

MONTANA TEEN DRIVER CURRICULUM GUIDE
Lesson Plan & Teacher Commentary

Module 2.2 – Basic Control and Vehicle Balance

Lesson Objective (from *Essential Knowledge and Skills Topics*):

Topic 6. Performing Basic Maneuvers

1. The student is expected to describe and demonstrate:
 - a. the pre-drive and starting tasks;
 - b. the four (4) steering wheel control techniques and when each is used;
 - c. procedures for entering and leaving the roadway;
 - d. acceleration control;
 - e. controlled, threshold, and trail braking control;
 - f. procedures for left and right precision turns from a stopped and moving position; and
 - g. procedures for backing straight and while turning.

Topic 7. Standard Vehicle Reference Points

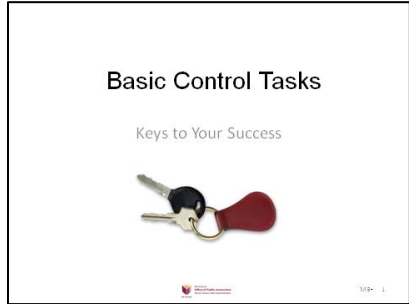
1. The student is expected to identify, describe and demonstrate:
 - a. knowledge of the blind areas to the front, sides, and rear of a vehicle while seated in the driver's seat of a vehicle;
 - b. knowledge of how targeting establishes steering accuracy and helps develop a systematic searching habit;
 - c. a visual reference point that will place the front bumper at a line or curb;
 - d. a visual reference point that will place the right side tires 3-6 inches, 3 feet, and 6 feet from a line or curb;
 - e. a visual reference point that will place the left side tires 3-6 inches from a line or curb;
 - f. a visual reference point for placement of a vehicle in the center of a lane;
 - g. visual reference points for placement of the rear bumper at a line or curb; and
 - h. lane placement and reference points for setup, entry to, and exiting from a turn.

Materials Needed:

1. Module 2.2 PowerPoint Presentation
2. Module 2.2 Fact and Work Sheets (printed out)

Module 2.2 Teacher Commentary

This teacher commentary can be used in conjunction with the PowerPoint presentation for this module. The module slide images are provided to allow you to connect the materials, data, and questions with the presentation.



Slide 1 – Starting [Play video]

Starting the car has changed over the years. The setup (we are assuming that the driver has already prepared to drive having gone over their checklist.

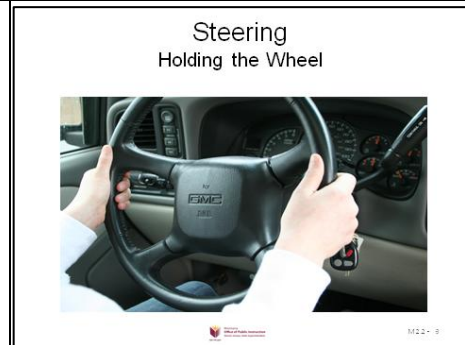
1. Foot on brake and clutch in for a standard transmission.
2. Vehicle in park or neutral for a standard transmission.
3. Twist the key, hold, then release when you hear the engine start.
4. Check gauges and to make sure the warning lights go out.
5. Adjust climate control, defroster, music player and radio before you shift into drive.



Slide 3 - Steering

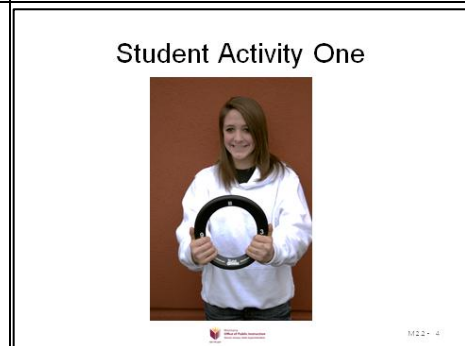
This picture identifies how to hold the wheel. Vehicle makers have designed the wheel so our hands can be comfortably placed on the wheel.

1. Imagine the face of a clock with the hands at 8 and 4 or 9 and 3.
2. Fingers wrapped around the wheel and thumbs on top of the wheel.



Slide 4 – Student Activity One

1. Have students obtain a steering wheel ring or paper plate works just as well.
2. Stand up facing the front of the class room
3. Look to a target you determine.
4. Hold the wheel with the chin above the wheel and away from their chest about 1-1.5 feet.
5. Ask them if when they look to the target if they can still see the steering wheel without looking directly at it.



Keep the wheel handy because we are going to use it in a couple of minutes.

Slides 5 & 6 – 1968 Camaro & 2001 Ford Taurus

These slides show that the cars their parents and grandparents learned to drive on are different than today's cars and therefore require a different steering technique than the one being taught in driver education today.

Plus, they are just really cool cars.



