

TRUMBULL PUBLIC SCHOOLS TRUMBULL, CONNECTICUT

TRUMBULL HIGH SCHOOL

Basic Automotive 2011

CURRICULUM WRITING TEAM

Matthew Iaccarino
Esther Bobowick

Technology Education Teacher
Curriculum Writing Specialist

Debra Owen - Department Chair

Director of Curriculum: Linda S. Paslov, Ed.D.

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The Trumbull Board of Education, as a matter of policy, prohibits discrimination on the grounds of age, creed, religion, sex, race, color, handicap, political affiliation, marital status, sexual orientation or national origin.

INTRODUCTION

This course will provide students with a basic knowledge of how an automobile operates. The various systems of the auto will be covered with classroom discussions and manipulate the actual components. This is an excellent course for all students who want to know more about a car.

Through hands-on learning experiences students will explore several systems of the automobile including engine components, drive trains suspension, braking systems and more. Special emphasis will be placed on hands-on learning activities where students disassemble and assemble the components of an automobile while replacing parts when needed.

The standards written in this curriculum are based on what the students should be able to accomplish after completion of the Basic Automotive course. Since Connecticut does not have state curriculum standards for automotive technology, references were taken from the National Automotive Technicians Education Foundation (NATEF) along with Automotive Technology Skills Standards from Nevada State Department of Education (www.doe.nv.gov)

- The **Performance Standards** for each unit describe what major areas of knowledge the students will be studying. The Performance Standards listed go hand in hand with the NATEF Skills Standards.
- In each unit there is an **Essential Question** that provides an inquiry based approach to learning in the unit.
- This is followed by a series of **Focus Questions** that define more specifically what students will be learning.
- Each unit has a **Scope and Sequence** of content representing vocabulary, skills, concepts and other key information.
- Sample **Modifications** are provided in each unit to assist the teacher with strategies for making the content accessible to all students.
- Each unit has a description of the types of **Assessments** that are appropriate for the content to be mastered.
- This is followed by suggested **Resources** and the **Time Allocation** for the number of lessons allotted for each unit

PHILOSOPHY

Studies show that students understand and retain knowledge when they experience or apply it to relevant situations. It is important that we provide all students with an education that will help them succeed in the workplace and in life.

Citizens of the 21st Century will need to possess a variety of diverse skills. It is vital that students enter the global economy with the ability to apply what they learned in school to a variety of ever-changing situations that they could not foresee before graduating. This course will help students acclimate into the real world and to prepare them for further education, as well as high skill, and high demand professions. As long as there are cars on the road there will have to be mechanics to fix them, so there's a very strong sense of job security.

MISSION STATEMENT

Trumbull High School educates students in a safe, inviting, student-centered community. We encourage academic achievement, extracurricular participation, enthusiasm and self-confidence to foster independence and personal and social growth. We teach skills for lifelong learning. We hold our school community to the ethical conduct and social awareness to live and participate in a democratic, diverse and global society.

GOALS

Upon completion of this course, students will:

- Identify the different safety equipment in the room and their uses
- Use hand tools and power equipment safely and in the correct manner
- Understand the past, present, and future states of the automotive industry
- Identify and troubleshoot the components of basic automotive systems
- Compare and contrast the differences in brake systems and identify the different components and their functions
- Identify the basic components of a 4 cycle engine and demonstrate the proper sequence
- Identify how laws in science are evident in or apply to the automotive electrical systems
- Identify the major components of steering mechanisms and how they work together with the suspension to give a car the smooth ride
- Identify components of a drive train, and demonstrate how the differential system operates

Basic Automotive Course Outline:

Unit 1– Safety – 5- 8 lessons

Unit 2 – Use of tools –and basic automotive equipment in the room – 12 lessons

Unit 3– Past Present and Future – 5 lessons

Unit 4– Basic automotive systems- 4 lessons

Unit 5– Braking systems – 8 lessons

Unit 6– Engine fundamentals - 10 lessons

Unit 7– Basics of the Electrical systems - 9-10 lessons

Unit 8– Suspension and Steering systems – 8 -10 lessons

Unit 9– Drivability – transmissions, clutch and differentials etc -10 lessons

– 3 extra days

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– 3 extra days

UNIT ONE

Shop Safety

PERFORMANCE STANDARDS:

- Students will identify the different safety equipment around the room and their uses

ESSENTIAL QUESTION:

- Why is it important that everyone understands and follows the safety procedures in and around the shop?

