

South Dakota Transportation, Distribution & Logistics

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Sioux Falls

Participants:

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Participants introduced themselves stating name, location, and curricular area of expertise.

An introductory video, *Success in the New Economy* written and narrated by Kevin Fleming and produced by Bryan Y. Marsh, was shared. This video (available on the Internet at <https://vimeo.com/67277269>), describes a fallacy in the traditional “college for all” model of education and encourages individuals to select career paths based on interests and skills. Discussion suggested wages support the premise that good jobs can come from 2-year preparation and that all counselors need this information to make students aware of all options available to them. It was noted that the Southeast Tech auto body program has a 100% placement rate, but that students need to be aware that they will start at the bottom with good wage progression opportunities. Internship or mentorship experiences are helpful.

It was noted that the purpose of the work was to develop South Dakota’s state standards for transportation, distribution & logistics to ensure that they:

- Are aligned with industry needs
- Prepare students to be successful in employment and in postsecondary training
- Establish a sequence of courses leading to completion of a program of study.

It was clarified that standards describe “what” is to be learned, not “how” it is to be learned.

Information was provided regarding the importance of the federal Carl D. Perkins Career and Technical Education Act to the work and an update on progress toward reauthorization of the Act, last authorized by Congress in 2006. Participants were reminded that Perkins has had strong bipartisan support in Congress and may be up for reauthorization this year.

The role of the standards committee was clarified to show that the standards committee members were selected because they were subject matter experts who would:

- Take the suggestions of industry
- Utilize personal expertise about how students best learn, and

- Write a standards draft.

It was further clarified that the work of the committee will go through industry validation and multiple public hearings before consideration for adoption by the State Board of Education.

It was noted that much of the early work of the standards review committee will be to identify programs of study. A program of study was defined as:

- A nonduplicative sequence of both academic and technical courses
- Beginning no later than grade 11 and continuing for at least two years beyond high school
- Culminating in a degree, diploma or certification recognized as valuable by business/industry partners.

A program of study was viewed as the bridge connecting preparatory and advanced work in high school with further study at the postsecondary level through a collegiate program or advanced training through work.

A summary of a recent labor market analysis for South Dakota was presented, with separate slides shown identifying the 20 largest industry clusters, the fastest growing industry clusters by percentage growth and increase in employment demand, and the occupations with a projected demand of 50 or more.

Participants were asked to identify industry trends by describing what was new in the industry and what is no longer done in the industry. It was intended that this information would guide discussion about where new standards were needed and where existing standards could be deleted. For transportation, distribution & logistics the discussion suggested:

New

- Self-driving cars
- Drones
- Bluetooth and wireless – wire is disappearing
- GPS
- Higher mileage vehicles – people are driving them longer
- Emission standards, especially diesel
- Electric cars
- OBD (On-Board-Diagnostics) III
- Crash avoidance
- Hydrogen fuel cell cars
- More use of aluminum
- Amazon – distribution networks
- Recreational vehicles moving to fuel injection

Emerging

- 1-wire CAN Bus (controller area network)
- Wireless technology
- Pre- and post-scan for collision (comparable to Health Insurance Portability and Accountability Act (HIPAA))
- Carbon fiber
- Water-based paints (EPA)

- 3D printing of parts (reduce inventory)
- Technician shortage
- Robotics (e.g. paint mixing)
- Scan tools

