checkpoints and deadlines? o How will I be able to tell when I have done a really outstanding job when applying this new knowledge? • Review student answers and have students discuss their answer when appropriate. • Show a video (http://www.unitedstreaming.com) on the given task and discuss the procedures in completing the task. Have students develop several questions and answers from the video and the discussion or develop a video anticipation guide for students to complete as they watch the video. • Take students on a field trip to a local industry to observe the use of various types of tasks that are currently being covered in class. • Pose a question that is related to the teaching objective to students. Ask students to think quietly about possible answers to the questions. This is usually only thirty seconds to one minute. Have students pair with a neighbor to discuss

n. Inspect, adjust, repair, or replace integral type power steering gear and mountings. o. Inspect and align pitman arm; replace as needed. p. Inspect drag link (relay rod) and tie rod ends; adjust or replace as needed. q. Inspect steering arm and levers, and linkage pivot joints; replace as needed. r. Inspect clamps and retainers on cross tube/relay rod/centerlink/tie rod; position or replace as needed. s. Check and adjust wheel stops. t. Lubricate steering linkage joints as needed.	their thinking. The discussion between the two students should last two to three minutes. Ask students to share their responses with the whole group of with a table group. Not all students have to share their answers with the large group. • Compose five to eight charts that represent the content material, pictorially or verbally. Use photographs, direct quotes from text, or other means to convey one idea per chart. Number each chart. Post the charts around the classroom or lab. Divide students into "touring groups" to fit the classroom space, age of students, and complexity of the material. Align one group per chart as a starting point. Allow groups to spend two to five minutes at each chart, taking notes and/or discussing the idea presented. Rotate the groups until all groups have "toured" each chart. When students return to their seats, allow some time for discussion and reactions. • Demonstrate identification and interpretation of the specific task concerns. Have students utilize a variety of resources and use technology productivity tools and the Writing Process (see Appendix D) to develop a report to identify and interpret task concerns. • Divide the students into groups based on learning styles and assign each group a specific task. Have each group construct a poster listing components and the diagram of the task. • Display pictures from the lab and facilitate discussion about the specific task. Have students perform each task assigned. • Have students role-play a given situation. Divide students into two groups: technicians and customers. Have technicians evaluate customer's concerns about a particular problem that relates to the current task being taught about an automobile. Have technicians determine the needed action. • Have students complete job shadowing

	experiences. Have students observe and record notes in a journal about the conversations the technician had with customers. • Have students complete a three column chart to summarize learning. In the first column, have students list the most important facts to remember from this unit. In the second chart, have students list what is somewhat important from this unit. In the third column, have students list what is not important from this unit. • After teaching each competency, provide a reflection and review for students. Reteach as appropriate to ensure mastery. **Assessment:** • Evaluate the questions and answers for content and clarity. • Assess field trip participation using the Field Trip Participation Checklist located in Appendix D. • Evaluate the poster using the Poster Assessment Rubric located in Appendix D. • Assess student participation in role-play using the Role-Play Rubric located in Appendix D. • Evaluate each task or a group of tasks using the Activity Performance Rubric located in Appendix D. • Review the journal entries and evaluate using the Student Journal Rubric located in Appendix D. • Evaluate students using the Workforce Skills Weekly Checklist found in Appendix D.
2. Explore suspension systems diagnosis and repair. a. Inspect front axles, U-bolts, and nuts; determine needed action. b. Inspect shock absorbers, bushings, brackets, and mounts; replace as needed. c. Inspect leaf springs, center bolts, clips, eye bolts and bushings, shackles, slippers, insulators, brackets, and mounts; determine	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

needed action. d. Inspect torque arms, bushings, and mounts; determine needed action. e. Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, and related bushings, mounts, shims, and cams; determine needed action. f. Inspect walking beams, center (cross) tube, bushings, mounts, load pads, and saddles/caps; replace as needed. g. Measure vehicle ride height; determine needed action.	
3. Explore wheel alignment diagnosis, adjustment, and repair. a. Evaluate customer concerns of vehicle wandering, pulling, shimmy, hard steering, and off-center steering wheel problem(s); adjust and repair as needed. b. Check camber; determine needed action. c. Check caster; adjust as needed. d. Check toe; adjust as needed. e. Check rear axle(s) alignment (thrustline/centerline) and tracking; adjust or repair as needed. f. Check front axle alignment (centerline); adjust or repair as needed.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.
4. Explore wheels and tires diagnosis and repair. a. Diagnose unusual tire wear patterns, check tread depth, and check for mismatched tread design; determine needed action. b. Diagnose wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.
5. Explore frame service and repair. a. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs.	**Teaching:** • Teaching strategies for this unit can be found in Competency 1. Safety will be reviewed and reinforced before and during the unit. Be aware that the ultimate goal

b. Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers' recommended procedures.	for the student is to complete the task or suggested objectives. **Assessment:** • Evaluate the student using the Activity Performance Rubric located in Appendix D.

STANDARDS

2004 ASE/NATEF Medium/Heavy Truck Technician Standards

MTB1 For every task in Brakes the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTB2 Air Brakes Diagnosis and Repair.
MTB3 Hydraulic Brakes System Diagnosis and Repair.
MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTE2 General Electrical System Diagnosis.
MTE3 Battery Diagnosis and Service.
MTE4 Starting System Diagnosis and Repair.
MTE5 Charging System Diagnosis and Repair.
MTE6 Lighting Systems Diagnosis and Repair.
MTE7 Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
MTE8 Related Electrical Systems.
MTS1 For every task in Suspension and Steering the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTS2 Steering Systems Diagnosis and Repair.
MTS3 Suspension Systems Diagnosis and Repair.
MTS4 Wheel Alignment Diagnosis, Adjustment, and Repair.
MTS5 Wheel and Tire Diagnosis and Repair.
MTS6 Frame Service and Repair.

Academic Standards

A1 Recognize, classify, and use real numbers and their properties.

A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
E6 Explore cultural contributions to the history of the English language and its literature.
E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
E10 Use language and critical thinking strategies to serve as tools for learning.

21st Century Skills

CS2 Financial, Economic, and Business Literacy
CS4 Information and Communication Skills
CS5 Thinking and Problem-Solving Skills
CS6 Interpersonal and Self-Directional Skills

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Recommended Tools and Equipment

CAPITALIZED ITEMS

1. Student Tool Kit (1 kit per 2 students)
   a. Adjustable wrenches (6" and 12") (2)
   b. Allen wrench sets, standard (.050" – 3/8") and metric (2mm – 7mm) (1 set)
   c. Brake spoon (1)
   d. Chisels – cape (5/16") and cold (3/8" & 3/4") (1 set)
   e. Claw type pickup tool (1)
   f. Combination wrench sets – standard (1/4" – 1") and metric (7mm – 19 mm) (1 set)
   g. Continuity test light (12v) (1)
   h. Feeler gauge (blade type) (.002" – .040") and (.006 mm – .070 mm) (1 set)
   i. Hack saw (1)
   j. Hammer – 16 oz. ball peen (1)
   k. Hammer plastic tip (1)
   l. Ignition wrench set – US and metric (1 set)
   m. Magnetic pickup tool (1)
   n. Pliers, combination 6", locking jaw, needle nose, side cutting, and slip joint (water pump) (1 set)
   o. Punches, center, brass drift, pin (1/8", 3/16", 1/4", 5/16"), and taper (3/8", 1/2", 5/8") (1 set)
   p. Scrapers – carbon 1" and gasket 1" (1 set)
   q. Screwdrivers – standard (stubby, 6", 9", 12", and offset) and Phillips (stubby #1, #2; 6" #1, #2; 12" #3) (1 set)
   r. Screw starters – standard and Phillips (1 set)
   s. Socket – set – 1/4" drive: 1/4" – 1/2" standard sockets, 1/4" – 1/2" deep sockets, 6mm – 12mm standard sockets, 6mm – 12mm deep sockets, flex/universal type handle, 3" and 6" extensions, ratchet (1 set)
   t. Socket set – 3/8" drive: 5/16" – 3/4" standard sockets; 3/8" –3/4" deep sockets; 9mm – 19mm standard sockets; 9mm – 19mm deep sockets; 3", 6", 12", and 18" extensions; flex head ratchet; ratchet; speed handle; universal joint; spark plug sockets (5/8" and 13/16") (1 set)
   u. Socket set – 1/2" drive: 7/16" – 1 1/8" standard sockets; 7/16" – 1 1/8" deep sockets; 10mm – 25mm standard sockets; 10mm – 25mm deep sockets; 3" ,6", and 12" extensions; flex/universal type handle, ratchet (1 set)
   v. Spark plug feeler gauge (gap tool) (1)
2. Air compressor and hoses (1 per program)
3. Axle stands (6 sets per program)
4. Bench or pedestal grinder (2 per program)
5. Computer scan tool (hand-held) – on-board diagnostics level II (4 per program of various brands)
6. Diesel/gasoline fuel pressure testing gauge set with adaptors (1 per program)
7. Hoist(s), engine (Min. 2 ton) (1 per program)
8. Hydraulic press with adapters (25 ton) (1 per program)
9. Master puller set (1 per program)

