Distraction Dodger
Lessons for High School Students

Intelligent Transportation Systems Institute
and the
HumanFIRST Lab
of the
University of Minnesota

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University of Minnesota

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and the HumanFIRST Lab

Driver Distraction Lessons for high school students based on

Distraction Dodger

The University of Minnesota's Intelligent Transportation Systems Institute and the HumanFIRST Lab collaborated with education and game design experts to create the Distraction Dodger educational computer game and this curriculum.

The game can be accessed at: http://www.its.umn.edu/DistractionDodger

The purposes of the game and curriculum are as follows:

1) To help teens and adults understand the importance of concentrating on driving and refraining from engaging in extraneous activities.
   • Users will be able to identify various distractions and their relative impact on driving ability, including kinesthetic, visual and auditory tasks.
   • Users will be introduced to content-related vocabulary such as attention allocation, resource management, information processing and task loading.
   • Users will have the opportunity to explore the scientific method and other concepts through data downloads.
   • Users will understand safety implications (dangers and consequences) associated with distracted driving.
2) To use the human factors of driving to increase interest in cognitive psychology as an area of interest through non-intuitive, open-ended, thought-provoking questions.
   • Users will understand how cognitive psychology applies to driver distraction and other transportation issues.

3) To gain national attention for ITS by providing a unique and valuable tool for teen and adult drivers and those who educate them.

The following audiences have been identified:

Primary audience: Teen drivers or drivers’ education students nationwide, ages 15-17, with a wide range of demographics.

Secondary audience: Driver education teachers and programs; departments of transportation/vehicle safety; university transportation programs throughout the country.

Tertiary audience: Pre-drivers ages 12-15 with a wide range of demographics with the goals of influencing later driving habits and encouraging them to influence parent and older sibling driving habits.

This curriculum includes five lessons which allow students to experience the content in 45-60 minute segments in several possible sequences. Students will be able to complete as few or as many of the lessons as the schedule allows. Lessons 1-4 can each stand alone with minor modifications. Lesson 5 requires that students have the background and vocabulary established in earlier lessons, particularly Lesson 3. This segmented approach is designed to fit well both with the learning style of high school students and the structure of today’s high schools. Completing
the entire curriculum requires approximately two weeks of class time in a high school with a typical 6-period day.

In addition to content related specifically to driver distraction and Distraction Dodger, several math and science concepts are reinforced, allowing the lessons to be used as a tool to teach, assess or enrich standards-based concepts such as graphical analysis, experimental design and using data to represent real-world concepts.

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<th>Activities</th>
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</thead>
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<td>1) Playing Distraction Dodger and reflecting on its distractions. 2) Examining the NHTSA data on distractions and crashes. 3) Other perspectives on specific distractions and their relationship to crashes.</td>
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</tr>
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</table>

Before using the lessons with students, teachers should ensure that the computers to be used include Flash and Java capabilities. Several of the lessons also suggest watching web-based video content from specific, reliable websites. Teachers will need to ensure that such content is accessible at school, and is not impeded by
firewalls, filters or bandwidth limitations. Additionally, Distraction Dodger is most effective when students have sound available on the computer.

Appendix A includes a list of all driving tips included in the game as part of the driving reports. You can use this list to generate your own posters or learning activities focused on the solutions to common distractions.

Appendix B includes more detailed descriptions of some of the less obvious features of the game, particularly the components of the graphs that are part of the driving reports.
Lesson 1: Driver distraction

Students will be able to identify the common types of distractions and understand the importance of avoiding distracted driving.

Standards-related content/skills: Graphical analysis

Typical high school class: Day 1

1) Provide students with 30-40 minutes to play the game. Students should have the opportunity to try it several times. They should begin to understand that the use of distractions during the game will ultimately decrease their performance (income), regardless of any short-term benefits.

2) Provide students with the Lesson 1 handout.

3) Activity 1 (10 minutes): With a partner or in small groups, students reflect on the game:
   a. What distractions were included in the game? How did this vary through the levels?
   b. Which distractions did you use most often? How did this vary through the levels?
   c. Which distractions had the biggest negative impact on performance, and why? How did this vary through the levels?
   d. Did the use of any of the distractions have a positive impact on performance, for either the short-term or long-term? Explain.
   e. What consequences of distracted driving did you discover in the game? How did this vary through the levels?

4) Allow time for whole-group discussion to provide closure for the lesson.
Typical high school class: Day 2

Activity 2 (30-45 minutes): Students will continue working from the Lesson 1 handout.

1) Remind students about the previous day’s activities and discussions. Additional game play may be allowed.

2) Provide students with several minutes to examine the following graph. (NHTSA, Sept. 2010) It is based on information from thousands of police accident reports in 2008 and 2009. The graph is also provided on the Lesson 1 handout and in the accompanying Powerpoint presentation.