2001 Ford Taurus



Only 2 1/2 revolutions to turn the steering wheel from locked left to locked right positions

This changes the way we turn the steering wheel



Slide 7 – Steering – Push Pull Steering

Push Pull Steering for a right hand turn

1. Push up with left hand while sliding your right hand up to 2 o'clock.
2. Pull down with your right hand.

Steering
Push-Pull/Hand to Hand



Steering
Push-Pull/Hand to Hand



Slide 9 and 10 – Student Activity Two [Play video]

Push pull Steering

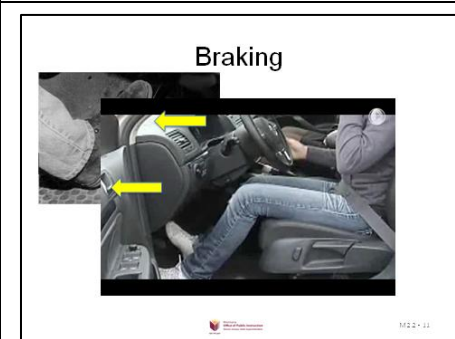
1. Have students stand up with their wheels in their hands at 9 and 3 or 8 and 4.
2. Look to the target.
3. To turn the wheel push up to ten with the left hand while sliding the right hand to 2
4. Pull down with the right hand to 4 while sliding the left hand back to 8.
5. Repeat the process until the wheel has turned about 3 times.
6. Now go the opposite direction.
7. Push the wheel up to 2 with the right hand and slide the left hand up to 10
8. Pull the wheel down with the left hand to 8 while sliding the right hand down to 4
9. Repeat the process until the wheel turns about 3 times.



Slide 11 – Braking [Play video]

Position the foot in front of the brake with the heel on the floor and the ball of the foot in contact with the brake pedal.

To move to the accelerator pivot the foot from the brake to the gas with the heel still on the floor.



Slide 12 – Braking – [Play video]

Cover—move the foot from the accelerator and place it over and just above the pedal

Controlled—Depress the brake pedal with heel still on the floor and pushing down the pedal with the ball of the foot. Car should slow.

Trail—In between controlled braking and cover the brake it is the braking used while going downhill, the last seconds before a stop, and going through a curve that requires the driver to depress the brake pedal slightly.

Threshold—depressing the brake pedal firmly to the point of just before the brakes and wheels lock up and cause a skid.

Braking

- Cover
- Controlled
- Trail
- Threshold
- ABS

Drive Safer America!

"Stomp, Stay, Steer"
Getting the full benefit from anti-lock brakes.

M22-12

ABS—Depressing the brake until the ABS pump engages and keeps the wheels from skidding thus maintaining rolling traction.


Slide 13 – Braking – PEP Activity

1. Proper seating
2. Hands on steering wheel
3. Foot properly positioned over pedal
4. Pivot the foot back and forth the brake pedal and gas pedal
5. Keep heel on floor and pivot the foot.
6. Apply braking pressure for covering the brake
7. Apply braking pressure for controlled braking
8. Apply braking pressure for trail braking
9. Apply braking pressure for threshold braking
10. Apply braking pressure for ABS braking.

Materials needed: Steering wheel, Simulated brake pedal, simulated accelerator

Braking

- PEP Activity



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Denise Juneau, State Superintendent

Slide 14 – Shifting into Gear
Types of gear shift levers.
It is important to know about the different types of levers because cars are changing with each new model year.



Slide 15-16 – Accelerating
Pivot foot from brake to accelerator while keeping the heel on the floor.

Cover the accelerator—foot off the brake and over the accelerator. The idle speed is set to cause the car to move at about 3-5 miles per hour at idle speed.

Light Acceleration—slightly depressing the accelerator to increase speed. (Students have a tendency to push too firmly thus causing the car to jerk ahead.) This needs practice in the classroom.

Progressive acceleration—smoothly increasing the pressure on the pedal to progressively increase the car’s speed. Used to get into traffic or accelerate when a traffic light turns green.



Slide 17 – Target
 Slide 18 – Target Area
 Slide 19 – Targeting Path
 Slide 20 – Three concepts for developing effective seeing habits



Slide 21 – Vehicle Balance
 We know that an object at rest is in balance with the weight of the vehicle distributed equally to all four tires.
 Movement causes the vehicle to become out of balance and any change in steering, acceleration or braking will affect the vehicle balance.
 The driver in most crashes has mismanaged vehicle balance by putting too in much braking, steering or acceleration thus exceeding the capacity of the vehicle and its tires to hold the road. Timely use of vision helps the driver determine what speed and steering choices will work to keep the car in balance and thus on the road.

Vehicle Balance

- Best balance when vehicle is not moving
- Movement creates changes to vehicle balance
- Vehicle balance can be mismanaged

Slide 22 – Vehicle Balance
 As we said before Best balance is when the vehicle is not moving. The cut away tire patches shows that the tire foot print is exactly the same for each of the four tires.. This vehicle’s weight is evenly distributed on all four tires.