10. Microcomputer with monitor, printer (CD-ROM and cables) (6 per program)
11. Microcomputer service information software (CD-ROM) (1 per computer)
12. Parts cleaning tank (Heated and EPA Approved) (1 per program)
13. Steel top workbenches with vises (1 per 2 students)
14. Tap and die set (US and metric) (2 per program)
15. Tire mounting machine (1 per program)
16. Wheel balancer (1 per program)
17. Brake lathe with disc service attachments with large vehicle attachments (1 per program)
18. Refrigerant recovery/recycling machine (R-12) (1 per program)
19. Refrigerant recovery/recycling machine (HFC-134a) (1 per program)
20. Battery/starter/charging system tester (1 per program)
21. Valve and valve seat resurfacing equipment (1 per program)
22. Valve spring tester (1 per program)
23. Diesel fuel injector nozzle pop tester (1 per program)
24. Arc/MIG welder with all accessories (1 per program)
25. Fuel system pressure testing gauge with adapters (1 per program)
26. Asbestos containment/removal device (1 per program)
27. 2 post above the ground lift (1 per program)
28. 4 post above the ground lift (with front end alignment capability) (1 per program)
29. Axle bearing nut set (2 3/8 – 4 7/8 inch) (1 per program)
30. Transmission/power steering fluid recovery/recycling machine (1 per program)
31. Antifreeze recovery/recycling machine (1 per program)
32. Asbestos containment/removal device (1 per program)

NON-CAPITALIZED ITEMS

1. Air blow gun (OSHA approved) (2 per program)
2. Battery post cleaner (6 per program)
3. Battery terminal pliers (6 per program)
4. Battery terminal puller (6 per program)
5. Files – coarse 6" and 12", fine 6" and 12", half-round 12", and round 6" and 12" (2 sets per program)
6. Flare nut (tubing wrenches) 3/8" – 3/4" and 10mm – 17mm (1 set per program)
7. Flashlight (1 per tool box)
8. Fuel system pressure gauge with adapters (1 per program)
9. Hammer – dead blow plastic mallet (2 per program)
10. Jumper wire set (2 per program)
11. Pliers – hose clamp (2 per program)
12. Pry bars – rolling head and straight (2 per program)
13. Screwdriver set – Posidrive 7 #1 – #4 (2 sets per program)
14. Screwdriver set – Torx 7 (T-8 – T-55) (2 sets per program)
15. 3/8" drive air ratchet (1 per program)
16. 3/8" drive impact sockets (US and metric) (2 sets per program)
17. 3/8" drive impact wrench (1 per program)
18. 3/8" drive flexible socket set (US and metric) (1 per program)

19. 1/2" drive air impact wrench (2 per program)
20. 1/2" drive impact sockets (US and metric) (2 sets per program)
21. Air chisel with various bits (1 per program)
22. Battery charger/booster starter (2 per program)
23. Belt tensioner gauge (1 per program)
24. Compression tester (3 per program)
25. Cooling system pressure tester (1 per program)
26. Floor creeper (1 per 2 students per class)
27. Cylinder leakage tester (2 per program)
28. Dial indicator with flex arm and clamp base (2 per program)
29. Digital multimeter with various lead sets (1 per 2 students per class)
30. Drain pans (6 per program)
31. Drill – 3/8" variable speed (6 per program)
32. Drill – 1/2" variable speed (2 per program)
33. Extension cords (6 per program)
34. Fender covers (10 per program)
35. Floor jack (1 1/2 ton minimum capacity) (3 per program)
36. Gear lube dispenser (1 per program)
37. Hand-held vacuum pump (1 per program)
38. Hot plate (or equivalent) (1 per program)
39. Jumper cables (3 sets per program)
40. Outside micrometers (0 – 1", 1 – 2", 2 – 3", 3 – 4", 4 – 5") (4 sets per program)
41. Oil can – pump type (1 per program)
42. Oil filter wrench(es) various sizes (2 sets per program)
43. Pressure washer (1 per program)
44. Remote starter switch (2 per program)
45. Screw extractor set (2 per program)
46. Seat covers (10 per program)
47. Snap ring pliers set – external and internal (2 set per program)
48. Soldering gun (4 per program)
49. Soldering iron (25 watt pencil type) (4 per program)
50. Sparkplug boot puller (5 per program)
51. Tach/dwell meter (1 per program)
52. Thread repair insert kit (1 per program)
53. Tire inflator chuck (2 per program)
54. Trouble/work lights (1 per 2 students)
55. Tube quick disconnect tool set (1 per program)
56. Tubing cutter and flaring set (2 per program)
57. Twist steel drill bit set (1/64" – 1/2" (2 sets per program)
58. Valve core removal tool (2 per program)
59. Vernier calipers (0 – 6" and 0 – 125mm) (2 sets per program)
60. Waste oil receptacle (1 per program)
61. Ball joint press (1 per program)
62. Bearing packer (2 per program)
63. Brake pedal holder (1 per program)
64. Drag link tool (1 per program)

65. Inner tie rod end tool (1 per program)
66. Pitman arm puller (1 per program)
67. Shock absorber tools (1 per program)
68. Spring/strut compressor tool (1 per program)
69. Tie rod puller (1 per program)
70. Wheel weight pliers (1 per program)
71. Brake bleeder, pressure (1 per program)
72. Brake cylinder clamps (1 sets per program)
73. Brake disc micrometer (2 sets per program)
74. Brake drum micrometer (1 set per program)
75. Brake shoe adjusting gauge (2 per program)
76. Brake spring installers (6 per program)
77. Brake spring pliers (6 per program)
78. Air conditioner service port adapter set (1 per program)
79. Manifold gauge set (2 per program)
80. Antifreeze tester (2 per program)
81. Carburetor plug and angle gauge set (1 per program)
82. Computer carburetor tools (1 per program)
83. Cylinder leakage tester (2 per program)
84. Oxygen sensor socket (2 sets per program)
85. Sending unit socket (1 per program)
86. Sparkplug thread tap (1 per program)
87. Static strip (4 per program)
88. Timing advance light (4 per program)
89. Vacuum/pressure gauge set (2 per program)
90. Transmission jack(s) (1 per program)
91. Transmission holding fixtures (1 per program)
92. Transmission special tools set (1 per program)
93. Alternator service tools (1 per program)
94. Connector pick tool set (1 per program)
95. Wire and terminal repair kit (4 per program)
96. Clutch alignment set (1 per program)
97. Clutch pilot puller set (1 per program)
98. Universal joint tools (1 per program)
99. Valve guide repair unit (1 per program)
100. Valve spring compressor (1 per program)
101. Hydraulic pressure testing gauge (1 per program)
102. Oxyacetylene welding and cutting set (1 per program)
103. Wheel chocks for heavy trucks (2 sets per program)
104. Universal joint press for heavy trucks (1 per program)
105. Twin disk clutch adjustment tool for heavy trucks (1 per program)
106. Axle thread chaser (2- 4¼ inch) (1 per program)