FOCUS QUESTIONS (Student Objectives)

Following completion of this unit, students will be able to answer the following questions:

- What is OSHA?
- What are the four types of fires?
- Where is the power emergency stop?
- Where are the fire extinguishers/fire blankets in the room?
- Where is the fire escape route?
- What is the MSDS sheet and where is it located?
- What are the different types of Personal Protective Equipment (PPE)?
- Where is the location of the emergency eyewash station?
- Is the classroom environment designed safely?
- Where is the location of the flammable material cabinet?

CONTENT (Scope and Sequence)

- 1.) OSHA/MSDS Sheet
 - Purpose of OSHA
 - Regulations
 - OSHA Regulators
 - Classroom designed for safety
 - Emergency power stops
- 2.) Fire Safety
 - A Class Fire
 - B Class Fire
 - C Class Fire
 - D Class Fire
 - Fire Blanket
 - Fire Escape Route
- 3.) Personal Protective Equipment
 - Emergency Eye Wash
 - Safety Glasses
 - Rubber gloves/shop aprons
 - Appropriate clothing

MODIFICATIONS

Provide unit material at varied reading levels using multiple resources

Provide unit material in varied languages using translation software

ASSESSMENTS

Written assessment covering key points on shop safety

Students will work in pairs to demonstrate an assigned safety expectation

Resources:

Automotive Excellence Volume 1, Glencoe, 2004.

Automotive Excellence Volume 2, Glencoe, Academic Applications Workbook

Automotive Encyclopedia, Goodheart Wilcox, 1995.

Internet Resources: www.howstuffworks.com, etc.

Shop Safety Video with questions

Time Allocation: 5-8 lessons

UNIT TWO

Use of Tools

PERFORMANCE STANDARDS:

- Students will demonstrate the safe and correct use of tools and equipment around the automotive laboratory.

ESSENTIAL QUESTIONS:

- Why are there SAE and Metric specific sized tools?
- What is the correct method to safely handle and use tools appropriately?

FOCUS QUESTIONS (Student Objectives):

Following completion of this unit, students will be able to answer the following questions:

- What are the different types of hammers?
- What is the difference between open end, box and tubing wrenches?
- What are the different types of sockets?
- What is the procedure to follow for using vehicle handling tools?
- What is a torque wrench and how does it work?

CONTENT (Scope and Sequence):

1. Hammers
 - Ball Peen
 - Rubber Mallet
 - Dead Blow
 - Claw
2. Wrenches
 - Open End
 - Box End
 - Combination
 - Tubing
 - Adjustable
 - Torque
3. Sockets
 - American SAE vs. Metric
 - Traditional
 - Impact
 - Ratchets and extensions (1/4", 3/8", 1/2")
4. Hydraulic Lift (purpose, types)
 - Safety
 - Floor jack
 - Jack Stands

UNIT THREE

Past, Present, Future

PERFORMANCE STANDARDS:

- Students will explain how the automotive industry has evolved over the years

ESSENTIAL QUESTIONS:

- How has the car industry made changes and progressed over the years?
- What are the external factors that will influence the car designs and systems we can expect to see in the future?

FOCUS QUESTIONS (Student Objectives):

Following completion of this unit, students will be able to answer the following questions:

- When was the start of the car industry in America?
- What is an assembly line?
- What are three popular car models in today's society and what are they like?
- What is a hybrid, how does it work?
- What is the future of the car industry looking like?

CONTENT (Scope and Sequence):

1. First car build year
2. Henry Ford
Assembly Line
Date of origin
3. Toyota
Honda
Ford
Chevrolet
4. Full Hybrid
Mild Hybrid
Plug In Hybrids
5. Battery Power
Hybrid Power
Environmental Friendly
Flying Vehicles?

MODIFICATIONS

Provide unit material at varied reading levels using multiple resources

Provide unit material in varied languages using translation software

ASSESSMENTS

- Students group presentations of the particular section of automobile history.
- When one group is in the front of the room presenting, his/her classmates will each individually give feedback according to a certain criteria on the project rubric. This feedback will be given back to the presenting group members at the conclusion of the presentation. Those presenters will meet, and reflect on the feedback, determining what improvements could be changed if they were to do it again. All students will be required to submit an individual reflection, stating their own personal point of view about what they would do differently.

