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Improving teenage driver perceptions regarding the impact of distracted driving in the Pacific Northwest

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ABSTRACT

The goal of this educational outreach project was to examine perceptions of driver distraction among teenagers in the Pacific Northwest. Specifically, to identify secondary tasks this group may consider distracting and determine their self-reported engagement in those same secondary tasks while driving. An interactive presentation was developed and administered to 1,400 teenage drivers. Teenagers from age 14 to 18 years were recruited from high schools in Washington, Idaho, and Oregon with an approximately equal sample in each State. Of these participants, 1,006 teenage drivers responded to a pre- and postknowledge survey administered immediately before and 2 weeks after the interactive presentation. The purpose of the survey was to measure the degree to which the interactive presentation improved teenage driver perspectives regarding the hazards of distracted driving. Results indicated that the interactive presentation positively influenced teenage driver perspectives, meaning that after the interactive presentation, teenage drivers were more likely to correctly identify different types of distracted driving.

KEYWORDS

distracted driving; teenage drivers; transportation safety; education; outreach

1. Introduction

Young drivers are a particularly vulnerable driving group, with the highest crash risk when compared to other age groups (Mayhew, Simpson, & Pak, 2003; National Highway Traffic Safety Administration [NHTSA], 2000). Research suggests that this can be attributed to inexperience (Williams, Karpf, & Zador, 1983), higher willingness to take risk (Hedlund, 2007; Laapotti, Keskinen, Hatakka, & Katila, 2001), and higher propensity to engage in distracting activities and heightened susceptibility to peer influences (Allen and Brown, 2008; Chen, Baker, Braver, & Li, 2000).

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Table 1. Logistical factors encountered during interactive presentations.

Logistical Factor	Variability
Classroom size	Individual classroom to theater with stadium seating
Student numbers	20 students to over 300 students per presentation
Available preparation time	10 min to over 1 h
Available contact time	30 min to 120 min
Authorization	Granted by principal or school district
Internet	Wireless, ethernet, or none
Sound	Speakers, microphone or none

As drivers gain more experience behind the wheel, they become more risk aware. The level of risk associated with engagement in a distracting task can be characterized by the frequency, duration, and context (NHTSA, 2010a). That is, using a mobile device while merging into heavy traffic may pose higher risks than tuning the radio in the same traffic situation. In self-reported studies, young drivers have noted low seatbelt use (Chliaoutakis, Gnardellis, Drakou, Darviri, & Sboukis, 2000) and a high willingness to speed in many situations (Laapotti et al., 2001).

Novice drivers tend to lack the experience to appropriately assess the attentional capacity needed for each driving situation (Lansdown, 2002). Studies have shown that young drivers often fail to anticipate and recognize hazards and tend to be slower in responding to unanticipated events when compared to middle-age drivers (Deery, 1999; Hedlund, 2007; Patten et al., 2006). Teenage drivers also tend to be early adopters of new technology (Lee, 2007) and are more likely to use a handheld cell phone while driving than other age group (NHTSA, 2010b). They are also more adversely affected by phone conversations (Shinar, Tractinsky, & Compton, 2005).

Young males and young females engage in distractions differently, which can affect the exposure to varying crash risks. In a study conducted by Foss, Goodwin,

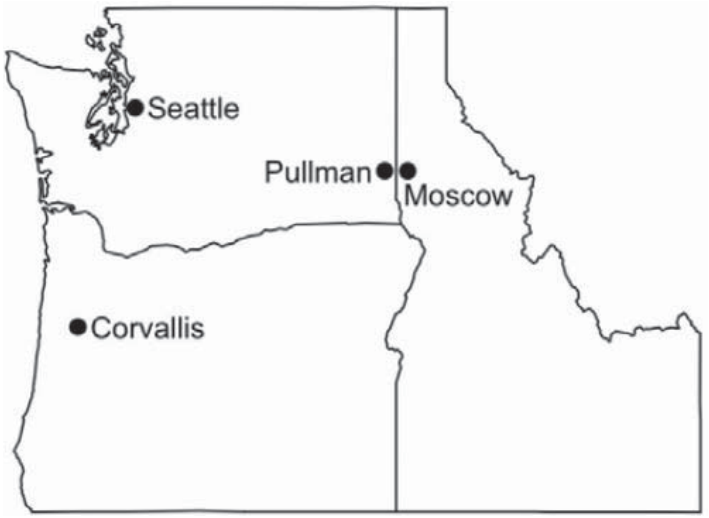

Figure 1. Locations of data collection sites in the United States of America.