RECOMMENDED INSTRUCTIONAL AIDS

It is recommended that teachers have access to the following items:

1. Cart, AV (for TV-VCR) (1)
2. Cart, AV (for overhead projector) (1)
3. Mylar board (1)
4. Internet connection (1)
5. TV – VCR (1)
6. Video out (microcomputer to TV monitor) (1)
7. Smart board
8. Laptop computer
9. Microcomputer with monitor, printer (CD-ROM and cables) (Instructor use)
10. Light box projector (1 per program)

ASSESSMENT

BLUEPRINT

Title of Program: Diesel Service Technology Program Level: Secondary

This program is assessed using the MS-CPAS. The following blueprint summary contains the competencies that are measured when assessing this program. Competencies are grouped into *clusters* and a weight is given to each cluster to determine the number of items needed from each cluster. The numbers of C1s and C2s (item difficulty levels) are also indicated on the blueprint.

Cluster/Competency	**Level 1 (C1)**	**Level 2 (C2)**	**TOTAL**	**%**
Cluster 1: Fundamentals Diesel I Unit 2: Safety Unit 3: Tools, Technical References, Measurement, Fasteners, and Basic Welding Diesel II Unit 2: Advanced Tools, Technical References, Measurement, Fasteners, and Basic Welding	22	0	22	22
Cluster 2: Diesel and Small Engines Diesel II Unit 4: Diesel Systems and Theory	17	6	23	23
Cluster 3: Brakes/Hydraulics Diesel I Unit 4: Brakes/Basic Hydraulics	10	6	16	16
Cluster 4: Electrical/Electronics Diesel I Unit 5: Basic Electrical/Electronic Systems Diesel II Unit 3: Advanced Electrical/Electronic Systems	17	6	23	23

Cluster/Competency	**Level 1 (C1)**	**Level 2 (C2)**	**TOTAL**	**%**
Cluster 5: Steering and Suspension Systems Diesel II Unit 5: Steering and Suspension Systems	10	6	16	16
Total Questions:	76	24	100	100%

Appendix A: 2004 ASE/NATEF Medium/Truck Technician Standards[1]

MTB1 For every task in Brakes the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTB2 Air Brakes Diagnosis and Repair.
MTB3 Hydraulic Brakes System Diagnosis and Repair.
MTE1 For every task in Electrical/Electronic Systems the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTE2 General Electrical System Diagnosis.
MTE3 Battery Diagnosis and Service.
MTE4 Starting System Diagnosis and Repair.
MTE5 Charging System Diagnosis and Repair.
MTE6 Lighting Systems Diagnosis and Repair.
MTE7 Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair.
MTE8 Related Electrical Systems.
MTS1 For every task in Suspension and Steering the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTS2 Steering Systems Diagnosis and Repair.
MTS3 Suspension Systems Diagnosis and Repair.
MTS4 Wheel Alignment Diagnosis, Adjustment, and Repair.
MTS5 Wheel and Tire Diagnosis and Repair.
MTS6 Frame Service and Repair.
MTD1 For every task in Diesel the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.
MTD2 General Engine Diagnosis.
MTD3 Cylinder Head and Valve Train Diagnosis and Repair.
MTD4 Engine Block Diagnosis and Repair.
MTD5 Lubrication Systems Diagnosis and Repair.
MTD6 Cooling System Diagnosis and Repair.
MTD7 Air Induction, and Exhaust Systems Diagnosis and Repair.
MTD8 Fuel System Diagnosis and Repair.

[1] *2004 ASE/NATEF Medium/Heavy Truck Technician standards*. Retrieved August 10, 2004, from http://www.natef.org

MTD9 Engine Brakes.

Appendix B: Academic Standards

Algebra I[2]

Competencies and Suggested Objective(s)

A1 Recognize, classify, and use real numbers and their properties.
- a. Describe the real number system using a diagram to show the relationships of component sets of numbers that compose the set of real numbers.
- b. Model properties and equivalence relationships of real numbers.
- c. Demonstrate and apply properties of real numbers to algebraic expressions.
- d. Perform basic operations on square roots excluding rationalizing denominators.

A2 Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- a. Analyze relationships between two variables, identify domain and range, and determine whether a relation is a function.
- b. Explain and illustrate how change in one variable may result in a change in another variable.
- c. Determine the rule that describes a pattern and determine the pattern given the rule.
- d. Apply patterns to graphs and use appropriate technology.

A3 Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- a. Solve, check, and graph linear equations and inequalities in one variable, including rational coefficients.
- b. Graph and check linear equations and inequalities in two variables.
- c. Solve and graph absolute value equations and inequalities in one variable.
- d. Use algebraic and graphical methods to solve systems of linear equations and inequalities.
- e. Translate problem-solving situations into algebraic sentences and determine solutions.

A4 Explore and communicate the characteristics and operations of polynomials.
- a. Classify polynomials and determine the degree.
- b. Add, subtract, multiply, and divide polynomial expressions.
- c. Factor polynomials using algebraic methods and geometric models.
- d. Investigate and apply real number solutions to quadratic equations algebraically and graphically.
- e. Use convincing arguments to justify unfactorable polynomials.
- f. Apply polynomial operations to problems involving perimeter and area.

A5 Utilize various formulas in problem-solving situations.
- a. Evaluate and apply formulas (e.g., circumference, perimeter, area, volume, Pythagorean Theorem, interest, distance, rate, and time).
- b. Reinforce formulas experimentally to verify solutions.

[2] *Mississippi mathematics framework—Algebra I*. (2003). Retrieved September 10, 2003, from http://www.mde.k12.ms.us/curriculum/index_1.htm

c. Given a literal equation, solve for any variable of degree one.
d. Using the appropriate formula, determine the length, midpoint, and slope of a segment in a coordinate plane.
e. Use formulas (e.g., point-slope and slope-intercept) to write equations of lines.

A6 Communicate using the language of algebra.
a. Recognize and demonstrate the appropriate use of terms, symbols, and notations.
b. Distinguish between linear and non-linear equations.
c. Translate between verbal expressions and algebraic expressions.
d. Apply the operations of addition, subtraction, and scalar multiplication to matrices.
e. Use scientific notation to solve problems.
f. Use appropriate algebraic language to justify solutions and processes used in solving problems.

A7 Interpret and apply slope as a rate of change.
a. Define slope as a rate of change using algebraic and geometric representations.
b. Interpret and apply slope as a rate of change in problem-solving situations.
c. Use ratio and proportion to solve problems including direct variation (y=kx).
d. Apply the concept of slope to parallel and perpendicular lines.

A8 Analyze data and apply concepts of probability.
a. Collect, organize, graph, and interpret data sets, draw conclusions, and make predictions from the analysis of data.
b. Define event and sample spaces and apply to simple probability problems.
c. Use counting techniques, permutations, and combinations to solve probability problems.

Biology I[3]

Competencies and Suggested Objective(s)

B1 Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
a. Demonstrate the proper use and care for scientific equipment used in biology.
b. Observe and practice safe procedures in the classroom and laboratory.
c. Apply the components of scientific processes and methods in the classroom and laboratory investigations.
d. Communicate results of scientific investigations in oral, written, and graphic form.