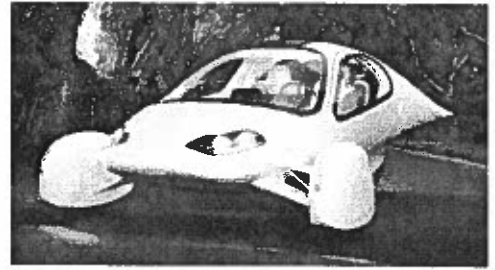
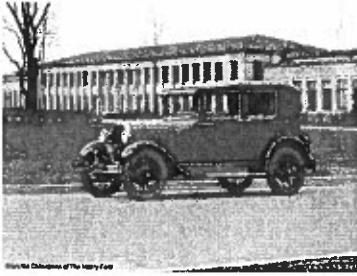
Resources: Internet Resources

Magazine articles

DVD/Video tapes with question sheets

Time Allocation: 5 lessons

Past, Present, Future Project



For this project you will be working in small groups that I will assign. There will be an individual portion of this project along with a group presentation. The group portion of the project should be a PowerPoint presentation roughly 5-10 minutes long explaining about your generation of automobile. In your groups you will be assigned to research either Automobile Technology from the Past, Present Technology we see in our lives today, or Future Technology we can expect to see and share it with the class.

ESSENTIAL QUESTIONS:

- How has the car industry made changes and progressed over the years?
- What are the external factors that will influence the car designs and systems we can expect to see in the future?

The following is what should be included:

Individual Portion-

This will be a typed one page brief summary of your generation of automobile and what you learned. You can also include what you liked about the activity, what you didn't like, what you feel you deserve for an individual grade and why.

Group Portion-

Your 5-10 minute presentation should include a visual showing what some of the different types of vehicles from that time look like. There should also be a description to help explain some of the characteristics for cars of that time. You can include such things as, how the cars are powered, assembly process, cost, safety systems, efficiency, and other rival car manufacturers of the time.

(See next page for rubric)

Past, Present, Future Rubric

CATEGORY	4	3	2	1
Display	Presentation is colorful, organized and informative to aid in the explanation of the topic	Presentation is lacking one of aspects of being organized, colorful, and informative	Presentation is lacking two or more aspects of organization, and informative	Entire presentation lacks organization and structure
Focus on Topic (Content)	There is one clear well focused topic. Main idea stands out and is supported by detailed information	Main idea is clear but the supporting information is general	Main idea is somewhat clear but there is a need for more supporting information	The main idea is not clear. Information is randomly presented.
Sentence Structure (Sentence Fluency)	All sentences are well constructed with varied structure	Most sentences are well constructed	Some sentences are well constructed	Sentences appear incomplete or rambling
Grammar, Spelling, Punctuation	Writer makes no errors in grammar, spelling or punctuation that distracts reader from the content	Writer makes 1-2 errors in grammar, spelling or punctuation	Writer makes 3-4 errors in grammar, spelling or punctuation	Writer makes more than 4 errors in grammar, spelling or punctuation

UNIT FOUR

Basic Automotive Systems

PERFORMANCE STANDARDS

- Students will demonstrate and explain the major automotive components and how they work together as a system.

ESSENTIAL QUESTIONS:

- What are the relationships among the components that allow the system to function as a whole?

FOCUS QUESTIONS (Student Objectives):

Following completion of this unit, students will be able to answer the following questions:

- How does the power from the motor get transferred to turn the wheels on your car?
- What different kinds of suspensions are there to absorb the shock of daily driving?
- What path does gasoline follow to get from your gas tank to exploding in the engine?
- How tire technology progressed to its present state in the Auto industry?

CONTENT (Scope and Sequence)

1. Transmission
Axles
CV Joint
2. Strut
Coil Spring
Leaf Spring
3. Fuel Pump
Fuel Line
Fuel Filter
Fuel Injectors
Carburetor
4. Tier maintenance and Safety
Snow Tires
Tire Size
Radial Tire
Bias Ply Tire

MODIFICATIONS

Provide unit material at varied reading levels using multiple resources

Provide unit material in varied languages using translation software

ASSESSMENTS

- Written quiz of the main automotive systems
- Visual system identification on a car

Resources:

Under and Around Your Car. Video with questions.