Table 2. Participant demographics.

	Corvallis, OR *n* (%)	Moscow, ID *n* (%)	Pullman, WA *n* (%)	Seattle, WA *n* (%)	Combined *n* (%)
Total	293 (29.1)	231 (23.0)	271 (26.9)	211 (20.1)	1006 (100)
Grade level					
Freshman	0 (0)	36 (15.6)	72 (26.6)	37 (17.5)	145 (14.4)
Sophomore	0 (0)	65 (28.1)	57 (21.0)	51 (24.2)	173 (17.2)
Junior	132 (45.0)	67 (29.0)	74 (27.3)	70 (33.2)	343 (34.1)
Senior	142 (48.5)	62 (26.8)	67 (24.7)	48 (22.8)	319 (31.7)
Type of license					
None	11 (3.8)	27 (11.7)	79 (29.2)	30 (14.2)	147 (14.6)
Permit	37 (12.6)	68 (29.4)	61 (22.5)	77 (36.5)	243 (24.2)
Provisional	45 (15.4)	45 (19.5)	35 (12.9)	36 (17.1)	161 (16.0)
Full	124 (42.3)	90 (39.0)	87 (3.2)	56 (26.5)	357 (35.5)

McCartt, and Hellinga (2009) females were more likely to use a cell phone while driving when compared to males, and in Goodwin, Foss, Harrell, and O'Brien (2012), males were more likely to look way from the road while driving when talking to others inside their car. In fact, teenage drivers' engagement in distractions and increased risk taking has been associated with the presence of other teenage passengers (Curry, Mirman, Kallan, Winston, & Durbin, 2012). Because driver behavior is affected by the behavior of passengers in a vehicle, there are potential benefits to educate all teenagers about the dangers of distracted driving.

Numerous strategies targeted toward young drivers have been implemented to help mitigate deleterious effects of driving distracted that include policies and law enforcement, feedback provided inside and outside of vehicle, and public safety announcements and other educational campaigns on a regular basis (Engstrom, Gregersen, Hernetkoski, Keskinen, & Nyberg, 2003). Shope (2006) and McGehee, Raby, Carney, Lee, and Reyes (2007) suggested that educational interventions with parental involvement can lead to reduction in crashes. Graduated driver licensing (GDL) programs have also been successful in providing novice drivers experience and knowledge under conditions of minimal risk (Hedlund, 2007). Appropriate feedback provided in the car (Donmez, Boyle, & Lee, 2007, 2008a, 2008b) or as a supplement to parental involvement (McGehee et al., 2007) has also been shown to diminish the impact and the amount of risk-taking behavior by teenage drivers.

Table 3. Participant driving experiences.

	Corvallis, OR *n* (%)	Moscow, ID *n* (%)	Pullman, WA *n* (%)	Seattle, WA *n* (%)	Combined *n* (%)
Drivers Education Training					
Yes	134 (45.7)	161 (69.7)	143 (52.8)	147 (69.7)	585 (58.2)
No	136 (46.4)	31 (13.4)	38 (14.0)	14 (6.6)	219 (21.8)
Not Yet	7 (2.4)	24 (10.4)	41 (15.1)	34 (16.1)	106 (10.5)
Crashes					
Yes	67 (22.9)	68 (29.4)	93 (34.3)	45 (21.3)	273 (27.1)
No	202 (68.9)	137 (59.3)	174 (64.2)	157 (74.4)	670 (66.6)
Moving violations					
Yes	22 (7.5)	14 (6.1)	14 (5.2)	10 (4.7)	60 (6.0)
No	248 (84.6)	191 (82.7)	251 (92.6)	191 (90.5)	881 (87.6)