B2 Investigate the biochemical basis of life.
a. Identify the characteristics of living things.
b. Describe and differentiate between covalent and ionic bonds using examples of each.
c. Describe the unique bonding and characteristics of water that makes it an essential component of living systems.

[3] *Mississippi science framework—Biology I.* (2003). Retrieved September 10, 2003, from http://www.mde.k12.ms.us/curriculum/index_1.htm

d. Classify solutions using the pH scale and relate the importance of pH to organism survival.
e. Compare the structure, properties and functions of carbohydrates, lipids, proteins and nucleic acids in living organisms.
f. Explain how enzymes work and identify factors that can affect enzyme action.

B3 Investigate cell structures, functions, and methods of reproduction.
a. Differentiate between prokaryotic and eukaryotic cells.
b. Distinguish between plant and animal (eukaryotic) cell structures.
c. Identify and describe the structure and basic functions of the major eukaryotic organelles.
d. Describe the way in which cells are organized in multicellular organisms.
e. Relate cell membrane structure to its function in passive and active transport.
f. Describe the main events in the cell cycle and cell mitosis including differences in plant and animal cell divisions.
g. Relate the importance of meiosis to sexual reproduction and the maintenance of chromosome number.
h. Identify and distinguish among forms of asexual and sexual reproduction.

B4 Investigate the transfer of energy from the sun to living systems.
a. Describe the structure of ATP and its importance in life processes.
b. Examine, compare, and contrast the basic processes of photosynthesis and cellular respiration.
c. Compare and contrast aerobic and anaerobic respiration.

B5 Investigate the principles, mechanisms, and methodology of classical and molecular genetics.
a. Compare and contrast the molecular structures of DNA and RNA as they relate to replication, transcription, and translation.
b. Identify and illustrate how changes in DNA cause mutations and evaluate the significance of these changes.
c. Analyze the applications of DNA technology (forensics, medicine, agriculture).
d. Discuss the significant contributions of well-known scientists to the historical progression of classical and molecular genetics.
e. Apply genetic principles to solve simple inheritance problems including monohybrid crosses, sex linkage, multiple alleles, incomplete dominance, and codominance.
f. Examine inheritance patterns using current technology (gel electrophoresis, pedigrees, karyotypes).

B6 Investigate concepts of natural selection as they relate to diversity of life.
a. Analyze how organisms are classified into a hierarchy of groups and subgroups based on similarities and differences.
b. Identify characteristics of kingdoms including monerans, protists, fungi, plants and animals.
c. Differentiate among major divisions of the plant and animal kingdoms (vascular/non-vascular; vertebrate/invertebrate).
d. Compare the structures and functions of viruses and bacteria relating their impact on other living organisms.

e. Identify evidence of change in species using fossils, DNA sequences, anatomical and physiological similarities, and embryology.
f. Analyze the results of natural selection in speciation, diversity, adaptation, behavior and extinction.

B7 Investigate the interdependence and interactions that occur within an ecosystem.
a. Analyze the flow of energy and matter through various cycles including carbon, oxygen, nitrogen and water cycles.
b. Interpret interactions among organisms in an ecosystem (producer/consumer/decomposer, predator/prey, symbiotic relationships and competitive relationships).
c. Compare variations, tolerances, and adaptations of plants and animals in major biomes.
d. Investigate and explain the transfer of energy in an ecosystem including food chains, food webs, and food pyramids.
e. Examine long and short-term changes to the environment as a result of natural events and human actions.

English II[4]

Competencies and Suggested Objective(s)

E1 Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
a. Produce individual and/or group compositions and/or projects to persuade, tell a story, describe, create an effect, explain or justify an action or event, inform, entertain, etc.
b. Produce writing typically used in the workplace such as social, business, and technical correspondence; explanation of procedures; status reports; research findings; narratives for graphs; justification of decisions, actions, or expenses; etc.
c. Write a response, reaction, interpretation, analysis, summary, etc., of literature, other reading matter, or orally presented material.
d. Revise to ensure effective introductions, details, wording, topic sentences, and conclusions.

E2 Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
a. Listen to determine the main idea and supporting details, to distinguish fact from opinion, and to determine a speaker's purpose or bias.
b. Speak with appropriate intonation, articulation, gestures, and facial expression.
c. Speak effectively to explain and justify ideas to peers, to inform, to summarize, to persuade, to entertain, to describe, etc.

E3 Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
a. Read, view, and listen to distinguish fact from opinions and to recognize persuasive and manipulative techniques.

[4] *Mississippi language arts framework—English II*. (2003). Retrieved September 10, 2003, from http://www.mde.k12.ms.us/curriculum/index_1.htm

b. Access both print and non-print sources to produce an I-Search paper, research paper, or project.
c. Use computers and audio-visual technology to access and organize information for purposes such as resumes, career search projects, and analytical writings, etc.
d. Use reference sources, indices, electronic card catalog, and appropriate research procedures to gather and synthesize information.

E4 Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
a. Interact with peers to examine real world and literary issues and ideas.
b. Show growth in critical thinking, leadership skills, consensus building, and self-confidence by assuming a role in a group, negotiating compromise, and reflecting on individual or group work.

E5 Complete oral and written presentations which exhibit interaction and consensus within a group.
a. Share, critique, and evaluate works in progress and completed works through a process approach.
b. Communicate effectively in a group to present completed projects and/or compositions.
c. Edit oral and written presentations to reflect correct grammar, usage, and mechanics.

E6 Explore cultural contributions to the history of the English language and its literature.
a. Explore a variety of works from various historical periods, geographical locations, and cultures, recognizing their influence on language and literature.
b. Identify instances of dialectal differences which create stereotypes, perceptions, and identities.
c. Recognize root words, prefixes, suffixes, and cognates.
d. Relate how vocabulary and spelling have changed over time.

E7 Discover the power and effect of language by reading and listening to selections from various literary genres.
a. Listen to and read aloud selected works to recognize and respond to the rhythm and power of language to convey a message.
b. Read aloud with fluency and expression.
c. Analyze the stylistic devices, such as alliteration, assonance, word order, rhyme, onomatopoeia, etc., that make a passage achieve a certain effect.
d. Demonstrate how the use of language can confuse or inform, repel or persuade, or inspire or enrage.
e. Analyze how grammatical structure or style helps to create a certain effect.

E8 Read, discuss, analyze, and evaluate literature from various genres and other written material.
a. Read and explore increasingly complete works, both classic and contemporary, for oral discussion and written analysis.
b. Read, discuss, and interpret literature to make connections to life.
c. Read from a variety of genres to understand how the literary elements contribute to the overall quality of the work.

d. Identify qualities in increasingly complex literature that have produced a lasting impact on society.
e. Read for enjoyment, appreciation, and comprehension of plot, style, vocabulary, etc.

E9 Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
a. Infuse the study of grammar and vocabulary into written and oral communication.
b. Demonstrate, in the context of their own writing, proficient use of the conventions of standard English, including, but not limited to, the following: complete sentences, subject-verb agreement, plurals, spellings, homophones, possessives, verb forms, punctuation, capitalization, pronouns, pronoun-antecedent agreement, parallel structure, and dangling and misplaced modifiers.
c. Give oral presentations to reinforce the use of standard English.
d. Employ increasingly proficient editing skills to identify and solve problems in grammar, usage, and structure.

E10 Use language and critical thinking strategies to serve as tools for learning.
a. Use language to facilitate continuous learning, to record observations, to clarify thought, to synthesize information, and to analyze and evaluate language.
b. Interpret visual material orally and in writing.