3) In groups of 2 or 3, students should answer the following questions that require them to examine and interpret the details of the graph:
   a. In what units are the numbers reported? (answer: percentage of all crashes.)
   b. What drivers or crashes are included in this graph? (answer: The portion of all crashes in the sample. Not the percentage of all crashes in which a distraction was identified. This is a critical distinction.)
   c. Some crashes are attributed to more than one distraction. Based on this graph, what is the minimum and maximum percentages of crashes that could be attributed to one or more of these distractions? (answer: Min: 15.9% if all crashes cited multiple distractions. Max: 31.7% if all crashes cited only one distraction.)

4) Have students prepare answers to the following questions for group discussion:
   a. Does anything surprise you about the information presented? If so, what, and why does it surprise you?
b. Does this graph reflect your observations on the road? Which distractions do you see used most when you or others are driving?
c. What might be some possible explanations for the very low incidence of text messaging described in this graph? List at least three.

5) Discuss the questions as a group.

a. Usually, students will immediately notice the low incidence of text messaging and the low incidence of phone conversations as compared to conversing with a passenger.
b. Students may notice that dialing/hanging up a phone is represented far less than conversing on the phone.
c. Other explanations include the frequency and duration of the distraction task, two factors that are not included in this representation. Conversing with a passenger, for example, is likely the most frequent and longest duration task on the list. Similarly, people spend much more time conversing on the phone than dialing the phone.
d. If students don’t uncover it on their own, point out that this graph does not represent the relative riskiness of these distractions. Point out that additional possibilities exist to examine data by factors such as the total number of miles traveled while engaging in the distraction or the total time traveled while engaging in the distraction. Such analyses would allow for something that would come closer to identifying the relative risk factor.
Typical high school class: Day 3

Activity 3: Other perspectives (20 minutes plus summation)

Other studies reach very different conclusions – and report their data in very different ways. These variations should be embraced as part of the current level of understanding of the issues, the possibilities for future research and careers, and the lack of absolute certainty about the exact impact of any particular distraction. Help students recognize that statistics reflect trends, but do not provide certainty or predictability for any particular driver or situation.

Recognition of that lack of certainty should not detract from an unequivocal message that distracted driving definitely increases the risk of a crash.
1) The following graph is from a study done by Dr. David Strayer of the Department of Psychology at the University of Utah. The study was conducted using a driving simulator. In the simulated situation, the test subject was following a car, which braked suddenly, then resumed speed. The following is the graph of the test subjects’ responses under different conditions. “Baseline” refers to driver response without either alcohol or cell phone (or other distraction) involved. The horizontal axis is the measurement of time, in seconds. The entire report by David Strayer is available here:


2) In small groups, students should answer the following questions based on this graph.

a. Describe in words what the graph says about the responsiveness of someone in the three conditions represented.
b. Approximately five seconds after the data begins, two of the lines join together for the first time. What does this indicate?

c. Why do you suppose that the alcohol and cell phone lines never return to the level of the baseline?

d. Perhaps you've heard that using a cell phone while driving is as bad as driving drunk. Based on the particular study represented by this graph, is that statement true? Justify your answer.

3) Either collect written work, conduct a class discussion, or both to ensure students understand what the graph does and does not say.

4) Another study by the Virginia Tech Transportation Institute (VTTI) used “naturalistic” measures of eye movement in actual vehicles during normal operations. They examined crash data and found the following impact on the risk of a crash for distracted driving vs. non-distracted driving.

<table>
<thead>
<tr>
<th></th>
<th>Cars &amp; light vehicles</th>
<th>Heavy vehicles &amp; trucks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dialing a cell phone</td>
<td>2.8 X</td>
<td>5.9 X</td>
</tr>
<tr>
<td>Talking or listening on a cell phone</td>
<td>1.3 X</td>
<td>1.0 X</td>
</tr>
<tr>
<td>Use of or reach for electronic device</td>
<td>1.4 X</td>
<td>6.7 X</td>
</tr>
<tr>
<td>Text messaging</td>
<td></td>
<td>23.2 X</td>
</tr>
<tr>
<td>Drunk at legal limit</td>
<td>7 X</td>
<td></td>
</tr>
</tbody>
</table>


Discuss the following as a whole class or in small groups. Use the accompanying Powerpoint presentation.

a) How do the results of this study compare to the NHTSA study in activity 1?
b) Do the studies measure the same factors in the same way? What is the same and what is different about the two methods?
c) Do the studies contradict each other, reinforce each other, or both? Explain.

Note the following:

a) This study shows that even just listening or talking on a cell phone increases the risk of a crash by 30 percent.
b) Drunk driving carries over twice as much risk as dialing a cell phone.
c) Text messaging was not measured for cars, but is the largest by far of the risk factors for heavier vehicles and trucks.

5) Use one or more of the following questions to launch a summative discussion or to provide the foundation for a structured debate.

a) How would you describe the relative impact of cell phone usage versus other distractions?
b) To improve highway safety, should we consider banning larger, multi-passenger vehicles or carpooling, since those encourage driver-passenger conversations? Why or why not?
c) Cognitive distraction, simply thinking about something other than driving, is a significant contributor to crashes. What can be done to help people focus their attention on driving?
d) Based on all of these data representations, what can you conclude, if anything, about the impact of different distractions?
e) If distractions such as talking to a passenger have a much stronger correlation to crashes, why is there so much talk about the use of cell phones and driving?
f) Consider the following statement. What does this say about cell phone usage as compared to passenger-driver conversations? How does this statement compare to the first graph presented in this lesson?