No longer done

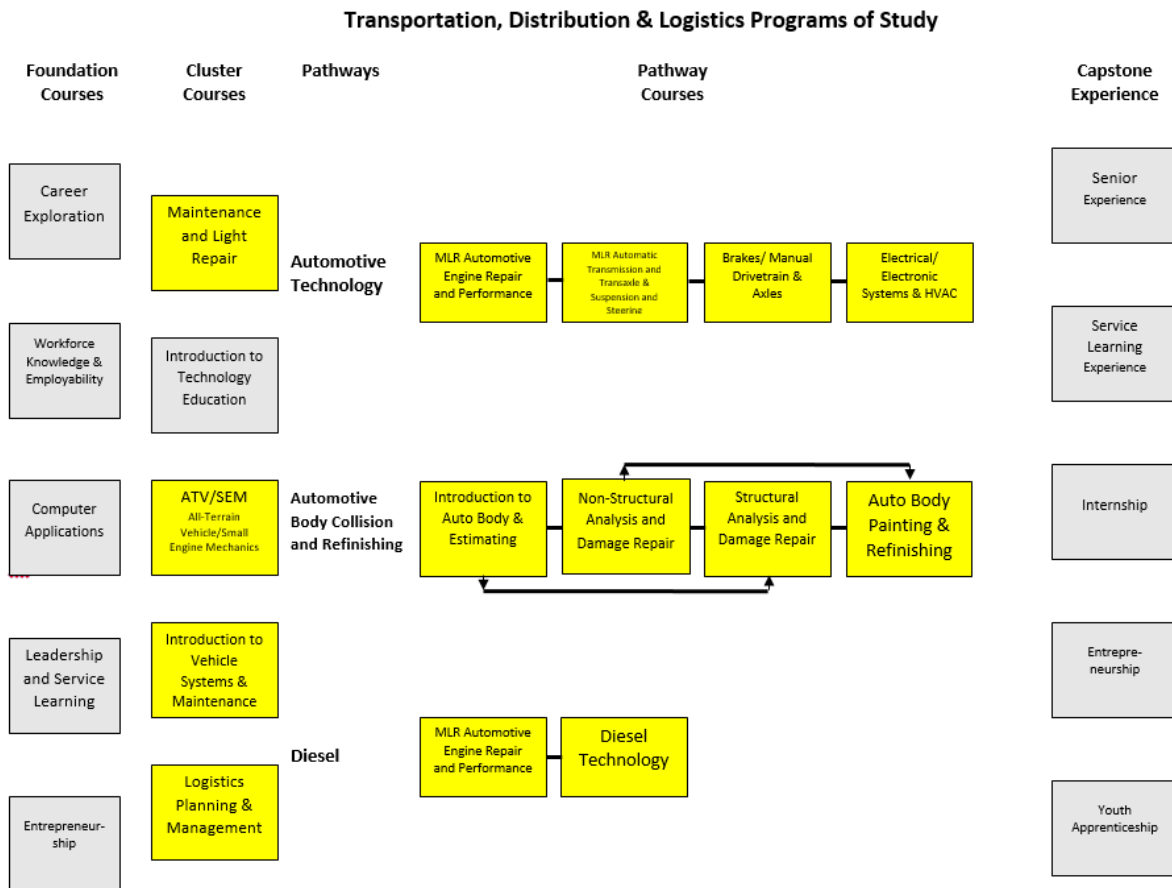
- Engine overhaul
- Tune-ups
- Component repair (now just replacement)
 - Carburetors
 - Starters

Results of a recent survey of employers were shared. The survey was designed to ascertain if employers were having hiring difficulties, if applicants were deficient in either soft or technical skills, and options for a state response. One hundred eighty seven survey responses were included in the results with the largest participation from hospitality and tourism (38), architecture and construction (25), manufacturing (20), agriculture, food and natural resources (19), business management (14), finance (12) and marketing (12). In general:

- Four out of five employers noted having hiring difficulties in the previous 12 months.
- Primary reasons for this hiring difficulty were:
 - Low number of applicants (126)
 - Lack of work experience (88)
 - Lack of technical or occupational skills (62)
 - Lack of soft skills (48)
 - Unwillingness to accept offered wages or work conditions (38)
- Occupational areas noting the greatest hiring difficulties were hospitality (37), manufacturing (20) and marketing (20) though these results are skewed by the response rate from the individual sector.
- The most highly noted soft skills lacking were:
 - Initiative (118)
 - Attendance/dependability (114)
 - Communications (99)
 - Customer service (88)
 - Problem solving (78)
- Similarly, employers noted the highest needs for additional training in:
 - Attendance/timeliness/work ethic (75%)
 - Customer service (61%)
 - Problem-solving (52%)
 - Teamwork (41%)
- Forty four percent of employers noted that applicants lacked technical skills.
- Employers asked that the state response focus on:
 - Communications (10)
 - Work ethic (9)