U. S. History from 1877[5]

Competencies and Suggested Objective(s)

H1 Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.
a. Apply economic concepts and reasoning when evaluating historical and contemporary social developments and issues (e.g., gold standard, free coinage of silver, tariff issue, laissez faire, deficit spending, etc.).
b. Explain the emergence of modern America from a domestic perspective (e.g., frontier experience, Industrial Revolution and organized labor, reform movements of Populism and Progressivism, Women's Movement, Civil Rights Movement, the New Deal, etc.).
c. Explain the changing role of the United States in world affairs since 1877 through wars, conflicts, and foreign policy (e.g., Spanish-American War, Korean conflict, containment policy, etc.).
d. Trace the expansion of the United States and its acquisition of territory from 1877 (e.g., expansionism and imperialism).

H2 Describe the impact of science and technology on the historical development of the United States in the global community.
a. Analyze the impact of inventions on the United States (e.g., telephone, light bulb, etc.).
b. Examine the continuing impact of the Industrial Revolution on the development of our nation (e.g., mass production, computer operations, etc.).

[5] *Mississippi social studies framework—U.S. History from 1877*. (2003). Retrieved September 10, 2003, from http://www.mde.k12.ms.us/curriculum/index_1.htm

c. Describe the effects of transportation and communication advances since 1877.

H3 Describe the relationship of people, places, and environments through time.

a. Analyze human migration patterns since 1877 (e.g., rural to urban, the Great Migration, etc.).

b. Analyze how changing human, physical, geographic characteristics can alter a regional landscape (e.g., urbanization, Dust Bowl, etc.).

H4 Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

a. Interpret special purpose maps, primary/secondary sources, and political cartoons.

b. Analyze technological information on graphs, charts, and timelines.

c. Locate areas of international conflict (e.g., Caribbean, Southeast Asia, Europe, etc.).

H5 Analyze the contributions of Americans to the ongoing democratic process to include civic responsibilities.

a. Examine various reform movements (e.g., Civil Rights, Women's Movement, etc.).

b. Examine the government's role in various movements (e.g., arbitration, 26th Amendment, etc.).

c. Examine the role of government in the preservation of citizens' rights (e.g., 19th Amendment, Civil Rights Act of 1964).

d. Examine individuals' duties and responsibilities in a democratic society (e.g., voting, volunteerism, etc.).

Appendix C: 21st Century Skills[6]

CS1 Global Awareness

- Using 21st century skills to understand and address global issues
- Learning from and working collaboratively with individuals representing diverse cultures, religions, and lifestyles in a spirit of mutual respect and open dialogue in personal, work, and community contexts
- Promoting the study of non-English language as a tool for understanding other nations and cultures

CS2 Financial, Economic, and Business Literacy

- Knowing how to make appropriate personal economic choices
- Understanding the role of the economy and the role of business in the economy
- Applying appropriate 21st century skills to function as a productive contributor within an organizational setting
- Integrating oneself within and adapting continually to our nation's evolving economic and business environment

CS3 Civic Literacy

- Being an informed citizen to participate effectively in government
- Exercising the rights and obligations of citizenship at local, state, national, and global levels
- Understanding the local and global implications of civic decisions
- Applying 21st century skills to make intelligent choices as a citizen

CS4 Information and Communication Skills

- Information and media literacy skills: Analyzing, accessing, managing, integrating, evaluating, and creating information in a variety of forms and media; understanding the role of media in society
- Communication skills: Understanding, managing, and creating effective oral, written, and multimedia communication in a variety of forms and contexts

CS5 Thinking and Problem-Solving Skills

- Critical thinking and systems thinking: Exercising sound reasoning in understanding and making complex choices, understanding the interconnections among systems
- Problem identification, formulation, and solution: Ability to frame, analyze, and solve problems
- Creativity and intellectual curiosity: Developing, implementing, and communicating new ideas to others, staying open and responsive to new and diverse perspectives

CS6 Interpersonal and Self-Directional Skills

- Interpersonal and collaborative skills: Demonstrating teamwork and leadership, adapting to varied roles and responsibilities, working productively with others, exercising empathy, respecting diverse perspectives
- Self-direction: Monitoring one's own understanding and learning needs, locating appropriate resources, transferring learning from one domain to another
- Accountability and adaptability: Exercising personal responsibility and flexibility in personal, workplace, and community contexts; setting and meeting high standards and goals for one's self and others; tolerating ambiguity

[6] *21st century skills.* (n.d.). Washington, DC: Partnership for 21st Century Skills.

- Social responsibility: Acting responsibly with the interests of the larger community in mind; demonstrating ethical behavior in personal, workplace, and community contexts

Appendix D: Rubrics and Resources

Activity Performance Rubric

Student Name _____ Date _____

Task to be Performed_____

	Possible Points	Points Awarded
Safety Personal safety (glasses, clothing, etc.) Safe use of tool Safely performs the task	25	
Performance of the Task Follows the task instructions Performs the task efficiently Performs the task satisfactorily	50	
Lab Maintenance Area clean-up (clean and tidy) Area organization (before, during, and after the task)	25	
Total	100	

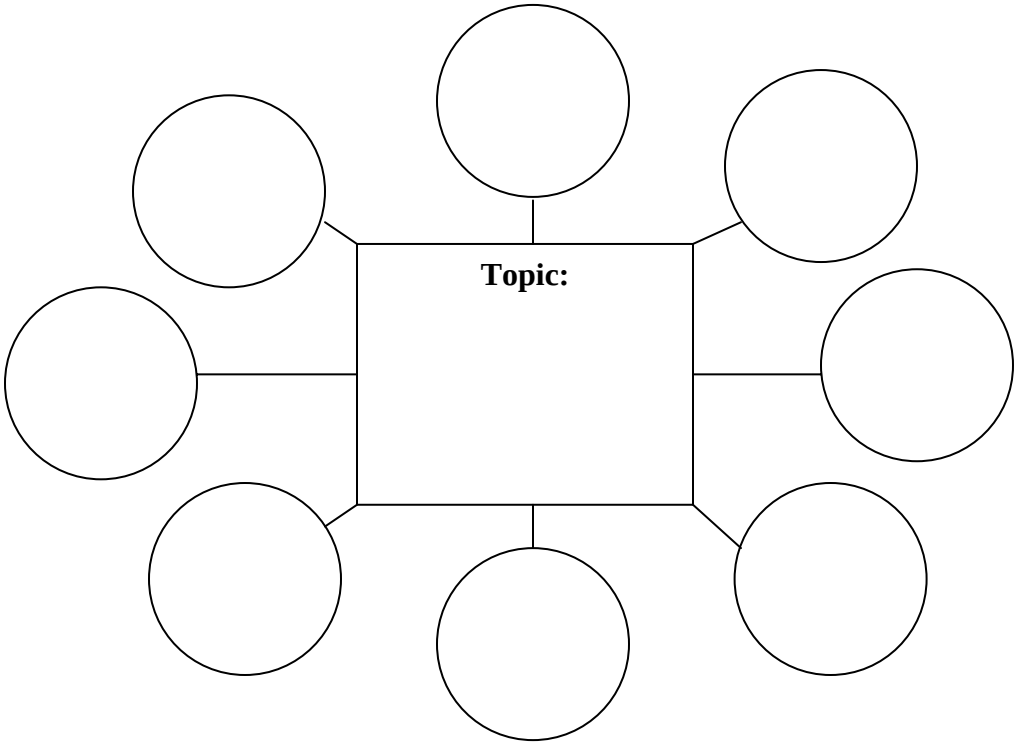
Comments for Deductions:

Case Study Assessment Rubric

	Excellent 4 Points	Accomplished 3 Points	Needs Improvement 2 Points	Unsatisfactory 1 Point
Comprehension	Shows complete understanding of the issues, and grasps implications beyond the immediate issue	Asks for more details to clarify understanding of the issue	Shows partial understanding of the issue but does not ask for clarification	Resists attempts to get clarification
Strategizing	Develops realistic strategies that would provide a satisfactory conclusion	Chooses appropriate strategies that may satisfy	Shows evidence of strategy that may or may not satisfy	Needs assistance to choose a strategy
Innovation	Devises more than one resolution to the problem	Offers a solution	Offers a solution with a limited point of view	Shows some understanding of the problem
Communications	Convincingly communicates resolution	Explains solution so others can understand	Conveys an opinion	Unsure of how to explain