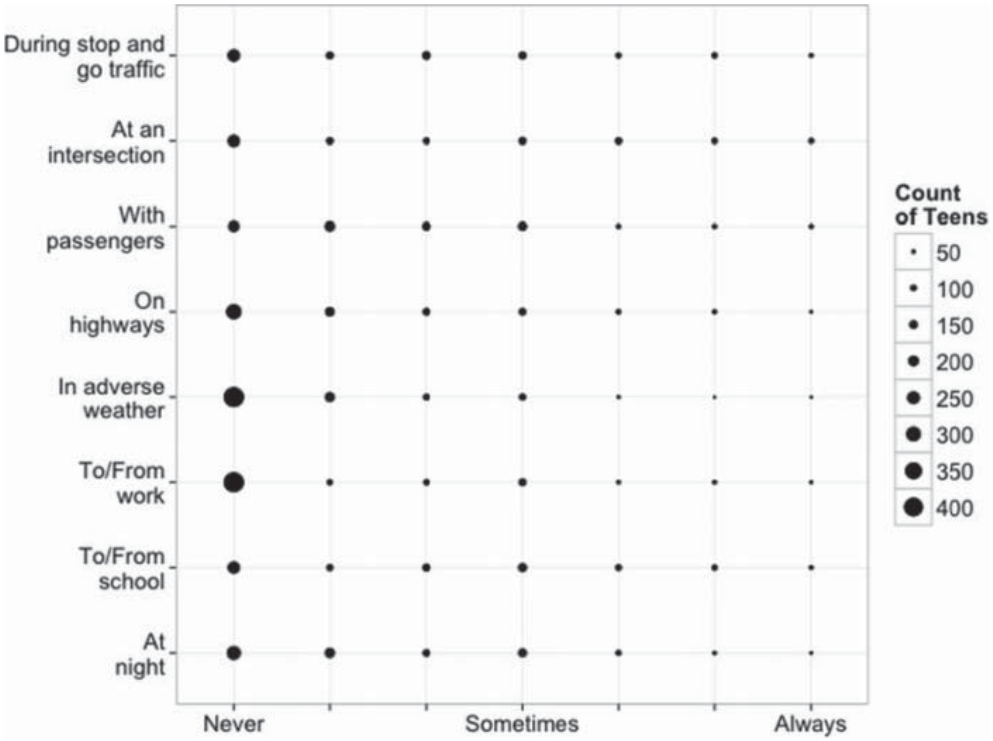

Figure 2. Performance of secondary tasks during different conditions.

Educational interventions can also be successful in changing student attitudes and behavior, and there are two complementary approaches: presentation of a diverse set of evidence and active engagement with the material (Vosniadou, 1994, 2008). A broad and diverse set of evidence suggests that engaging students in the learning process during a presentation is effective on changing their conceptual understanding (Chi, 2009; Hake, 2002; Prince, 2004). Active learning requires students to do more than passively listen. It requires activities such as writing, discussion, and tactile problem solving that engage students in higher-order thinking tasks such as analysis, synthesis, and evaluation.

The goal of this study is to examine driver distraction among teenagers using self-reported data collected before and after an interactive presentation. The interactive presentation was designed to expose students to a variety of evidence showing how activities performed while driving can result in distractions that significantly reduce their ability to drive safely. This study differs from other teenage distracted driving studies in two significant ways: (1) pre-/postsurvey responses were collected to assess the influence of an interactive presentation given to teenage student participants and (2) teenage drivers were sampled from one region in the United States to assess potential differences in behavior (the Pacific Northwest).

This research effort addresses the following four objectives:

- Develop an interactive presentation regarding teenage distracted driving that engages a variety of student learning styles

Table 4. How distracting participants perceived specific activities while driving.