The current state program of study in transportation, distribution & logistics showed twelve current cluster or pathway courses. Participants were asked to chart out a new program of study incorporating

course titles for which standards would be developed. The process involved placing course titles on post-it notes on the wall with an open process to organize or change course titles as the group deemed appropriate, recognizing that some courses which would appropriately fall into the program of study may have been reviewed with standards developed by other groups. The resulting structure is shown in the chart that follows and includes five foundation courses, five cluster courses (one for which standards already exist), pathway courses in three separate pathways (automotive technology, automotive body collision and refinishing, and diesel), and four capstone experience options (expanded to five options with work in June 2017). The structure gives students latitude to move from cluster courses to any of the three pathways. Pathway course options are generally associated with one pathway and are sequential except that the structural and non-structural courses in auto body and collision may be taken in either order.



Members were also asked to look at their Program of Study to make certain that students would be ready to make the transition from middle school to high school and from high school to the postsecondary level. To do so, participants were asked what they would want students to know and be able to do upon entry into programs at the postsecondary level, not as hard prerequisites, but general expectations for students to be ready to participate fully and effectively; and what they would want students to know and be able to do upon entry into secondary programs, reflecting upon whether those expectations were included in the courses available at the middle level or in the foundational courses. For transportation, distribution & logistics, the following skills were identified:

Middle School to High School

- Be on time/attendance
- Fractions/decimals
- Metric measurement
- Safety
 - Personal protection
 - Lab environment
- Cleanliness
- Understanding of the career field

High School to Postsecondary Program

- Wearing appropriate apparel
- Attendance
- Communications
- Technology
- Professional presentation (appearance)
- Cleanliness
- Terminology
- Basic Math

Participants were encouraged to identify a “big picture” concept statement describing what was to be accomplished within each course before developing standards. This “big picture” statement would eventually be revised to be an executive summary statement at the time that the standards had been drafted.

Information was provided about what makes good standards. Criteria were shared with the participants. These criteria included:

- Essential – does it define knowledge and skills that an individual must have to participate fully and effectively in programs that prepare them to enter careers with livable salaries, and to engage in career advancement in growing, sustainable industries?
- Rigorous – does it ask a student to demonstrate deep conceptual understanding through the application of knowledge and skills to new situations?
- Clear and specific – does it convey a level of performance without being overly prescriptive? Is it written in a way that the general public would understand?
- Teachable and Learnable – does it provide guidance to the development of curricula and instructional materials? Is it reasonable in scope?
- Measurable – Can it be determined by observation or other means that the student has gained the knowledge and skills to be demonstrated to show attainment of the standard?
- Coherent – Does it fit within the progression of learning that is expected for the program of study?
- Sequential – Does it reinforce prior learning without being unnecessarily repetitive? Does it provide knowledge and skills that will be useful as the student continues through the program of study?
- Benchmarked – Can the standard be benchmarked against industry or international standards? Does it prepare the student to be successful in the regional, state and global economies?

State agency staff met in May of 2015 to review the processes to be used for standards review. During that session the staff identified other criteria to be considered when writing standards:

- Connections to postsecondary programs
- Relevant across the content area
- Compatible with virtual learning
- Reflects business/industry input
- Adaptable to change over time
- Allows for instructional creativity
- Appropriate for the target audience
- Aligned with relevant academic content
- Applicable to student organizations
- Recognizes unique features of CTE

These additional criteria were shared with participants for their consideration during standards development, and an exercise was conducted in which participants individually, and then as a group, reviewed four sample standards.

Brief mention was made of resources available in the Dropbox in which members shared information. The Dropbox review showed categories of information provided in the general section and noted that a Working Drafts folder would be created in which participants would store their work.

A Standards Template was shared with the participants and reviewed:

- The course title was inserted at the top.
- A grid of administrative information was completed to the extent the information was known. This grid included:
 - The Career Cluster [Transportation, Distribution & Logistics]
 - The Course Code [to be added by state staff if not known]
 - Any prerequisites or recommended prior coursework
 - Credits [generally established by the individual school district]
 - Graduation requirement [generally established by the individual school district]
 - Program of study and sequence [a listing of the components of the program of study]
 - Student organization options
 - Coordinating work-based learning appropriate for the course
 - Industry certifications [if appropriate for the course]
 - Dual-credit or dual enrollment options if available
 - Teacher certification requirements [to be completed by state staff]
 - Resources
- Course description. Eventually this will be an executive summary describing the course, but in the process participants were encouraged to develop a “big picture” statement about the course to serve as a reminder when developing standards.
- Program of study application: a more detailed description of the elements within the program of study and where the particular course fits within a sequence.
- Course Standards and prods
 - “Prods” is a list of topics to keep in mind when developing standards to see that related topics are included. The prods identified by state staff include:
 - Safety
 - Soft skills