“Taken together, the ... studies establish that not all conversations in the vehicle lead to impairments in driving. In particular, because the driver and an adult passenger adjust their conversation based upon the real-time demands of driving, in-vehicle conversations do not increase the odds of an accident. However, if that same conversation is performed over a cell phone, the conversation diverts the driver’s attention from the road and drivers are significantly more likely to be involved in a crash.” (Strayer)

g) Design an experiment that would allow you to gather more evidence about cell phone conversations vs. conversing with a passenger.
Lesson 2 – The extent and impact of distracted driving

Students will understand the prevalence of distracted driving, and its consequences.

Standards-related content/skills: Use of data and statistics from primary sources.

Typical high school class: Day 4

Lesson 2, Activity 1: The Prevalence of Distracted Driving

Throughout this curriculum and while teaching the lessons, the language used should deliberately avoid assuming that the distraction caused the crash. There is significant debate about the correlation and the causality of crashes and engagement in non-driving activities.

A great many studies and resulting statistics are available regarding driving, crashes, injuries and fatalities. Several organizations collect such information, and the National Highway Traffic Safety Administration (NHTSA) conducts and funds many of them. Statistics in this lesson come from the NHTSA unless otherwise noted. Additional statistics can be found at: http://www-fars.nhtsa.dot.gov/Main/index.aspx and http://www-nrd.nhtsa.dot.gov/CATS/

1) Present students with the following statistics (included in the accompanying Powerpoint presentation) and discuss to ensure understanding:
   a. In 2008, nationwide:
      i. Total crashes reported: 6,024,000
      ii. Crashes resulting in injuries: 1.711 million
      iii. Crashes resulting in deaths: 37,435
      iv. Fatality rate by miles: 1.27 deaths for every 100 million vehicle miles traveled
      v. Fatality rate by population: 13 deaths per 100,000 people.
vi. At least one form of driver distraction contributed to crashes resulting in 5,870 fatalities and 515,000 injuries.

vii. About 18 percent of the drivers were involved in at least one non-driving activity, with the majority (about 12%) engaged in conversing either with other passengers or on a cell phone."

2) The 2008 data comes from a nearly two-year study released in July 2009. The summary is of this report is just seven pages long. Provide the students with the report summary and ask them to read it. The document is available here: http://www-nrd.nhtsa.dot.gov/Pubs/811057.pdf. The full report on crashes for 2008, useful for additional background information or for particularly interested students, can be accessed here: www-nrd.nhtsa.dot.gov/Pubs/811059.PDF

3) With this background, students will now explore the NHTSA database with the goal of extrapolating these statistics down to a particular state and perhaps even community. Small groups may each take a different year so that longitudinal charts and graphs can be created by combining the different groups’ work. Alternatively, small groups could each take a neighboring state or county or community so that an entire region can be analyzed. Based on the data on the websites and in the reports referenced, each small group should answer the following questions for their chosen location and data year.

a. How many crashes were reported?
b. How many fatalities were recorded?
c. How many crashes involved injuries?
d. What is the fatality rate by per million miles driven?
e. What is the fatality rate per 100,000 people?
f. Based on specific data available, answer the following questions. If specific data is not available, assume that the proportion of crashes that were preceded by the driver engaging in non-driving activities was the same as the national sample (18%) described above.
i. In how many crashes was the driver engaged in some non-driving activity?

ii. For how many injuries was the driver engaged in some non-driving activity?

iii. For how many fatalities was the driver engaged in some non-driving activity?

4) Typical high school class: Day 5. Students will now use their data to create a more complete picture of how their particular location/year compares to other student groups. Divide students into groups according to the questions above. Each group may be assigned more than one question depending on the class size and group size desired. The groups will need access to the entire class’ data from step 1. If the students studied different locations, each group should create a map that displays all of the classroom data for each particular data point above (a-f). If the students studied different years, then each group should create a longitudinal graph of each particular data point (a-f above).

5) After students complete their graphs/maps, display them in the classroom. Provide an opportunity for students to review the work from all groups. Discuss any trends, absence of trends, or local variations from the national results presented at the beginning of this lesson. Use the following questions as a guide:

   a. If there are noticeable differences across years or regions, what do you think contributes to those differences?
   b. Are there significant differences between your location and the national statistics? If so, what might contribute to those differences?
Lesson 2, Activity 2: The Teen Brain

Typical high school class: Day 6

1) Begin class with this quote from a study by the Virginia Tech Traffic Institute:

“All cell phone use should be banned for newly licensed teen drivers.” (VTTI, 2009).