		Response (% Change, Post–Pre)						
		1 Strongly Disagree	2	3	4 Neutral	5	6	7 Strongly Agree
Activity	City	Δ	Δ	Δ	Δ	Δ	Δ	Δ
Talk on mobile phone	Corvallis	**−2.34**	**−4.30**	**−5.08**	**−7.81**	**−7.42**	**−1.17**	10.55
	Seattle	6.35	0.00	**−4.76**	**−3.17**	4.76	9.52	**−9.52**
	Pullman	**−1.09**	**−6.01**	**−3.28**	**−3.83**	**−5.46**	0.00	4.37
	Moscow	**−3.90**	**−4.33**	2.16	6.93	4.33	**−2.16**	9.09
Dial a mobile phone	Corvallis	0.39	**−0.78**	**−2.73**	**−5.08**	**−8.59**	**−11.72**	10.94
	Seattle	7.94	0.00	0.00	0.00	**−7.94**	6.35	**−4.76**
	Pullman	**−2.73**	**−2.19**	**−4.37**	**−7.65**	**−5.46**	1.09	6.01
	Moscow	**−1.30**	**−3.46**	**−1.30**	3.90	3.03	1.30	9.96
Text message	Corvallis	0.39	**−3.13**	**−0.39**	**−2.34**	**−1.56**	**−8.20**	**−2.34**
	Seattle	9.52	1.59	**−3.17**	**−3.17**	3.17	**−14.29**	9.52
	Pullman	**−3.28**	**−1.64**	**−1.64**	**−1.64**	0.00	**−2.73**	**−4.37**
	Moscow	**−0.43**	0.87	**−1.73**	**−1.30**	**−4.76**	2.60	16.88
Eat or drink	Corvallis	**−3.13**	**−10.16**	**−8.20**	**−14.45**	**−3.91**	2.73	19.92
	Seattle	0.00	0.00	**−6.35**	**−0.32**	12.70	4.76	**−7.94**
	Pullman	**−2.19**	**−2.19**	**−6.56**	**−6.56**	**−3.28**	**−2.19**	7.10
	Moscow	**−6.49**	**−1.30**	1.73	8.66	6.06	1.73	1.73
Insert/use CDs	Corvallis	**−2.73**	**−9.77**	**−11.33**	**−14.84**	**−3.52**	0.78	22.27
	Seattle	6.35	**−6.35**	**−4.76**	**−4.76**	9.52	4.76	**−6.35**
	Pullman	**−1.09**	**−7.65**	**−2.73**	**−3.83**	**−4.37**	**−1.09**	4.92
	Moscow	**−4.33**	**−7.36**	6.49	10.82	3.46	1.73	1.30
Tune radio	Corvallis	**−3.91**	**−12.11**	**−9.77**	**−14.45**	**−1.17**	1.56	20.70
	Seattle	**−3.17**	–6.35	**−12.70**	0.00	7.94	14.29	1.59
	Pullman	**−4.37**	–7.10	**−1.09**	**−3.83**	**−1.09**	**−2.19**	3.83
	Moscow	**−5.19**	**−1.73**	**1.73**	11.26	2.16	3.03	0.87
Change climate setting	Corvallis	**−10.55**	**−13.67**	**−8.59**	**−8.20**	**−1.95**	1.56	21.88
	Seattle	**−4.76**	0.00	**−20.63**	9.52	6.35	11.11	1.59
	Pullman	**−7.65**	**−6.01**	1.64	**−3.83**	**−2.19**	1.64	1.09
	Moscow	**−8.66**	8.23	**−1.30**	8.66	3.90	**−0.87**	2.16