- Reinforcing academic concepts in math, language arts, science and social studies
- Addressing all aspects of the industry
- Trends [so that students are thinking of the direction that an industry is moving]
- Indicators – the main topics written in terms of a demonstration of knowledge and skills
- Sub-indicators – statements identifying in more detail how the indicator will be demonstrated
- Integrated content – A space that allows for examples, explanation, reference to credentials, alignment with other academic standards or other useful information to bring clarity to the understanding about the intent of the sub-indicator
- Notes – a place for additional information to clarify the intent and expectations of the indicator.

Particular information was shared about Webb’s Depth of Knowledge Levels which would be assigned at the sub-indicator level.

An example standards template was shared to ensure understanding.

Working teams were then established to write the standards. Each team selected a course to begin the work. Early drafts were reviewed by all participants to gauge consistency. The consultants reviewed all draft standards each evening and participants were led with guiding questions so that they could refine their own work. Eventually, when standards had been developed for all courses, the participants did a final group review of all standards to give their approval. Final documents were then reviewed by the consultants for format and structure, and saved to the shared Dropbox. Participants were given two weeks to make any final comments or suggestions, at which time the Dropbox was put into a “read-only” status.

For transportation, distribution & logistics the following cluster and pathway course standards were developed:

Cluster Courses

Maintenance and Light Repair (MLR)

Students will demonstrate safety practices for automotive repair.

- Identify and demonstrate general shop safety rules and procedures using Occupational Safety and Health Administration (OSHA) standards

Students will demonstrate an understanding of the safe and appropriate use of tools and equipment.

- Utilize safe procedures for handling of tools and equipment

Students will locate needed information.

- Identify sources of service information
- Identify proper vehicle identification information

Students will prepare vehicles for service.

- Prepare vehicle for service

Students will prepare vehicle for customer.

- Ensure vehicle is prepared to return to the customer per school/company policy

Students will perform basic vehicle service.

- Perform basic vehicle service

Students will inspect and repair engine.

- Test and perform actions necessary to repair engine

Students will service an automatic transmission.

- Service transmission system

Students will inspect, diagnose and repair manual drive train and axles.

- Diagnose and repair manual drive train and axles

Students will repair suspension and steering.

- Diagnose suspension and steering; determine necessary action
- Inspect and repair tire and wheel assembly

Students will inspect, diagnose and repair brake assembly.

- Diagnose and repair brake fluid system
- Inspect and repair brake shoes and drum assemblies
- Inspect and repair caliper assembly
- Inspect and repair rotor assembly
- Inspect and repair vacuum supply
- Inspect and repair brake indicator light components

Students will inspect, test and repair electrical/electronic systems.

- Diagnose electrical circuit problems
- Inspect and repair battery problems
- Diagnose and repair starter
- Diagnose and repair charging system

Students will inspect, diagnose and repair heating and air conditioning.

- Identify and visually inspect A/C system components

Students will inspect, diagnose and improve engine performance.

- Perform the necessary tests and repairs to improve engine performance

Students explore career opportunities in the transportation, distribution and logistics career cluster and develop leadership skills.

- Research career opportunities in the transportation, distribution and logistics fields

ATV/SEM (All-Terrain Vehicle/Small Engine Mechanics)

Students will demonstrate shop and tool safety.

- Examine basic shop safety using Occupational Safety and Health Administration (OSHA) standards
- Demonstrate proper use of hand and power tools
- Summarize the proper use of Safety Data Sheets (SDS)
- Create safety portfolio

Students will demonstrate independent and teamwork skills as well as explore career opportunities within the industry.

- Practice in leadership activities
- Utilize guidance software to research and report on career opportunities
- Develop a teamwork project

Students will properly prepare customer documentation.