Automotive Excellence Volume 1, Glencoe, 2004.

Automotive Excellence Volume 2, Glencoe, Academic Applications Workbook

Automotive Encyclopedia, Goodheart Wilcox, 1995.

Internet Sources: www.howstuffworks.com, etc

Time Allocation: 4 lessons

UNIT FIVE

Braking Systems

PERFORMANCE STANDARDS

- Students will demonstrate how to inspect, diagnose, and service different brake systems

ESSENTIAL QUESTION:

- Why are there different types of braking systems for automobiles?

FOCUS QUESTIONS (Student Objectives):

Following completion of this unit, students will be able to answer the following questions:

- What types of maintenance should be performed on brake systems?
- What is the function of the master cylinder?
- Explain how to bleed a brake system
- What are the steps one would follow to install new brake components?
- What do you look for when doing a visual brake check?
- What is friction?

CONTENT (Scope and Sequence):

1. Brake Pads
Brake Shoes
Brake Rotor
Brake Drum
2. Master Cylinder
Pushrod
Brake Fluid
3. Need A Second Person
Remove Air From Lines
Pump Brake Pedal
Brake Bleeder
4. Inspect Pads
Inspect Rotors
Drum Brake Inspection Plate
5. Friction
Noise, Vibration, Energy Transfer

MODIFICATIONS

Provide unit material at varied reading levels using multiple resources

Provide unit material in varied languages using translation software

ASSESSMENTS

- Written quiz regarding the different brake systems
- Hands on removal and reinstallation of a disc brake system

Resources:

Master Cylinder, Video

How to change the rear brake shoes on your car, Video with questions

Automotive Excellence Volume 1, Glencoe, 2004.

Automotive Excellence Volume 2, Glencoe, Academic Applications Workbook

Automotive Encyclopedia, Goodheart Wilcox, 1995.

Internet Resources: www.howstuffworks.com, etc

Time Allocation: 8 lessons

UNIT SIX

Engine Fundamentals

PERFORMANCE STANDARDS

- Students will be able to name, describe, disassemble and reassemble a typical combustion engine

ESSENTIAL QUESTIONS:

- What is the difference between a 2 cycle and 4 cycle engine?
- How do the engine components work together as a system?

FOCUS QUESTIONS (Student Objectives):

Following completion of this unit, students will be able to answer the following questions:

- What are the 4 strokes of a 4 cycle engine?
- What is the function of each piston stroke?
- How do the intake and exhaust valves work?
- When is engine maintenance performed?
- What are the basic components of a 4 cycle engine?

CONTENT (Scope and Sequence)

1. Intake
Compression
Power
Exhaust
2. Intake Fresh Air/Fuel Mixture
Compress Air/Fuel
Ignition
Exhaust Burnt Gases
3. Camshaft Lobes
Rocker
Pushrod
Valve Springs
4. Suggested Manufacturers Oil Change Time Interval
Every 3000, 6000 Miles
5. Engine Block
Crankshaft
Connecting Rods
Pistons
Intake/Exhaust Valves
Valve Springs
Cylinder Head
Valve Cover

MODIFICATIONS

Provide unit material at varied reading levels using multiple resources

Provide unit material in varied languages using translation software

ASSESSMENTS

- Quiz on Cylinder Heads, Valves, Combustion Chamber
- Quiz on Oil Pan, Crankshaft, Pistons
- Participation grade during engine disassembly/reassembly

Resources:

Automotive Excellence Volume 1, Glencoe, 2004.

Automotive Excellence Volume 2, Glencoe, Academic Applications Workbook

Automotive Encyclopedia, Goodheart Wilcox, 1995.

Internet resources: www.howstuffworks.com, etc.

How To Build a 600 Horsepower Gasoline Engine, Video with questions

Time Allocation: 12 lessons

UNIT SEVEN

Basics of the Electrical System

PERFORMANCE STANDARDS

- Students will diagram the sequence of electronic components to complete the automobile circuit.

ESSENTIAL QUESTION:

- How does the electrical system function to make a car stay running?