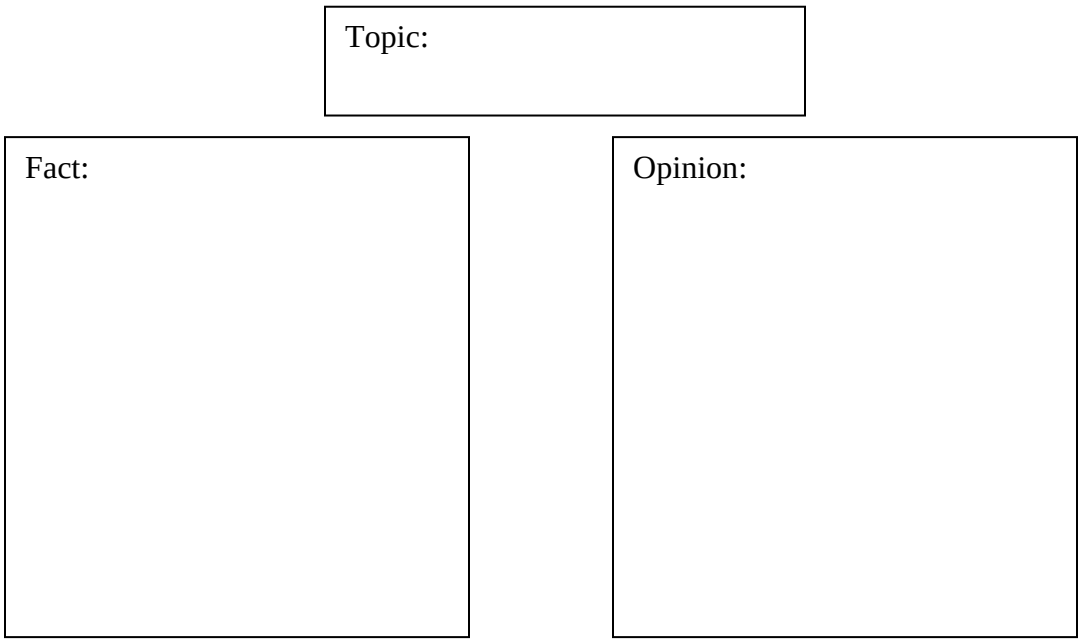
Cluster Word Web

A Cluster Word Web can be used to help students determine main and supporting ideas. Have students place their topic in the square and details about their topic in the circles:



Fact or Opinion:

Have students writing their topic in the top rectangle. Have students add details to the fact or the opinion blocks:



Field Trip Participation Checklist

_____1. The student arrived at the designated meeting place on time with all materials and supplies required for the field trip.
_____2. The student observed all safety rules and policies while traveling to and participating in the field trip.
_____3. The student demonstrated interest in the content of the field trip by paying attention to the exhibits and speakers, asking pertinent questions, and taking notes.
_____4. The student exhibited a positive attitude toward the events and activities of the field trip.
_____5. The student remained on task throughout the field trip.
_____6. The student exhibited cooperative workplace skills with other students throughout the field trip.

Group Participation Assessment Rubric

	Beginning **1 point**	Developing **2 points**	Accomplished **3 points**	Exemplary **4 points**	Score
Group Discussions	Contributed exceptional effort to discussions of the group	Contributed great effort to discussions of the group	Contributed good effort to discussions of the group	Rarely contributed to discussions of the group	
On-task Behavior	Exhibited on-task behavior consistently	Exhibited on-task behavior most of the time	Exhibited on-task behavior some of the time	Exhibited on-task behavior inconsistently	
Helping Others	Assisted other group members	Occasionally assisted other group members	Seldom assisted other group members	Did not assist other group members	
Listening	Always listened to ideas of group members	Occasionally listened to ideas of group members	Seldom listened to ideas of group members	Ignored ideas of group members	

Group Presentation Assessment Rubric

	Exemplary **4 points**	Accomplished **3 points**	Developing **2 points**	Beginning **1 point**	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, or some grammatical errors	Weak, inaccurate, or many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Participation	Well-balanced participation by all group members	All group members have significant participation	Most group members participate	One main speaker with little participation from other group members	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	

Interview Rubric

The Student	Excellent 4	Good 3	Needs Improvement 2	Unacceptable 1
Arrives prior to the interview.				
Displays confidence with body language.				
Maintains eye contact.				
Maintains proper facial expression.				
Provides a self-introduction.				
Extends hand and shakes hands firmly with the interviewer(s).				
Dresses appropriately for the interview.				
Responds in a concise, grammatically correct, and appropriate manner.				
Asks appropriate questions, and demonstrates awareness of background of company and requirements of the job.				
Cues on interviewer's closure and responds appropriately.				

Notes:

KWL Chart

Purposes:

- To help students access prior knowledge through brainstorming
- To identify areas of student interest or concern
- To aid the teacher in planning lessons as well as checking for understanding
- To track student learning throughout the unit
- To identify areas for further student research/study

Process:

- Use this strategy prior to, during, or at the close of any unit of study. The process can be done individually, in small groups, or as a class activity.
- Post the charts or have students record their information in groups.
- During the brainstorming phase, emphasize getting lots of ideas rather than debating or discussing the ideas as they are generated. Debates, clarifications, and discussions of ideas occur once the brainstorming is over. Do not clarify any confusion or react in any way other than to record the data. Conflicting data may be recorded.
- During the lesson or unit of study, misconception, confusion, or curiosity should be addressed.

Sample Chart:

K **What do you already Know about the topic?**	W **What do you Want to learn about the topic?**	L **What have you Learned about the topic?**

Poster Assessment Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Required Content	The poster includes all required content elements as well as additional information.	All required content elements are included on the poster.	All but 1 of the required content elements are included on the poster.	Several required content elements were missing.	
Labels	All items of importance on the poster are clearly labeled with labels that are easy to read.	Almost all items of importance on the poster are clearly labeled with labels that are easy to read.	Many items of importance on the poster are clearly labeled with labels that are easy to read.	Labels are too small to read or no important items were labeled.	
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed.	
Grammar	There are no grammatical or mechanical mistakes on the poster.	There are 1-2 grammatical or mechanical mistakes on the poster.	There are 3-4 grammatical or mechanical mistakes on the poster.	There are more than 4 grammatical or mechanical mistakes on the poster.	

Presentation Assessment Rubric

	Exemplary 4 points	Accomplished 3 points	Developing 2 points	Beginning 1 point	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate, mostly accurate, and few grammatical errors	Poorly planned, somewhat accurate, or some grammatical errors	Weak, inaccurate, or many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	

Problem Solution Chart

Have students write the task in the task area. Then have students brainstorm possible problems and solutions.

Task:	
Possible Problem:	Possible Solution:
Possible Problem:	Possible Solution:
Possible Problem:	Possible Solution:
Possible Problem:	Possible Solution:
Possible Problem:	Possible Solution:
Possible Problem:	Possible Solution:

Reflective Writing Rubric

	4	3	2	1
Writing Structure	Sentences and paragraphs are complete, well-constructed, and of varied structure.	All sentences are complete and well-constructed (no fragments, no run-ons). Paragraphing is generally done well.	Most sentences are complete and well-constructed. Paragraphing needs some work.	There are many sentence fragments or run-on sentences OR paragraphing needs lots of work.
Content	The writing contains a description of all components of the communication process.	The writing contains a description of 3 components of the communication process.	The writing contains a description of 2 components of the communication process.	The writing contains a description of 1 component of the communication process.
Content Accuracy	The writing contains at least 3 accurate examples of types of communications.	The writing contains at least 2 accurate examples of types of communications.	The writing contains at least 1 accurate example of types of communications.	The writing contains no examples of types of communications.
Content Understanding	Ideas were expressed in a clear and organized fashion.	Ideas were expressed in a pretty clear manner, but the organization could have been better.	Ideas were somewhat organized, but were not very clear.	The writing seemed to be a collection of unrelated sentences.