- Complete work order form
- Prepare customer bill/receipt

Students will apply communication, mathematics and science knowledge and skills to ATV/SEM.

- Examine how physics concepts apply to small engine technology
- Explore the application of fundamental laws of hydraulics
- Perform mathematical calculations and measurements commonly used in small engines
- Communicate findings as related to mathematics and science

Students will troubleshoot a small engine.

- Implement strategic diagnostic procedures
- Conduct preventative maintenance on a small engine

Students will properly test, diagnose, service, and repair charging and electrical systems related to small engines.

- Illustrate the application of Ohm's law to charging and electrical systems related to small engines
- Interpret schematics, diagrams, and reference information used in small engine electrical systems
- Use strategy-based diagnostics for determining the cause of a fault in an electrical circuit

Students will properly test, diagnose, service and repair fuel delivery systems as related to small engine technology.

- Analyze the functions and operations of a fuel system related to small engine technology
- Diagnose fuel system problem
- Perform fuel system service

Students will properly test, diagnose, service and repair emission systems related to small engine technology.

- Analyze the function and operation of emission systems related to small engines
- Diagnose emission systems relating to small engine technology
- Perform emission system service on small engine

Introduction to Vehicle Systems & Maintenance

Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements, for an automotive repair facility.

- Demonstrate automotive technician safety practices
- Understand the way in which waste gasses, emission, and other environmentally destructive substances are generated and their effects on the environment

Students explore career opportunities in the transportation, distribution and logistics career cluster and develop leadership skills.

- Demonstrate independent and teamwork skills
- Explore career opportunities within the industry

Students will demonstrate an understanding of the safe and appropriate use of tools, equipment and work processes.

- Understand and use the appropriate tools and equipment
- Diagnose and analyze components and systems
- Select and demonstrate proper use of measuring devices and mathematical formulas
- Use and understand standard and metric units of measurements
- Use measurement devices to diagnose and repair vehicles and components following industry standards
- Demonstrate access and proper usage of Technical Service Bulletins (TSB) and service manuals
- Comprehend the importance of calibration processes, systems, techniques using various measuring and testing devices

Students understand scientific principles in relation to chemical, mechanical, and physical functions of various power plants and vehicle systems.

- Demonstrate knowledge of the operation of the internal combustion engine
- Demonstrate a basic understanding of the operating principles of heating and air conditioning systems
- Compare alternate fuel and power sources

Students perform and document maintenance procedures according to manufacturers' specifications.

- Demonstrate the procedures and practices for manufacturer's repair and maintenance schedules
- Demonstrate the use of service information to repair a vehicle
- Demonstrate proper procedures for work order, customer information, and billing information completion

Students will understand and apply appropriate business practices.

- Demonstrate the importance of, and the procedures for, maintaining accurate records
- Understand the concept and application of ethical business practices
- Understand the concept and application of acceptable customer relations practices

Students will understand and apply appropriate vehicle service and repairs.

- Perform general engine diagnosis and repair in professional manner within National Automotive Technicians Education Foundation (NATEF) standards
- Demonstrate ability to maintain and service lubrication and cooling systems
- Understand the basic operation of computer controlled systems, and location and identification of related parts

Students understand the function, principles and operation of electrical systems using manufacturers' and industry standards.

- Demonstrate an understanding of how to diagnose and repair electrical systems
- Diagnose and service batteries

- Demonstrate knowledge needed to diagnose and repair starting and charging systems
- Demonstrate ability to properly diagnose and repair lighting systems
- Demonstrate ability to properly diagnose and repair heating and air conditioning systems

Students understand the function and principles of automotive brake, steering and suspension, automatic and manual transmission systems.

- Demonstrate how to diagnose and service hydraulic and friction systems
- Demonstrate how to diagnose and service steering and suspension systems
- Demonstrate how to diagnose and service automatic and manual transmissions

Logistics Planning & Management

Students will recognize occupational safety guidelines.

- Demonstrate safety practices as identified in Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements

Students will analyze and categorize logistics and transportation operations.

- Research the four subdivisions of logistics in light of organizational management practices
- Synthesize information from textbook, print and online industry sources
- Describe tradeoffs that occur between transportation and inventory costs
- Demonstrate the ability to calculate and explain to others the purchase cost, ordering cost, and holding cost for a given material or product within the supply chain
- Perform inventory calculations to minimize costs as would a logistics manager for a given company

Students will learn warehousing practices used in logistics and management.