Read	Corvallis	**−1.17**	**−3.91**	**−1.95**	**−8.59**	**−9.77**	**−10.16**	16.02
	Seattle	6.35	1.59	4.76	**−9.52**	**−4.76**	**−4.76**	9.52
	Pullman	**−0.55**	**−2.19**	**−1.64**	**−4.92**	**−4.37**	**−4.92**	3.28
	Moscow	**−0.87**	**−1.73**	**−2.16**	0.87	0.43	4.76	10.82
Look for an item in bag	Corvallis	**−0.78**	**−0.39**	**−4.69**	**−8.98**	**−11.72**	**−8.20**	15.23
	Seattle	6.35	1.59	0.00	**−7.94**	**−3.17**	**−7.94**	11.11
	Pullman	0.00	**−2.19**	**−1.64**	**−4.37**	**−2.73**	**−3.83**	**−0.55**
	Moscow	**−1.30**	0.43	**−3.03**	1.73	**−0.87**	1.73	13.42
Use other devices	Corvallis	**−1.17**	**−0.78**	**−2.73**	**−6.25**	**−7.03**	**−11.33**	8.98
	Seattle	3.17	4.76	0.00	**−1.59**	**−6.35**	**−4.76**	6.35
	Pullman	**−1.09**	**−2.19**	**−2.19**	**−1.64**	**−0.55**	**−9.84**	1.64
	Moscow	**−0.87**	**−1.30**	**−0.87**	0.43	**−3.90**	4.76	13.85
Work on homework	Corvallis	**−2.34**	0.00	**−2.34**	**−1.17**	0.00	**−5.47**	**−8.59**
	Seattle	9.52	**−1.59**	1.59	**−1.59**	**−7.94**	3.17	**−1.59**
	Pullman	**−1.09**	**−1.64**	0.00	0.00	**−0.55**	**−2.19**	**−9.29**
	Moscow	0.43	0.00	**−0.43**	**−1.73**	**−7.79**	1.30	19.91
Daydream	Corvallis	**−3.13**	**−3.52**	**−8.59**	**−6.64**	**−16.02**	1.56	16.80
	Seattle	1.59	**1.60**	**−14.29**	**−7.94**	**−1.59**	14.29	6.35
	Pullman	**−6.01**	2.73	0.00	**−0.55**	**−3.83**	**−1.64**	**−6.01**
	Moscow	0.43	**−1.73**	**−2.60**	3.90	**−0.43**	5.63	6.93
Complex thinking	Corvallis	**−3.91**	**−3.91**	**−9.38**	**−12.50**	**−12.11**	0.00	22.27
	Seattle	**−1.59**	1.59	0.00	**−9.52**	**−3.17**	1.59	14.29
	Pullman	**−1.64**	**−4.92**	0.55	**−4.92**	**−4.37**	**−2.19**	1.64
	Moscow	**−4.33**	0.87	**−4.33**	7.79	5.63	1.73	4.76
Apply make-up or shave	Corvallis	**−1.95**	**−0.78**	0.39	**−5.47**	**−7.42**	**−8.59**	4.30
	Seattle	7.94	1.59	0.00	**−6.35**	4.76	**−1.59**	**−4.76**
	Pullman	**−3.83**	0.00	0.55	**−4.37**	1.64	**−11.48**	2.73
	Moscow	0.00	0.43	**−1.73**	1.30	**−7.79**	0.87	19.05