FOCUS QUESTION (Student Objectives):

Following completion of this unit, students will be able to answer the following question:

- What is Ohm's Law?
- What is the purpose of a battery, how is it constructed and how does it operate?
- How is electricity generated, stored, distributed and used in an automobiles electrical system?
- How does the engine starter fit into the circuit?
- How is a wiring diagram used when diagnosing electrical problems?

CONTENT (Scope and Sequence)

1. Ohm's Triangle
 $I=V/R$
2. 12 Volt, 6 Volt System
Battery Acid
Battery Charger
Battery Cells
3. Generator
Alternator
12 Volts
6 Volts
Voltage Regulator
Stator

MODIFICATIONS

Provide unit material at varied reading levels using multiple resources

Provide unit material in varied languages using translation software

ASSESSMENTS

- Chapter Questions from *Automotive Excellence* textbook
- Quiz on material covered in the text

Resources:

Automotive Excellence Volume 1, Glencoe, 2004.

Automotive Excellence Volume 2, Glencoe, Academic Applications Workbook

Automotive Encyclopedia, Goodheart Wilcox, 1995.

Internet Resources: www.howstuffworks.com, etc

Batteries, Video with questions

Time Allocation: 8 classes

UNIT EIGHT

Suspension and Steering Components

PERFORMANCE STANDARDS

- Students will demonstrate the interdependence between the key parts of the steering and suspension systems

ESSENTIAL QUESTION:

- What are the major components of a steering system?
- What are the different types of suspension systems?

FOCUS QUESTION (Student Objectives):

Following completion of this unit, students will be able to answer the following question:

- What are the different front suspension designs?
- What are the different rear suspension designs?
- How does caster, camber, and toe affect steering?
- How does a rack and pinion steering setup work?

CONTENT (Scope and Sequence)

1. Strut
Coil Spring
A Arm
Ball Joint
2. Leaf Spring
Coil Spring
Sway Bar
3. Caster
Positive Camber
Negative Camber
Toe In
Toe Out
4. Steering Shaft
Pinion
Rack
Tie Rod
Power Steering

MODIFICATIONS

Provide unit material at varied reading levels using multiple resources

Provide unit material in varied languages using translation software

ASSESSMENTS

- Suspension Component Identification Quiz
- Participation during activities/lecture

Resources:

Automotive Excellence Volume 1, Glencoe, 2004.

Automotive Excellence Volume 2, Glencoe, Academic Applications Workbook

Automotive Encyclopedia, Goodheart Wilcox, 1995.

Internet Resources: www.howstuffworks.com, etc.

Time Allocation: 8-10 lessons

UNIT NINE

Drivability- Transmissions, Clutch and Differentials

PERFORMANCE STANDARDS

- Students will diagram the specific components of an automobile drivetrain including transmissions, driveshafts, differentials and more.

ESSENTIAL QUESTION:

- How does a transmission make your vehicle move?

FOCUS QUESTION (Student Objectives):

Following completion of this unit, students will be able to answer the following question:

- What types of maintenance should be performed on a drive train?
- How does an automatic transmission work?
- How does a manual transmission work?
- What other components are needed along with a transmission to make your vehicle move?

CONTENT (Scope and Sequence)

1. Fluid Check
Check for leaks
Replacement of fluid/gaskets
2. Torque Converter
Input Shaft
Automatic Transmission Fluid
3. Clutch
Manual Gears
Hydraulic Clutch Reservoir

MODIFICATIONS

Provide unit material at varied reading levels using multiple resources

Provide unit material in varied languages using translation software

ASSESSMENTS

- Participation
- Differential Note-taking Sheet
- Differential Culminating Quiz

Resources:

Automotive Excellence Volume 1, Glencoe, 2004.

Automotive Excellence Volume 2, Glencoe, Academic Applications Workbook

Automotive Encyclopedia, Goodheart Wilcox, 1995.

Internet Resources: www.howstuffworks.com, etc

U Joint/Differential, Short Video

Time Allocation: 8 lessons

UNIT TEN
Extra

COURSE CREDIT

One half credit in Technology Education

One class period daily for half a school year

PREREQUISITES

There are no prerequisites for this course.

COURSE DESCRIPTION

Basic Automotive

This is a one-semester, half-credit course. This course is designed to provide students with an introduction to automobile systems.

ATTENDANCE: You are expected to come to class on time ready to work with all materials required for that day. This includes notebook or folder and pen. **You are responsible to get any and all notes that you missed the day of an absence.** Please keep in mind that I will report cuts to your parent(s) and house principal.