- Compare and contrast the warehousing requirements for a variety of different products
- Describe various warehouse layouts and equipment used to move materials in each
- List categories of aisle spacing and describe the advantages and disadvantages of each
- Demonstrate the ability to complete and interpret warehouse documents including, but not limited to, packing slips, bills of lading, advance shipment notices, distribution sheets, pick lists, invoices, special orders, and inventory forms
- Differentiate between bulk and rack storage, and indicate situations when each is employed

Students will learn regulations associated with logistics and management.

- List international, national, state, and local agencies and organizations that regulate some part of the supply chain and the role played by each. Indicate over what areas each agency has jurisdiction
- Analyze the impact of international trade agreements on logistics decisions
- Research International Commercial Terms (INCOTERMS®) developed by the International Chamber of Commerce

Students will learn problem solving trends associated with logistics and management.

- Solve given problems related to transportation of goods and warehousing by evaluating data and presenting solutions or recommending appropriate decisions
- Plan for the storage, movement, and delivery of a specific good or service from one location to another

Students will learn trends associated with logistics and management.

- Analyze case studies of the logistics operations of various retail companies to see how they plan for and adjust their operations to remain competitive
- Using websites and journals from professional organizations related to transportation, distribution and logistics, identify trends that are impacting local, regional, national, and international supply chains

Automotive Technology pathway

MLR Automotive Engine Repair and Performance

Students will demonstrate automotive technology safety practices as identified in Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.

- Demonstrate automotive technology safety practices

Students will demonstrate proper tool selection and usage.

- Demonstrate proper tool selection and usage

Students will prepare the vehicle for service.

- Perform preparatory procedures for vehicle service

Students will perform engine repair.

- Perform engine maintenance operations
- Understand component operation and perform maintenance on cylinder head and valve train
- Test, inspect and perform maintenance on the lubrication and cooling system

Students will test, diagnose, and repair engine performance issues.

- Perform engine diagnostics and analyze retrieved data
- Test the computerized controls and analyze retrieved data
- Perform maintenance on the fuel, air induction, and exhaust systems
- Perform maintenance operations on emissions control system

MLR Automatic Transmission/Transaxle & Suspension/Steering

Students will demonstrate automotive technology safety practices as identified in Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.

- Demonstrate automotive technology safety practices

Students will demonstrate proper tool selection and usage.

- Demonstrate proper tool selection and usage

Students will perform diagnostics and repair on the vehicle's automatic transmission and transaxle.

- Inspect and identify drivetrain components
- Perform maintenance on vehicle automatic transmission and transaxle while on the vehicle
- Analyze the vehicle's automatic transmission and transaxle while off the vehicle

Students will perform maintenance on vehicle suspension and steering systems.

- Analyze and evaluate the suspension and steering system components
- Inspect and assess the suspension and steering system

- Inspect and measure vehicle wheel alignment
- Inspect, identify, and repair wheels and tires

Brakes/Manual Drivetrain & Axles

Students will demonstrate automotive technology safety practices including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.

- Demonstrate automotive technician safety practices

Students will demonstrate knowledge of brake system theory and procedure.

- Analyze and diagnose automotive brake hydraulic and friction systems

Students will demonstrate knowledge and procedure of the hydraulic brake system.

- Analyze and draw conclusions concerning malfunctions of brake hydraulic systems
- Apply repair skills to correct malfunctions of brake hydraulic systems

Students will demonstrate knowledge of theory and repair procedures for drum brake systems.

- Assess and evaluate operation of drum brake systems
- Repair drum brake systems

Students will demonstrate knowledge of theory and repair procedures for disc brake systems.

- Assess and evaluate operation of disc brake systems
- Repair disc brake systems

Students will demonstrate knowledge of theory and repair procedures for power assist units.

- Analyze power-assist units

Students will demonstrate knowledge of theory and repair procedures for related systems – wheel bearings, parking brakes, electrical.

- Diagnose related systems (i.e., wheel bearings, parking brakes, electrical)
- Repair related systems

Students will demonstrate knowledge of theory and repair procedures for related systems – antilock brake systems (ABS), traction control systems (TCS), electronic stability control (ESC).