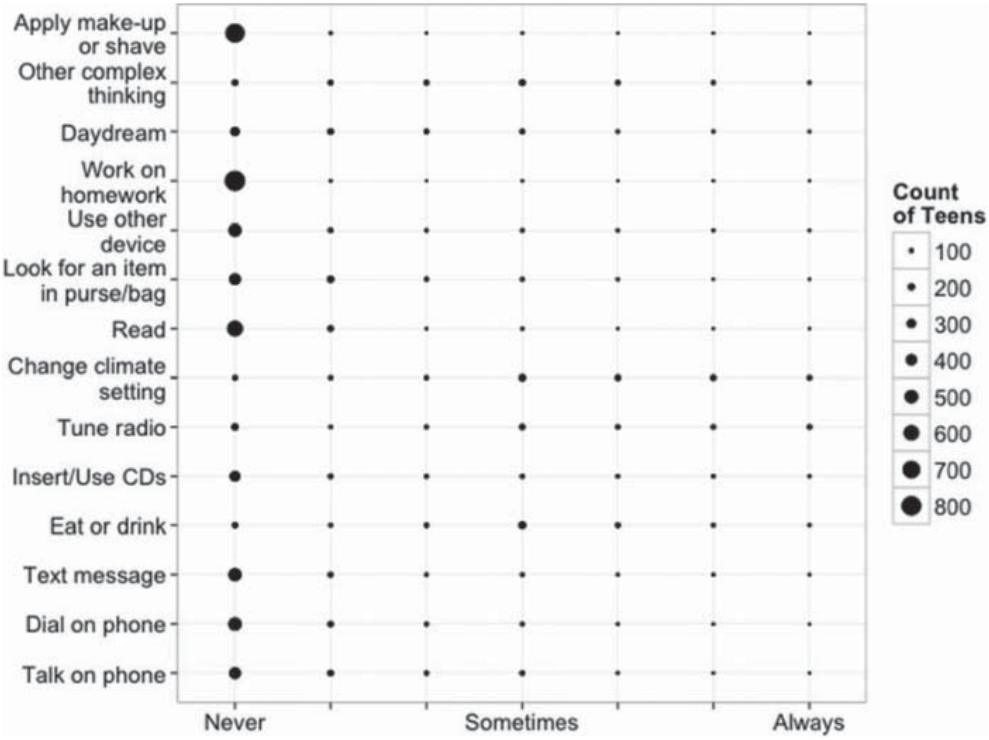

Figure 3. Self-reported level frequency of secondary driving tasks, presurvey results.

- Administer the presentation to a cross-section of teenage students across the Pacific Northwest
- Determine existing self-reported perspectives of teenage drivers regarding the hazards of distracted driving
- Determine if the newly developed interactive presentation improves those perspectives.

2. Method

The study deployed a before, intervention/treatment, and after methodology. The aim was to evaluate the effectiveness of an interactive presentation in changing students' attitudes and perceptions about distracted driving.

Immediately before the presentation, as the students entered the classroom or auditorium, they were handed the presurveys. As soon as the students were seated, researchers instructed the students to respond to the presurvey. Upon completion of the presurvey, researchers then collected the surveys and the interactive presentation was delivered. Two weeks later, the postsurveys were administered by either the researchers or the high school teachers.

2.1. *Pre- and postsurvey content*

A four-page presurvey and one-page postsurvey were developed for deployment at each school. The presurvey was based on a survey from Westlake and Boyle

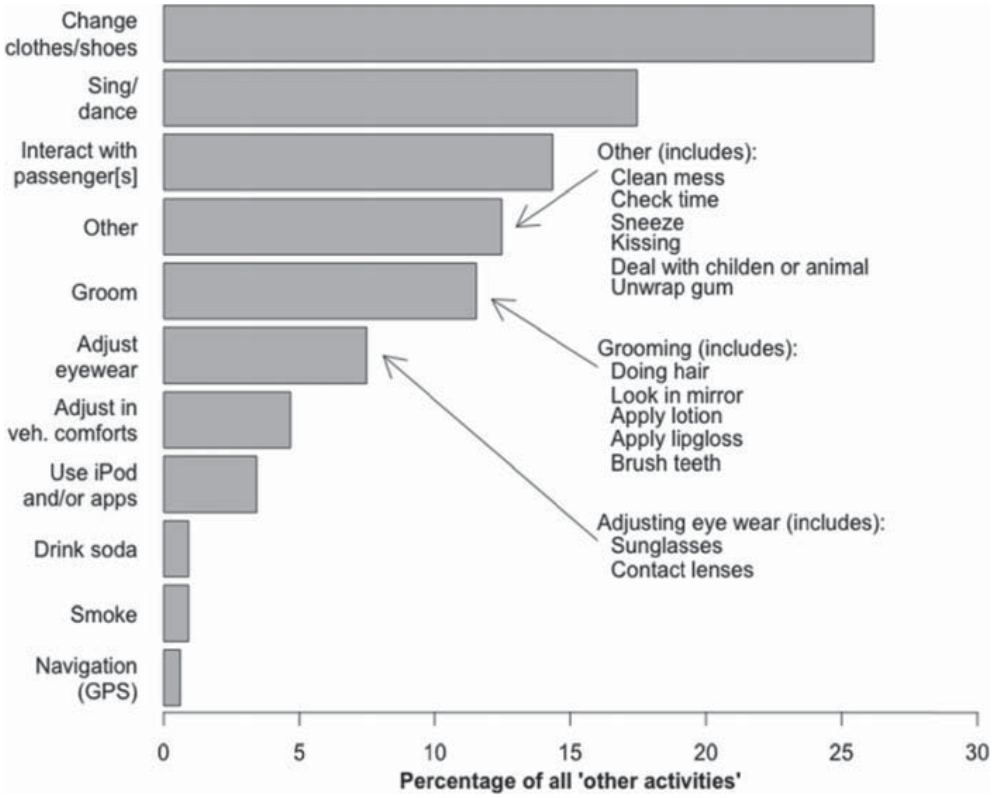

Figure 4. Other distracting activities during driving.