Resume Rubric

	Excellent 25	Well Done 20	Meets Standards 15	Beginning 10	No evidence 0	Score
Format	Resume contains: Name Address Phone Number Objective Education Experience References No Spelling Errors	Resume contains 6 of the criteria. No more than 2 spelling errors.	Resume contains 5 of criteria. No more than 4 spelling errors.	Resume contains minimal information. More than 4 spelling errors.	Assignment was not turned in.	
Education	Education includes all of the following: All schools attended. Graduation dates. Diploma/Degree awarded. Major field of study.	Education includes 3 of the following: All schools attended. Graduation dates. Diploma/Degree awarded. Major field of study.	Education includes 2 of the following: All schools attended. Graduation dates. Diploma/Degree awarded. Major field of study.	Education includes 1 of the following: All schools attended. Graduation dates. Diploma/Degree awarded. Major field of study.	Assignment was not turned in.	
Experience	Experience includes: Internships in the field. Entry level jobs relevant to current position. Current position	Experience includes: Internships in the field. Entry level jobs relevant to current position.	Experience includes: Entry level jobs relevant to current position as well as current job.	Experience includes current position only.	Assignment was not turned in.	
Realism	Resume contains realistic names and dates. Resume is believable.	Resume is fairly believable with realistic names OR dates.	Resume has unrealistic dates or names.	Resume is obviously unrealistic and contains conflicting information.	Assignment was not turned in.	

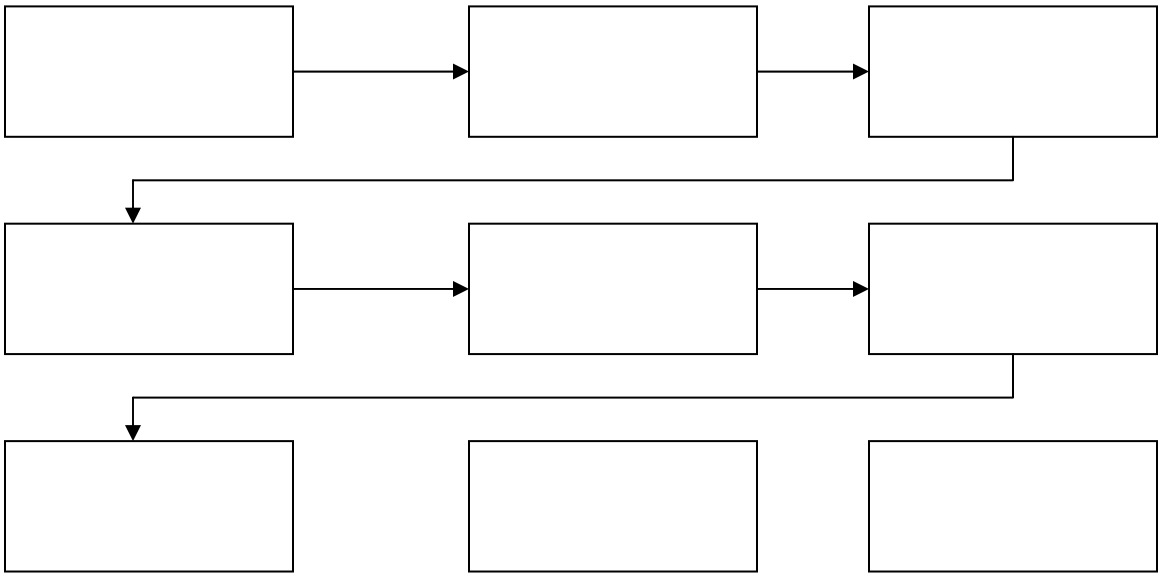
Written by D Cordero. Last updated 12/01/99

Role-Play Rubric

Indicators	Proficient 4	Strong 3	Basic 2	Weak 1
Assessment Outcomes	*Highly creative, inventive, mature presence of outcome*	*Detailed and consistent evidence of outcome*	*Beginning of or some evidence of outcome*	*Little or no evidence of outcome*
Focus Question Provided	Group provides a clear, relevant focus question to the audience to give the anticipatory set.	Group provides a focus question to the audience to give the anticipatory set.	Group provides a vague focus question to the audience to give the anticipatory set.	Group provides a very vague or no focus question to the audience to give the anticipatory set.
Knowledge of Content	Group of students is obviously well-prepared and knowledgeable about the content; highly credible in role; information is completely accurate.	Group of students is mostly prepared and knowledgeable about the content; somewhat credible in role with little or no vagueness; little or no errors in information.	Group of students is slightly prepared and somewhat knowledgeable about the content they are role-playing; little or no credible in role with vagueness; errors in information.	Group of students is not prepared and vaguely knowledgeable about the content they are role-playing; no credibility in role with multiple errors in information.
Creativity in Presentation	Group of students is serious and methodical in the presentation, using believable role playing that creatively conveys the knowledge desired.	Group of students is somewhat serious in the presentation, using mostly convincing role playing that conveys the knowledge desired.	Group of students is slightly serious in the presentation, using slightly convincing role playing that conveys the knowledge desired.	Group of students is not serious in the presentation, not using convincing role playing that conveys the knowledge desired.
Use of Props	Group of students has collected the relevant props to include the tools demonstrated plus additional props to create the scene and used them effectively to role-play.	Group of students has collected the relevant props to include the tools demonstrated and used them effectively to role-play.	Group of students has collected little or no props to include the tools demonstrated and used them.	Group of students has not collected props to include in the role play.
Collaboration Among Team Members	Group of students assumed necessary roles and carried out their duties in the roles to work in a highly effective collaborative team.	Group of students assumed necessary roles and somewhat carried out their duties in the roles.	Group of students somewhat assumed roles and slightly carried out their duties in the roles.	Group of students showed no signs of collaboration.
Interactive Closure Activity	Group of students provided a highly effective, interactive closure activity that was unique and provided a check for understanding of the role play.	Group of students provided effective closure activity that provided a check for understanding of the role play.	Group of students provided a vague closure activity.	Group of students provided no closure activity.

Sequential and Chronological Map

Have students list the process in sequential and/or chronological order:



Step-by-Step Chart

Have students write the task that they are to accomplish in the task area. Then have students determine and write each step of their procedure with details.