Ask for student reaction. Do they agree or disagree, and why? Next, share the larger quote:

“All cell phone use should be banned for newly licensed teen drivers. Our research has shown that teens tend to engage in cell phone tasks much more frequently -- and in much more risky situations -- than adults. Thus, our studies indicate that teens are four times more likely to get into a related crash or near-crash event than their adult counterparts.” (VTTI 2009)

Do any of the students change their reaction at all?

2) Present the following statistics from Pew Research:
   a. One in three (34%) texting teens ages 16-17 say they have texted while driving. That translates into 26% of all American teens ages 16-17.
   b. Half (52%) of cell-owning teens ages 16-17 say they have talked on a cell phone while driving. That translates into 43% of all American teens ages 16-17.
   c. 48% of all teens ages 12-17 say they have been in a car when the driver was texting.
   d. 40% say they have been in a car when the driver used a cell phone in a way that put themselves or others in danger. (PIP: Teens and Distracted Driving, November 2009)

3) Do these statistics match with the class' experience? Do a quick show of hands to gauge the experience of your group. Note that if your students are below driving age, only items c and d will be relevant. How closely does your group match the national sample from Pew?
4) Ask students why they think that teens behave in riskier ways. Discuss as a lead-in to a brief study of the teen brain.

5) Using the accompanying Powerpoint presentation, provide students with the introduction to brain development. Note that the following explanation is accurate as far as it goes, but it is simplistic in an effort to avoid excessive technical details.

![Diagram of the brain](http://www.cyh.com)

The frontal lobe, labeled “intelligence and personality” in the diagram above, is responsible for “executive functions,” such as decision making skills, impulse control, complex emotions, and rational thought.

All parts of the brain do not develop at the same time, and development of different sections occurs in waves. Early in life, development starts at the front and moves towards the back with an emphasis on the white matter, the connections between various parts of the brain. Gray matter, the cells responsible for more complex thought, develops in spurts, with a large spurt in infancy and another prior to puberty. That development occurs from back to front.
The gray matter in the frontal lobe does not fully mature until young adulthood, usually around age 25.

So based on both science and common observation, it’s no surprise that for many teens:

• Rational decision-making takes a back seat to social needs.
• Immediate gratification is more important than long-term benefits or consequences.
• Impulsiveness outweighs thoughtfulness.
• Teen brains are growing faster and actively pruning unused and unneeded connections at higher rates than adult brains. That’s one reason teens also need more sleep.

It is a basic matter of brain development that teens are more impulsive, less capable of fully rational decision making and more variable in their personality. That’s how the human brain develops. Of course, hormones add another reason for these stereotypical characteristics.

6) Show students the PBS special, “Inside the Teenage Brain.” It is available online, free, in its entirety. It is divided into segments, and you should use as many segments as time allows. Discuss.
http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/view/

Typical high school class, Day 7

Lesson 2, Activity 3: Victim Impact

This activity encourages a discussion about the impact that car crashes can have on the victim. Questions encourage reflection on any serious car crashes that they, their family, or their peers have experienced. This activity has the potential to elicit strong emotions and painful memories. In addition, the videos are graphic and
blunt. It is critical that the teacher preview the videos and determine their suitability for their particular student audience. If it is known that students recently experienced a related loss, it may be useful to involve the school counseling staff in planning for and facilitating this discussion.

Ensure that the school Internet system will allow video streaming from distraction.gov prior to the lesson.

1) View several of the victim impact statements from the U.S. Department of Transportation’s driver distraction website, http://www.distraction.gov/. Alternatively, many states’ departments of motor vehicles or public safety have locally flavored videos available. There are also a great number of victim impact statements on YouTube. In Minnesota, contact the MN Dept. of Public Safety for their locally produced video (https://dps.mn.gov/).

Discussion questions:

a) Do you know anyone who has been in a serious car crash?

b) If you know, what role, if any, did driver distraction play in that crash?

c) What effect might these victim impact statements have on your own driving?

d) What effect might these victim impact statements have on your activities as a passenger in a vehicle?

2) Students should now be given the opportunity to get creative. Ask them to create a message for their peers that they think will be effective regarding the dangers of distracted driving. This can be in their choice (or the teacher’s choice) of formats. Depending on the subject area in which these lessons are offered, specific formats of artwork, video, audio, and other technology-based messages should be encouraged. Consider a competition, to be judged by
older or younger students, as a way to increase the motivation and to spread the message further within the school.
Lesson 3: The cognitive psychology of driver distraction

Students will understand the cognitive psychology of driver distraction and related terminology.

Students will be able to interpret multiple means of representing data.

The following terminology is used throughout this lesson. Depending on the students in the class, the teacher may wish to present this vocabulary as part of an introduction or it may be used and applied throughout the lesson, allowing students to learn through that application. The terms and their definitions are included in the Powerpoint accompanying these lessons.

**Attention allocation:** Conscious or subconscious choices about where a person directs their attention. Choosing to text while driving is an example of consciously choosing to allocate attention to the device rather than to driving. Responding to an animal running across the road can result in an automatic, subconscious choice to allocate attention to braking.