(2012), and the presurvey and postsurvey asked students to rate (on a 7-point Likert-type scale) how distracting they perceived specific activities to be while driving. These two surveys also solicited general demographics such as gender, year in school, and age.

The presurvey also asked more specific questions about driving history and experience, license type and training, driving frequency and duration, and how often and when they and/or their parent engage in specific secondary tasks. The presurvey took approximately 10 to 15 min to complete, whereas the postsurvey took approximately 5 to 10 min.

2.2. *Interactive presentation content*

The interactive presentation was developed so that students with different learning styles would be exposed to a variety of evidence that demonstrates how many secondary tasks performed while driving can be considered distracting with negative impacts on driving performance. Evidence included research results, videos of naturalistic driving, static images, hands-on demonstrations, and the use of inductive and deductive reasoning through extensive questioning. To promote a more interactive classroom environment, preplanned questions were used throughout the presentation and two activities were included; one activity involving every student participant and one involving several students at the front of the classroom.

Table 5. Change in mean responses between the post- and pre-surveys.

	Corvallis		Seattle		Pullman		Moscow		Combined	
Activities	*p*	Mean of Differences	*p*	Mean of Differences	*p*	Mean of Differences	*p*	Mean of Differences	*p*	Mean of Differences
Talk on mobile phone	<0.001	**−0.712**	0.668	0.147	0.025	**−0.342**	<0.001	**−0.491**	**−0.453**	<0.001
Dial a mobile phone	<0.001	**−0.383**	0.351	0.322	<0.001	**−0.471**	<0.001	**−0.451**	**−0.346**	<0.001
Text message	0.066	**−0.188**	0.305	0.344	0.276	**−0.155**	<0.001	**−0.457**	**−0.195**	0.004
Eat or drink	<0.001	**−1.162**	1.000	0	0.008	**−0.344**	<0.001	**−0.503**	**−0.652**	<0.001
Insert/use CDs	<0.001	**−1.137**	1.000	0	0.007	**−0.331**	<0.001	**−0.503**	**−0.626**	<0.001
Tune radio	<0.001	**−1.176**	0.004	**−0.742**	0.006	**−0.331**	<0.001	**−0.422**	**−0.712**	<0.001
Change climate setting	<0.001	**−1.428**	0.006	**−0.721**	0.032	**−0.290**	<0.001	**−0.394**	**−0.764**	<0.001
Read	<0.001	**−0.655**	0.722	0.115	0.181	**−0.187**	<0.001	**−0.491**	**−0.402**	<0.001
Look for an item in bag	<0.001	**−0.566**	0.761	0.098	0.620	**−0.071**	<0.001	**−0.474**	**−0.334**	<0.001
Use other devices	<0.001	**−0.393**	0.566	0.194	0.320	**−0.143**	<0.001	0.520	**−0.299**	<0.001
Work on homework	0.395	**−0.091**	0.259	0.387	0.962	0.007	<0.001	**−0.460**	**−0.098**	0.154
Daydream	<0.001	**−0.880**	0.054	**−0.541**	0.413	0.122	<0.001	**−0.423**	**−0.466**	<0.001
Complex thinking	<0.001	**−1.049**	0.104	**−0.443**	0.332	**−0.143**	<0.001	**−0.497**	**−0.597**	<0.001
Apply make-up/shave	0.005	**−0.343**	0.177	4.52	0.114	**−0.214**	<0.001	**−0.442**	**−0.234**	<0.001