ASSIGNMENTS/TESTS: Graded assignments/quizzes/participation will make up the majority of your marking period grade. Tests/quizzes will always be announced several days prior to the date they will be given. Project grades will count as test grades. Each project grade will be based on your ability to follow directions and apply the concepts we have discussed and practiced in class according to the project rubric. Points will be deducted on assignments/projects turned in late. If you cut class, you will **not** be allowed to make up the assignment/project or test/quiz that you missed on that day. You will receive a **FAILING GRADE** for that assignment/project or test/quiz. Any student caught cheating (any form) will immediately receive a **FAILING GRADE** and not be allowed to make up the assignment/test/quiz.

EFFORT: Since there will be limited amount of homework in this class you are expected to **use every minute in class** to complete your assignments. Every assignment should be completed to the best of your ability and should reflect pride in your work. Each project includes points for in-class on-task time. An effort grade will be a percentage of your marking period grade.

PARTICIPATION: Your daily participation is extremely important. You are expected to ask and answer questions as well as work cooperatively with a partner or a group when asked to. A participation grade will be a percentage of your marking period grade.

GRADING PHILOSOPHY: Throughout the class students have opportunities to show what they learned during the demonstration process. These formative assessments assist the teacher for planning instruction. Ultimately there will be summative assessments to give numerical grades that depict a level of mastery or understanding of the skills and content in this course. This summative assessment includes:

- Classwork/homework
- 50%** -Unit Quizzes
- Two performance based projects
- 50%** -Participation/demonstration

Course Title: _____

Name: _____

Student Reflection Rubric

After each unit students can mark which column best describes their current comfort with mastery of the concepts and skills in the Unit.

	Got It!	I have questions	Clueless	What will I do about it?
Safety				
Tools				
Automotive Systems				
Braking Systems				
Engine Fundamentals				
Electrical System				
Suspension & Steering				
Drivability				

APPENDIX A

NEASC Rubric 6

Demonstrate Responsibility for Self

Exemplary

Student demonstrates an independent, industrious work ethic. He/She sets goals and completes them with detail and on time. The student consistently prepares for classes daily. The student works exceptionally well cooperatively with peers and the staff. He/She participates and contributes in a co-curricular capacity within the total school community.

Proficient

Student demonstrates a positive work ethic. He/She sets goals and completes them within a reasonable amount of time. The student is frequently prepared for daily classes. Student works adequately both cooperatively and independently with peers and staff. He/She participates in co-curricular activities.

Needs Improvement

Student possesses a lackadaisical approach to work. He/She needs constant reminders to follow the goal setting process. When goals are established, they are rarely completed within a reasonable amount of time. Daily class preparation is sporadic. The student can work cooperatively and at times participation in activities with peers and staff. The student explores co-curricular opportunities.

Unacceptable

Student lacks a strong work ethic. No goals are evident. The student is not prepared for classes. He/She prefers to work cooperatively so others can do his/her work. The student selects a co-curricular; however, does not choose to participate actively when presented with the opportunity.

NEASC Rubric 7

Respects themselves and others and practices interpersonal skills

Exemplary

Student demonstrates a high level of cultural understanding and respect for the uniqueness of others, their practices, and perspectives. The student champions discussions to resolve differences through active listening and offers opinions in a positive and rational manner.

Proficient

Student demonstrates an appreciation and respect for cultural understanding of the uniqueness of others, their practices and perspectives. He/She actively discusses avenues to resolve differences when appropriate. The student presents encouraging opinions upon request.

Needs Improvement

Student demonstrates a limited appreciation and respect for the uniqueness of cultural understanding of others, their practices and perspectives. At times, he/she appears indifferent to the ordeals of others. The student supports his/her own opinions, but appears inflexible to resolve differences and remains tied to his/her own beliefs.

Unacceptable

Student demonstrates little or no appreciation and respect for the uniqueness of cultural understanding of others, their practices and perspectives. He/She demonstrates intolerance and lacks social interaction skills.

Teacher Self Reflection Questions after first implementation of this course.

- Is the sequence of the course material within each unit in the most effective order?
- What are the best ways to group the kids?
- When is the best time to talk about vehicle handling equipment?