**Auditory tasks:** Tasks that require listening. Examples from driving include listening to the radio, listening to conversation (including phone), and listening to audio signals such as sirens from emergency vehicles.

**Cognitive psychology:** A branch of the field of psychology that focuses on how people learn, perceive, think, reason and remember.

**Cognitive task:** A task that requires primarily thinking, such as solving a math problem in one’s head or thinking about the contents of a text message.
**Information processing**: The thought process of turning perceptions (input from the senses) into useful information. An example would be seeing a red octagon with white letters, ultimately recognizing that object as a stop sign, determining what would be an appropriate action or response, and then acting accordingly.

**Kinesthetic tasks**: Tasks that require primarily movement or manual dexterity. Examples from driving include shifting gears, using the brake/accelerator, waving to friends, managing the radio and texting.

**Performance decrement**: The amount by which a person's performance on a task decreases due to an excessive task load or other factors.

**Resource management**: Closely related to attention allocation, resource management refers to how a person chooses to distribute their limited resources of attention among the tasks in their task load.

**Task load**: A person’s task load is the combination of all tasks the person is performing at one time. Task loading is the act of requiring a person to engage in an increasing number of tasks.

**Visual tasks**: Tasks that require primarily visual attention. Examples from driving include watching the road, reading road signs, and viewing dashboard gauges, including GPS.

Typical high school class, Day 8

Activity 1 (20 minutes): Driving skills and distractions

1) This activity is intended to be done in pairs or small groups. Students are asked to break down driving into its many components. Although students will not create an exhaustive list, they should strive for a minimum of 20 separate activities involved in driving. For each of the specific skills, students
identify which types of tasks are involved, auditory/vocal, kinesthetic/manual, visual and cognitive. Each driving skill may have more than one task type. The chart below, included on the Lesson 3 handout, may be used. Students list their skill or action in the first column, and simply put an “X” for the appropriate label(s). A few examples are provided as a starting point.

<table>
<thead>
<tr>
<th></th>
<th>Auditory/vocal</th>
<th>Kinesthetic/manual</th>
<th>Visual</th>
<th>Cognitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading road signs</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Using turn signals</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Accelerating</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

2) Next, students review the following list of distractions. Students should categorize them as auditory/vocal, kinesthetic/manual, visual or cognitive. Some distractions may fit into multiple categories. Students label them with all categories that apply.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Auditory/vocal</th>
<th>Kinesthetic/manual</th>
<th>Visual</th>
<th>Cognitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conversing on the phone</td>
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<tr>
<td>Dialing/hanging up phone</td>
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<tr>
<td>Text messaging</td>
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<td></td>
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<tr>
<td>Conversing with passenger</td>
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<td></td>
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<tr>
<td>Focusing on other internal objects</td>
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<td></td>
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<tr>
<td>Looking at movements/actions of other occupants</td>
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<td></td>
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<tr>
<td>Reading maps, directions, newspaper or books</td>
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<tr>
<td>Eating or drinking</td>
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<tr>
<td>Smoking</td>
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<tr>
<td>Retrieving object from floor/seat</td>
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<tr>
<td>Retrieving object from other location</td>
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<td>Activity</td>
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<td>-------------------------------------------------------------------------</td>
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<tr>
<td>Adjusting radio/CD player/MP3 player</td>
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<tr>
<td>Adjusting other vehicle controls</td>
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<tr>
<td>Thinking about a personal problem, such as a family issue or job challenge</td>
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<tr>
<td>Listening to music</td>
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<tr>
<td>Listening to sports</td>
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<tr>
<td>Listening to talk radio about controversial issues</td>
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<tr>
<td>Solving a math problem, such as calculating the distance to your destination or your miles/gallon gas usage.</td>
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<tr>
<td>Applying makeup</td>
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</tr>
<tr>
<td>Shaving</td>
<td></td>
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<td></td>
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<tr>
<td>Waving to a friend</td>
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<td></td>
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<td></td>
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<tr>
<td>Checking voice mail</td>
<td></td>
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</tr>
</tbody>
</table>

3) In groups, ask students to rank the distractions from most distracting (#1) to least distracting (#22) based on the types of distractions, how closely those types are related to driving, and their own experience. Students place the numerical rank in the small column on the left side of the table above. For example, reading books is both visual and cognitive, which is closely related to many driving tasks. It would be reasonable to expect that to have a significant **performance decrement** (the amount that performance decreases because of the distraction), and therefore rank towards the most distracting.

4) Students then compare their rankings to the graph below (the same one from Lesson 1). The list of distractions above and the list that was reported in the graph are, of course, different. By thinking in terms of the four categories of skills and actions (auditory/vocal, kinesthetic/manual, visual, cognitive), and using the vocabulary introduced in these activities, students should answer the following questions individually or as a small group.
a) Does one category of task seem to cause more crashes or distraction than the others?

b) How closely does your group’s ranking and the graph match in terms of which categories of tasks are most problematic?

c) What explanation might there be for any differences?