Slide 23 – Vehicle Balance
 These are the four tire patches we saw from the previous slide. The car dynamics change as the driver brakes, accelerates, turns, and brakes and turns and the tire patches will change due to the weight transfer to different tires. Consider this, your life depends on those four patches doing their job of keeping the car in contact with the roadway. Changing vehicle balance will cause the tire patches to change size and affect their ability to hold the car on the road.

Vehicle Balance

- Movement, starting, stopping, and turning creates change in vehicle balance

Slide 24 - 27– Pitch Roll Yaw

There are three terms we use when speaking of vehicle balance. Those terms are Pitch, Roll, and Yaw. When a car is sitting still these do not come into play. When the car is in motion however, they play an integral part in what the vehicle does on the roadway.

Student Activity Three

25 These activities are intended to have the student use what they already know about balance and motion.

The first activity is about pitch forward. The students should demonstrate a kind of bow at the waist.

The second activity should show roll to the left on a right turn.

The third activity should show roll to the right for a left hand turn.

26 The students should lean backwards at the waist demonstrating pitch backwards.

The second activity should show the student lean backwards and their rear end should pivot around showing pitch and yaw

27 On the last activity the student should spin around in circles because the car will swap ends in a yawing motion. This true more so with a rear wheel drive vehicle

Student Activity Three**Slide 25**

- Everybody stand up
- Pretend you are in a car moving at 55 mph
- Show what happens to your body when
 - the driver slams on the brakes.
 - the driver makes a sharp right turn.
 - the driver makes a sharp left turn.

Slide 26

- Pretend you are in a car at a stop sign
- Show what happens to your body when
 - the driver stomps on the accelerator.
 - the driver stomps on the accelerator makes a sharp right turn.

Slide 27 Pretend you are in a car at a stop sign on a snowy day

- Show what happens to your body when
 - the driver stomps on the accelerator and turns sharply to the right.

Slide 28 Vehicle Balance Technical Terms: Pitch

Pitch – Vehicle weight is transferred to the rear tires when accelerating.

The opposite is true for a hard acceleration. Thrusting acceleration will cause the weight to transfer to the rear making the tire patches larger in the rear and smaller in the front. If the acceleration is hard enough the tires can actually become small enough to drastically affect steering. You have probably seen drag racing where the wheels actually lift off the road. These are extreme cases but the effect is that the driver loses all steering capabilities.



Vehicle Balance Technical Terms

Pitch – Vehicle weight is transferred to the rear tires when accelerating.

Slide 29 Vehicle Balance Technical Terms: Roll

Roll - Vehicle weight is transferred to the side tires when turning or cornering.

Right Turn causes the energy to move to the side of the car

With a hard right turn the weight is transferred to the outside left tires creating roll. The tire patch size increases on the left of the car because the weight of the car is transferred to the left as we redirect the energy of the car to the right. If the force exceeds the tires ability to hold the road it results in a skid. If the tires grip the road well and the speed is too great the car will literally roll over.



Vehicle Balance Technical Terms

Roll - Vehicle weight is transferred to the side tires when turning or cornering.

Right Turn causes the energy to move to the side of the car

Slide 30 Vehicle Balance Technical Terms: Yaw




Yaw – Traction to tires is lost causing vehicle to spin around its center of gravity or “Yaw” axis.

If you could run a pole through the center of the passenger compartment from the floor to the roof this would be known as the yaw axis. A car can spin around this yaw axis if say during a curve both rear tires lose traction then the energy of the car would cause it to spin on the yaw axis. In the common vernacular it is known as a spin out.

Vehicle Balance Technical Terms

Yaw – Traction to tires is lost causing vehicle to spin around its center of gravity or “Yaw” axis.



<p>Slide 31 – Brake and Steer What happens when you brake hard and steer to the right at the same time? You probably figured it out pretty quickly. The car pitches forward, The weight is transferred from the back to the front. The car also rolls because the weight is transferred to left wheels. Finally if the action is too great the car will yaw and the rear end will skid around in a yaw action.</p>	<p>What Happens When You Brake Hard and Steer to Right at the Same Time?</p>
<p>Slide 32 Vehicle Dynamics Click through this slide and have the students describe what is happening with each tire in terms of weight transfer, traction and tire shape.</p>	
<p>Slide 33 Vehicle Dynamics Notice that left front tire. It has the most vehicle weight on it and thus has the largest tire patch. The right rear tire is the smallest tire patch. This has implications for traction for the car which could lead to a crash or spin out for the driver. This kind of hard braking and steering usually happens because the driver didn't notice the low speed needed for a curve or tried to do an evasive steering and braking maneuver at the same time. Even so, the only way drivers can avoid making such maneuvers is to use the vision to manage vehicle dynamics.</p>	 <p>This diagram shows the tire pattern of the car in the previous slide.</p>
<p>Slide 34 Vehicle Balance [Play video]</p> <p>What happens to the vehicle balance as the driver gets closer to the end of the course?</p> <p>What can the driver do to keep the car more in balance?</p>	<p>What happens to the vehicle balance as the driver gets closer to the end of the course?</p> 

Updated April 24, 2013