- Diagnose electronic brake control systems: ABS, TCS and ESC systems

Students will demonstrate knowledge of theory and repair procedures for manual drive train and axles.

- Identify manual transmission information
- Perform general maintenance procedures

Students will perform maintenance procedures for hydraulic clutches.

- Check clutch hydraulic system

Students will define the operation of electronic manual transmission/transaxle.

- Inspect, diagnose and repair drive shaft, half shafts, universal joints and constant-velocity (CV) joints

Students will inspect, diagnose and perform repair procedures for the differential assembly.

- Perform maintenance on differential case assembly

Electrical/Electronic Systems & HVAC

Students will demonstrate automotive technology safety practices including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements for an automotive repair facility.

- Demonstrate automotive technician safety practices

Students will perform maintenance, diagnostic and repair procedures of electrical/electronic systems.

- Demonstrate knowledge of the vehicle electrical system
- Test and repair electrical problems

Students will perform maintenance, diagnostic and repair procedures of the battery systems.

- Identify battery requirements
- Service battery

Students will perform maintenance, diagnostic and repair procedures of starting systems.

- Explain starting system operation
- Inspect and repair starting system

Students will perform maintenance, diagnostic and repair procedures of the charging system.

- Remove, inspect and replace charging system components

Students will identify and perform repair procedures of electrical systems.

- Identify and inspect lighting, instrument cluster, driver information, and body electrical systems and verify operation
- Perform the following repair operations:
 - Aim headlights
 - Disable and enable supplemental restraint system (SRS) and verify indicator lamp operation
 - Remove and reinstall door panel

Students will research and identify heating, ventilation and air conditioning components.

- Obtain vehicle service information on heating and air conditioning components

Students will perform repair procedures for the refrigeration system.

- Inspect and repair refrigeration system components

Students will perform repair procedures for the heating and cooling system.

- Analyze heating and engine cooling system problem

Students will perform inspection and identification procedures for the heating, ventilation and air conditioning HVAC system.

- Inspect and identify operating systems and related controls

Automotive Body Collision and Refinishing pathway

Introduction to Auto Body and Estimating

Students will demonstrate understanding of auto body safety practices and careers.

- Demonstrate auto body safety practices
- Analyze career opportunities in the transportation, distribution & logistics career cluster

Demonstrate uses of auto body tools and equipment

- Demonstrate hand and power tools and their uses
- Analyze uses of a compressed air system

Employ collision repair estimating processes.

- Demonstrate the process involved in obtaining important information
- Demonstrate the process of writing a repair estimate

Apply auto body repair and finishing techniques.

- Demonstrate basic auto body repair techniques
- Demonstrate processes in automotive finishing

Non-Structural Analysis and Damage Repair

Students will demonstrate understanding of auto body safety precautions.

- Demonstrate auto body technology safety practices

Students will learn and demonstrate preparation for nonstructural repair

- Analyze and demonstrate processes involved in preparation for nonstructural inspection and repair

Students will learn and demonstrate procedures for outer body panel repairs, replacements and adjustments.

- Demonstrate the processes involved in outer body panel repairs, replacements and adjustments

Students will perform metal finishing and body filling.

- Understand and demonstrate the processes involved in metal finishing and body filling

Students will demonstrate service procedures for moveable glass and hardware

- Understand and demonstrate proper repair procedures for moveable glass and hardware

Students will demonstrate plastic repair.

- Understand and demonstrate repair processes and use of adhesives involved in plastic repair

Structural Analysis and Damage Repair

Students will demonstrate auto body technology safety practices.

- Demonstrate auto body technology safety practices.

Students will inspect and repair frames.

- Measure and analyze structural damage
- Make necessary repairs to the frame

Students will inspect, measure and repair unibody and unitized structures.

- Analyze and determine unibody and unitized structural damage
- Repair unibody and unitized structures

Students will inspect and repair or replace stationary glass.

- Inspect vehicles for glass damage and determine manufacturer's specifications for glass window replacement

Students will demonstrate proficiency in welding, cutting and joining.