Lesson 3, Activity 2 (20 minutes): Distraction Dodger’s internal rankings

1) Explain that the creators of Distraction Dodger used research from studies of distracted driving to determine which distractions in the game would result in the greatest **performance decrement**, the amount that performance decreases because of the distraction. In this activity, students will try to get into the heads of the game designers and figure out the performance decrement for the distractions.
### Distraction from the game

<table>
<thead>
<tr>
<th>Distraction from the game</th>
<th>Relative “performance decrement” on 100-point scale – hypothetical. Higher number means higher task load and greater negative impact on performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating food</td>
<td></td>
</tr>
<tr>
<td>Waving to friend</td>
<td></td>
</tr>
<tr>
<td>Listening and managing phone</td>
<td></td>
</tr>
<tr>
<td>Managing the car radio</td>
<td></td>
</tr>
<tr>
<td>Looking at GPS – Visual only</td>
<td></td>
</tr>
<tr>
<td>A fly outside of car</td>
<td></td>
</tr>
<tr>
<td>GPS – Audio and visual</td>
<td></td>
</tr>
<tr>
<td>A fly in car</td>
<td></td>
</tr>
<tr>
<td>Texting</td>
<td></td>
</tr>
<tr>
<td>Car radio – listening to music</td>
<td></td>
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<tr>
<td>Car radio – listening to sports</td>
<td></td>
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<tr>
<td>Voice mail - listening</td>
<td></td>
</tr>
<tr>
<td>GPS – Audio only</td>
<td></td>
</tr>
<tr>
<td>Phone conversation</td>
<td></td>
</tr>
</tbody>
</table>

2) **Have students play Distraction Dodger again with a focus on just how severely each distraction impacts their performance as shown in the graph in the driving report available at the end of each level. On a scale from 0 – 100, students should rank the performance decrement of each distraction in the game. The chart above, provided in the Lesson 3 handout, will be helpful.**

3) **Close the activity by showing students the list below. One of the four columns is the data that was actually supplied to the developers of Distraction Dodger. Which column was it, and what makes the students think so? How closely do their numbers match the real numbers? Discuss.**
Typical high school class: Day 8

Lesson 3, Activity 3 (40 minutes)

1) Show students the graph below, also in the Powerpoint. This graph is another representation of the impact of various distractions. In this case, drivers were on a track and were asked to notice changes in a center high-mounted stoplight (CHMSL). The graph shows the percent of such changes that the driver didn’t notice (“not detected”) when the driver was using the distraction indicated. Discuss the graph to ensure students understand it.
2) In small or large groups, discuss the following questions:
   a. How does this fit with – or contradict – the earlier graph from NHTSA?
   b. How does it fit with – or contradict – your experience from Distraction Dodger?
   c. What explanation might there be for differences between the NHTSA graph and this one?

3) Provide students with the following background information using the accompanying Powerpoint presentation.
This diagram summarizes the concepts underlying the previous activities, although it leaves off the auditory/vocal task category that the lessons have used.

The three circles represent three different hypothetical multitasking situations. The smallest inner circle is a low-demand task that requires little manual, visual or cognitive resource allocation. The middle circle represents a task that has a medium amount of all three types of resources, and the outer circle represents tasks that demand high levels of cognitive, manual and visual resources.

The circular shape can be used to indicate equal amounts of visual, cognitive and manual demand. Tasks can be described using three points, identifying low, medium and high demand for the three types of tasks.

Additional factors that are not represented in the diagram are the duration of the distraction activity and its frequency. These two easily understood ideas can be summed up as follows:
1. The longer a driver engages with a distraction, the more likely a crash is to occur.
2. The more frequently a driver engages with a distraction, the more likely a crash is to occur.

The first statement explains why ongoing activities such as conversations with a passenger, cell phone conversations and reading can be risky. They can go on steadily for a substantial amount of time.

The second statement explains why drivers who frequently engage in even brief tasks increase their risk of a crash.

To include the auditory/vocal type of task that we included in the earlier activities, a modified diagram can be used:

4) Have students graph each of the distractions in Activity 1 of this lesson based on their rankings and their own experience. Because this is a more complicated representation of similar content, some variation and modification should be allowed from the original conclusions. For example, a task earlier labeled as just visual and cognitive can now also be recognized as
having a small manual component, even if that component was not included on the chart in Activity 1. The Lesson 3 handout includes some diagrams suitable for this activity. Students may need multiple copies of the page with these diagrams.

A completed plot has four points, connected by lines. The following is one possible plot for texting.

5) Discuss the different ways in which the same data may be represented. What are the advantages and disadvantages of each method? Which method do the students prefer?
Lesson 4: Physics

Students will understand the impact of distractions on reaction time.

Standards-related content/skills: the physics of motion

The study of traffic, transportation, and driver distraction is an interdisciplinary study involving psychology, mathematics, engineering and physics, among other subjects. This lesson looks at some of the basic physics of motion of reaction time and how reaction time is impacted by a distraction.