Task:	
Step 1:	Details:
Step 2:	Details:
Step 3:	Details:
Step 4:	Details:
Step 5:	Details:
Step 6:	Details:

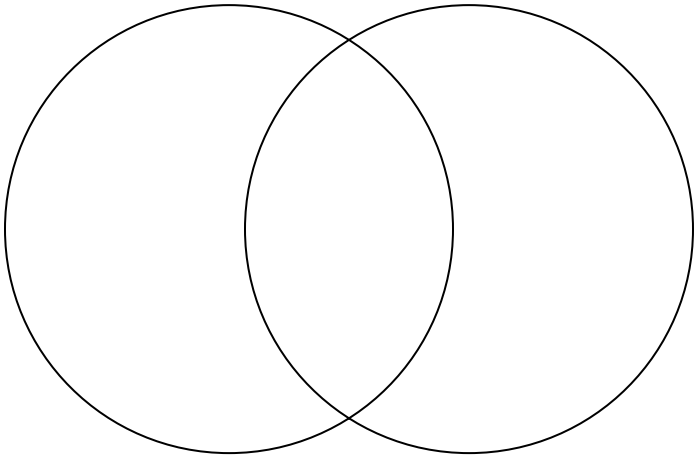
Student Journal Rubric

	Excellent 4	Very Good 3	Satisfactory 2	Needs Work 1	Score
Writing Quality	There is a strong writing style and ability to express concepts learned. Excellent spelling, grammar, syntax, spelling, etc.	There is a good writing style and ability to express concepts learned. Very good grammar, syntax, spelling, etc.	There is a writing style which conveys meaning adequately. Some minor grammatical, syntax, and spelling errors.	There is difficulty in expressing concepts. There is limited syntax. There are noticeable grammatical and spelling mistakes.	
Content	Clear and complete description of the activity is recorded. All major points are documented.	Very good description of the activity is recorded. Most major points are documented.	Good description of the activity is recorded. Some major points have been omitted.	Limited description of the activity is recorded. Very few major points are documented.	
Insight and Understanding	Definite insights into the implications of the activity are recorded. Awareness of complexity of issues and situations is present.	Some insight into the issue or situation is recorded. Some sense of complexity is present.	Insight is present from a more simplistic standpoint.	Only limited insight into the issue or situation is recorded.	
Application	Content of the activity is connected to the student's personal life and goals.	Content of the activity is connected to the field of agriculture.	Content of the activity is related to life in general.	Only limited connections are made between the content of the activity and the surrounding world.	
Total Score:					

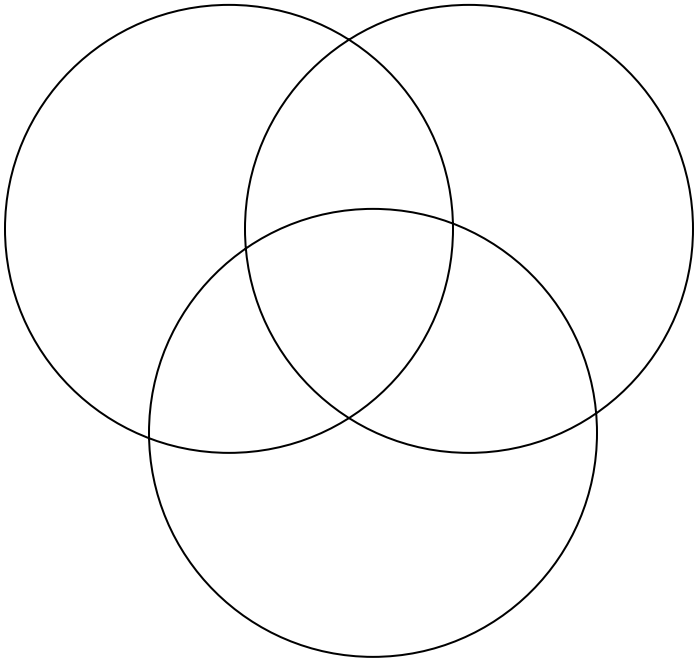
Venn Diagram

Have students use a Venn Diagram to compare and contrast subjects. Have students write details that tell how subjects are different in the outer circles and details that tell how the subjects are alike where circles overlap. After students present their ideas in the graphic, have them organize their ideas into a writing summary.

Use the following Venn Diagram to compare and contrast two subjects:



Use the following Venn Diagram to compare and contrast three subjects:



Weekly Learning Reflections

Name: _____ Week of: _____

What did I learn this week?

How can I use this information in the real world?

In what areas am I making progress?

In what areas do I need to improve?

What learning goals do I have for next week?

What did I enjoy most about this week?

Parent's Signature and Comments: _____

_____

_____

Student's Signature and Comments: _____

_____

_____

Workplace Skills Weekly Checklist

Name: _____ Date: _____ Period: _____

Behavior Skill	Never	Rarely	Most of the Time	Always
On Time and Prepared				
1. Arrives to class on time.				
2. Brings necessary materials.				
3. Completes homework.				
Respects Peers				
1. Respects others' property.				
2. Listens to peers.				
3. Responds appropriately to peers.				
4. Respects others' opinions.				
5. Refrains from abusive language.				
Respects Teachers/Staff				
1. Follows directions.				
2. Listens to teacher/staff.				
3. Accepts responsibility for actions.				
Demonstrates Appropriate Character Traits				
1. Demonstrates positive character traits (kindness, trustworthy, honesty).				
2. Demonstrates productive character traits (patient, thorough, hardworking).				
3. Demonstrates a level of concern for others.				
Demonstrates a Level of Concern for Learning				
1. Remains on task.				
2. Allows others to remain on task.				

The Writing Process

Step 1: Prewriting
During this step, allow students to brainstorm and determine ideas for their content. Students may complete the following during prewriting activities:

- Fee writing
- Journaling
- Image streaming (transplant yourself to another place or time and describe from a first person point of view)
- Lists
- Visualization
- Brainstorming - individually or as a group
- Webbing/mapping/clustering
- Graphic organizers
- Topic or word chart

Step 2: Writing
During this step, allow students to develop a rough draft of their writing. Encourage students to be selective in the ideas they choose to include. Have students focus on developing content and putting their ideas on paper. Do not require students to count words, but have them complete ideas instead.

Step 3: Revising
During this step, have student make decisions about how they want to improve their writing. Have students look at their writing from a different point of view. Encourage students to focus on making their writing clearer, more interesting, more informative, and more convincing. To help students revise their writing product, use the following strategies:

- Divide students into groups of 3 – 5 in varying ability. Distribute student writing samples to all group members. Make sure there are no names on the pieces of writing. Have everyone in each group read one paper and make marks for improvement. Have the reader write positive and corrective comments about each piece for later discussion within the group. Have the reader present the piece of writing to the group and discuss their comments. Have each group member add comments to each piece of writing.
- Have student ask themselves the following questions:
    - Can I read this piece of writing out loud without stumbling?
    - Is the series of events logical? Do they relate?
    - Is it clear what my goal is throughout the piece of writing?
    - Are vivid/descriptive words used to describe characters and/or events?
    - Is my train of thought clear?
    - Do I use a variety of verbs throughout the piece?
    - Is my writing wordy or redundant? Am I using the same words and phrases over and over again?
    - Is there a catch introduction?
    - Are transitional devices used throughout?

The Writing Process, Continued

- Is there a strong hook, main idea or theses, and lead-in?
- Is proper format followed throughout?
- Are all sentences complete?
- Did I use a thesaurus?

Step 4: Editing

Editing is checking spelling, capitalization, punctuation, grammar, sentence structure, subject/verb agreement, consistent verb tense, and word usage. During this step, have students do the following:

- Have students read their own work backwards. Encourage them to read the last sentence, then the second to last sentence, etc. Have students ask themselves:
  - Does each sentence make sense when you read it on its own?
  - Do you see or hear any errors in the sentence?
- Have students use a checklist to peer- or self-edit.

Step 5: Publishing

During this step, have students publish their final document. Students may use a word processing program or a blue or black pen to present their final copy. Give students a set of guidelines before they begin to publish their writing. Have students submit the following when they turn in their writing to ensure that they followed all of the steps in the writing process:

- Prewriting document
- Rough draft
- Edited copy
- Final document

21st Century Skills

	Diesel Services Technology I					Diesel Services Technology II				
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
CS1	X	X				X				
CS2	X	X	X	X	X	X	X	X	X	X
CS3	X	X				X				
CS4	X	X	X	X	X	X	X	X	X	X
CS5	X	X	X	X	X	X	X	X	X	X
CS6	X	X	X	X	X	X	X	X	X	X

Written Report Assessment Rubric

	Exemplary **4 points**	Accomplished **3 points**	Developing **2 points**	Beginning **1 point**	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	