- Analyze and identify correct welding procedures to be used in auto body repair work
- Perform proper welding operations to specific auto body repairs

Auto Body Painting & Refinishing

Auto body students understand painting and refinishing safety precautions.

- Demonstrate auto body painting and refinishing safety practices

Students will understand surface preparation procedures.

- Analyze areas for surface preparation
- Prepare automotive surface to be refinished

Students will understand spray gun and related equipment operation.

- Inspect, prepare and demonstrate usage of spray gun and related equipment

Students will understand and perform paint mixing, matching, and applying automotive refinishing materials.

- Understand the process for mixing and matching automotive paint
- Correctly apply automotive paint to prepared surfaces

Students will identify causes and correction procedures for paint defects.

- Identify paint defects, understand the causes, and correct paint defects

Students will understand and perform detailing of paint refinishing.

- Perform final vehicle inspection

Diesel pathway

MLR Automotive Engine Repair and Performance

[see Automotive Technology pathway]

Diesel Technology

Students will adhere to health and safety standards in the workplace, including systems and procedures.

- Apply skills and knowledge of health and safety practices and expectations to ensure a safe working environment for the individual and co-workers (fellow students)

Students will learn and understand basic electricity and electronics principles.

- Understand and implement basic electricity and electronic principles that apply to diesel powered equipment, including starting, charging, lighting and accessories
- Perform basic electrical repair techniques

Students will demonstrate their understanding of basic aspects of diesel engines.

- Understand the technical and nontechnical aspects of diesel engines

Students will apply principles of basic hydraulic systems.

- Research and inspect basic mobile hydraulics

Students will demonstrate how basic braking systems operate.

- Identify and understand basic vehicle braking systems, including hydraulic and air brake systems

Students will apply principles of fuel systems on diesel engines.

- Differentiate between, and identify components of, fuel delivery systems

A cover letter has been drafted to guide business/industry feedback to the standards developed through this process. The thirteen standards documents will be reformatted with three columns for business/industry feedback at the sub-indicator level utilizing a 1 (low) to 5 (high) scale:

- Is the sub-indicator essential?
- Is the sub-indicator clear and specific?
- Is the sub-indicator measurable?

Business/industry partners are also asked if the standards reflect the preparation necessary for a student to enter her/his particular occupational field. A sample of the reformatted document follows.

Career Cluster: Transportation, Distribution & Logistics

Course: MLR Automotive Engine Repair and Performance

EPER 5. Students will test, diagnose, and repair engine performance issues.

			Essential 1 (low) – 5 (high)	Clear and Specific 1 (low) – 5 (high)	Measurable 1 (low) – 5 (high)
Webb level	Sub-indicator	Integrated Content			
Level 3: Strategic Thinking	EPER 5.1. Perform engine diagnostics and analyze retrieved data. Examples: <ul style="list-style-type: none"> • Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins. P-1 • Perform engine absolute manifold pressure tests (vacuum/boost); document results. P-2 • Perform cylinder power balance test; document results. P-2 • Perform cylinder cranking and running compression tests; document results. P-2 • Perform cylinder leakage test; document results. P-2 • Verify engine operating temperature. P-1 • Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-1 	<ul style="list-style-type: none"> • NATEF tasks that apply to sub-indicators 			
Level 3: Strategic Thinking	EPER 5.2. Test the computerized controls and analyze retrieved data. Examples: <ul style="list-style-type: none"> • Retrieve and record diagnostic trouble codes (DTC), On-board Diagnostic (OBD) monitor status, and freeze frame data; clear codes when applicable. P-1 • Describe the use of the OBD monitors for repair verification. P-1 	<ul style="list-style-type: none"> • NATEF tasks that apply to sub-indicators 			
Level 2: Skill/Concept	EPER 5.3. Perform maintenance on the fuel, air induction, and exhaust systems Examples: <ul style="list-style-type: none"> • Replace fuel filter(s) where applicable. P-2 	<ul style="list-style-type: none"> • NATEF tasks that apply to sub-indicators 			

Following business/industry review, state staff will revise the standards documents as necessary to incorporate business/industry suggestions. The revised documents will be shared with participants in the standards development process and, eventually, with teachers of transportation, distribution & logistics courses throughout the state for their feedback. Final documents will be taken through public hearings and delivered to the State Board of Education for adoption.