Typical high school class: Day 9

Lesson 4, activity 1 (40 minutes). For this activity, students should have the following materials: Ruler (w/centimeters) or meterstick. Calculator.

1) Distribute the handout for Lesson 4. In pairs, students test each other’s reaction time using a ruler. One partner holds the ruler vertically while the other holds thumb and forefinger at the bottom (0 marker) of the ruler. The holder lets go of the ruler without warning. Upon release, the catcher pinches ruler. Note the distance the ruler falls. Do at least three trials per person. The catcher may find it helpful to rest their arm on a desk so that they don’t move from the starting point. The holder should merely drop the ruler – not propel it downward.

2) Students should convert the measurements to meters. Using a basic motion equation that students may have learned in physical science or physics class, students should calculate their reaction time for each trial:

\[ d = \frac{1}{2} a t^2 \]
The distance something falls, starting from rest, is equal to half of the acceleration due to gravity multiplied by the square of the time it falls.

For our purposes, we want to know how much time it took for the ruler to fall before the person reacted. A simple rearrangement of the equation results in:

\[
  t = \sqrt{2d/a}
\]

Remind students that the acceleration due to gravity is \(a = 9.8 \text{ m/s}^2\)

Using the information above and the measurements from the ruler, students calculate and record their reaction time for each trial.

3) Students then perform the experiment a second time, but this time, the person catching must read Abraham Lincoln’s Gettysburg Address, copied below. The catcher can hold the paper close to the ruler if they wish:

Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battle-field of that war. We have come to dedicate a portion of that field, as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

But, in a larger sense, we can not dedicate -- we can not consecrate -- we can not hallow -- this ground. The brave men, living and dead, who struggled here, have consecrated it, far above our poor power to add or detract. The world will little note, nor long remember what we say here, but it can never forget what they did here. It is for us the living, rather, to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us -- that
from these honored dead we take increased devotion to that cause for which they gave the
last full measure of devotion -- that we here highly resolve that these dead shall not have
died in vain -- that this nation, under God, shall have a new birth of freedom -- and that
government of the people, by the people, for the people, shall not perish from the earth.

Somewhere in the middle of the reading, the holder should drop the ruler.
Each pair should do at least three trials per person, varying the place in the
reading at which the ruler is dropped.

Students then calculate and record their reaction time for each trial using the
same method as before.

4) The handout instructs students to create a column graph of their reaction
time without the distraction and with the distraction. Students answer the
following questions:
   a. Was there a difference between your two reaction time calculations?
      If not, to what do you attribute that? If so, to what do you attribute
      that?
   b. In most cases, there will be a difference. Do you think this difference
      appeared because of cognitive or visual attention allocation to the
      distraction, or a combination of both?
   c. Look back at Lesson 1, Activity 3. That graph is repeated below. The
      teacher may wish to display it again from the Powerpoint
      presentation. Where on the graph do you see reaction time included?
      Explain.
5) Ask students to design and conduct a simple experiment that would allow them to more carefully determine whether the difference in reaction time was due to visual or cognitive distraction. Easy possibilities might include:

a. Varying the distance between the Gettysburg Address and the ruler, requiring different degrees of visual distraction.

b. Varying the reading activity to require different degrees of cognitive engagement. For example, students could use a nursery rhyme, the Gettysburg Address, and a random, unfamiliar paragraph from Shakespeare.

c. Varying the type of distraction. Instead of reading, a student could be required to do mental math problems, toss & catch a ball, or even engage in a more realistic driver distraction such as talking on the cell phone, talking with a friend, or eating a snack.

Have students record their hypothesis, procedure, results, and conclusion.
Typical high school class: Day 10

Lesson 4, activity 2 (20 minutes). Allow students some time to play Distraction Dodger again, with special attention to the distractions and how they impact performance. In small groups, have at two people in each group play the game and then download the data. Each person should play through several levels of the game and try using a variety of distractions. When sufficient data has been generated, export the data for review. In a whole-class or small group discussion, answer the following questions:

a. What kinds of distractions had the biggest impact for each person?
b. Did everyone have similar experiences regarding which distractions had the most impact?
c. Were the tasks that combined various modes (e.g. visual, kinesthetic) more problematic than others?
d. How did the results of the game experience compare to your earlier experiments?
Lesson 5: Possible technical solutions

Students will understand the potential for technological solutions to driver distraction.

Standards-related content/skills: Research skills

Typical high school class: Day 10+

1) Provide students with the following background.

   a. Education, including educational games such as Distraction Dodger, are one partial solution to the problem of distracted driving. Additionally, many groups are working on technological solutions.
   b. The effectiveness of technological solutions can be assessed by analyzing crash data both in simulators and naturalistic studies.
   c. Technological solutions to driver distraction serve one or both of two main purposes: crash avoidance and injury/fatality reduction.

2) Introduce students briefly to one or more of the following technologies.

   a. Adaptive cruise control
      
      http://www.jdpower.com/autos/articles/Adaptive-Cruise-Control/
      
   b. Automatic emergency braking (AEB) systems
      
      http://www.trw.com/sub_system/automatic_emergency_braking
      (includes video)
      
   c. Seat belt pretensioners and active control retractors (ACR)
      
      
   d. Heads-up Display (HUD) projected gauges
      
      http://www.gizmag.com/wego-hud-navigator/15347/
      http://www.wired.com/autopia/2010/03/gm-next-gen-heads-up-display/
4) Students may work individually, in pairs or in small groups. Each should pick one of these technologies or another one that they may be interested in. Other possibilities include active headrests, lane departure warnings, and electronic stability control, among others. Students are to conduct their own research to answer the following questions:

1) Which of the following types of distractions, if any is the technology designed to reduce or eliminate? There may be more than one answer, or the technology may not address any of these.

a. Auditory/vocal
b. Kinesthetic/manual
c. Visual
d. Cognitive

2) Is the technology designed to reduce the number of crashes, reduce the injuries/fatalities from crashes, or both? How is it designed to accomplish its goals?

3) Is the technology designed to reduce the “need” or attractiveness of engaging with a distraction, to reduce the duration a driver engages with a distraction, or to reduce the frequency with which a driver engages with a distraction? If so, how?

5) Allow students their choice of method for presenting their findings. Although simple written work is acceptable, allow for creative options using video, audio, Powerpoint, drama, multimedia, etc.
Related Practical Driving Tips

The following is a list of the practical driving tips that are included in Distraction Dodger. These can be shared with students throughout the lessons.

• Maintain appropriate following distance. Car following abilities can be degraded as a result of distraction.
• Be aware/vigilant of sudden braking. Reaction time to lead vehicle brake events can be slower when distracted.
• Be aware of lane drifting.
• An engaged driver is a better driver.
• No passengers or multiple passengers.
• Check your mirrors and other information sources. Distraction can reduce situation awareness.
• Turn down the radio
• Actively look for and avoid obstacles or problems.
• Look for signs. Distraction research has shown that drivers can fail to notice targets (e.g., signs, exits) when they are distracted.
• Concentrate on steering.
• Look 2 to 3 cars ahead of own vehicles. This helps drivers anticipate what will happen in front of them.
• Regularly check your speed.
• Texting requires substantial visual, cognitive, and perceptual resources which reduces the amount of these resources that are directed at driving safely. Save the texting for later.
• Internal distractions such as conversations or daydreaming can negatively affect a driver’s ability to detect and pay attention to all things in the environment.
• External distractions such as radios will redirect a driver's attention to that device and thus take attention off the important things in the environment or the car.
Appendix B

Using Distraction Dodger

In a fantastical driving environment, Distraction Dodger balances realistic driving situations with a clear safe driving message. There are several key aspects of the game worth emphasizing:

• As in real life, not every use of a distraction causes a bad event. At times, users may be able to briefly use a distraction without getting a ticket, experiencing a crash or even failing to serve a customer.

• Similarly, not every bad event is caused by the use of a distraction within the game. Simple inattentiveness, distractions from outside the game, and the challenge of managing the game’s tasks can all lead to crashes, violations, or other problems.

• The game has been carefully designed so that it does not result in users becoming so adept that they convince themselves they are capable of driving distracted. Increasing challenges at higher levels, the fantastical environment and the game controls all distance the learner from real driving situations.

• Students should be consistently reminded that although distractions vary in their severity, all distracted driving increases the risk of crashing.

Several features of the game that may initially be less obvious to many users, and you may wish to point out the following features to your students.

In the screen between levels, the cartoon figure “Dr. Driver” is standing in an artist’s rendition of the HumanFIRST Lab of the Intelligent Transportation Systems Institute at the University of Minnesota. One of the television screens in the image reads “Visit Lab.” By clicking on that, you will be taken to a YouTube video that describes the lab and the work they do there.
At the end of each level, users have the option to view a driving report, as well as a graph of their use of distractions and any violations they experience. The driving report from a particular attempt at Level 4 demonstrates how not all Bad Events are due to distractions. Because of the focus of the game, distracted driving, not all Bad Events result in specific driving feedback.
The graph from this same attempt at Level 4 provides additional insight into the user’s behaviors.

Note that Attention Allocation always adds up to 100%. When the user is engaged with a distraction, the portion of attention devoted to driving (the green) decreases and the amount of attention devoted to the distraction appears in the negative portion of the graph in red.

The “X’s” along the axis of the graph represent Bad Events and the “O’s” represent successful pizza deliveries, good stops at stop signs, and other successes. In the game, placing the mouse over the X or the O displays the details of that event, including the monetary penalty in cases of traffic tickets. Note that in this graph, as
in real life, not all Bad Events occur while distractions are being used, and not all use of distractions results in a Bad Event.

From the data available in the graph, students can determine how severe each distraction was, how each violation impacted their income in the game, and the correlation between their use of distractions and the Bad Events.

Remind students that although some distractions, such as the customer list, may provide short term benefits, they also increase the risk of a crash.