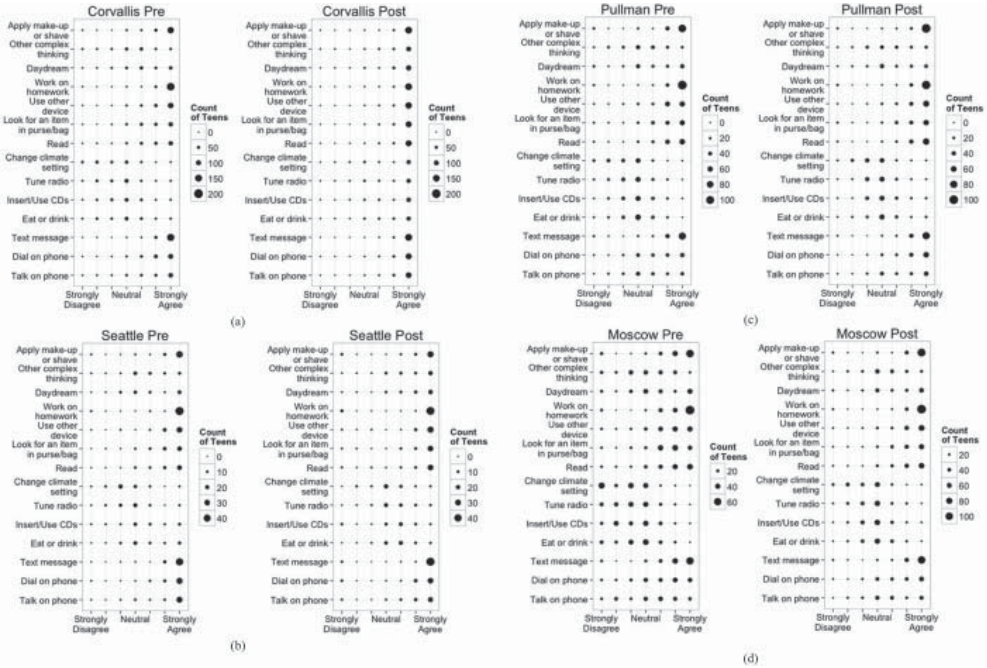

Figure 5. Summary of the responses to distracting activities in pre- and postsurvey.

To ensure consistency, an instructor's guide was developed for use by all presenters. These notes included summaries of the major points that needed to be communicated, the amount of time that should be spent, and the expected student outcomes for each slide. A video recorded presentation was also available for distance learning. A wide variety of logistical factors were considered as the interactive presentation content was developed. Table 1 describes those factors and the variability that was seen in those factors when the interactive presentations took place.

2.3. *Participants*

Participants in this study were recruited from high schools in relative proximity to Corvallis, Oregon; Seattle and Pullman, Washington; and Moscow, Idaho (Figure 1).

In total, almost 1,400 teenagers participated in the information sessions, and 1,006 returned the surveys. The mean age of students was 16.17 years with standard deviation of 1.13 years. The percentage of males and females reported, were 47.4% ($n = 477$) and 50% ($n = 503$), respectively, and this was consistent across all four cities. On average, participants reported driving 4.37 days per week with a standard deviation of 2.56. The years of driving experience ranged from 0.64 years in Pullman, to 0.83 years in Seattle, to 0.94 years in Moscow, and 2.32 years in Corvallis.

Participants were not individually compensated for their participation. However, a raffle for a US $50 gift card was used to link pre- and postsurvey responses and also to thank the participants for their participation. Detailed participant

demographics are included in Tables 2 and 3. The use of human participants in this study was reviewed and approved by the Institutional Review Board (IRB) at each participating institution.

3. Results

3.1. *Driving conditions*

Factors such as time of day, weather conditions, and trip purposes were included in the surveys. Figure 2 shows a dot plot that summarizes the influence that driving conditions had on the frequency teenage participants reported engaging in distracted driving. Although the self-reported data shows high response rates for never engaging in secondary tasks, there was a notable spread in responses for engagement during stop-and-go traffic, at intersections, with passengers, to and from school, and at night.

3.2. *Distracting activities*

Descriptive statistics were compiled for the data collected by each university and for the entire data set. When considering the entire data set on a 7-point Likert-type scale (*low distraction – highly distracting*), it was found that working on homework and text messaging were the two most distracting self-reported secondary tasks while driving. A similar trend was observed in the data when aggregated by each University.

It was also found that teenage drivers perceived adjusting the climate setting, tuning the radio, changing CDs, and eating/drinking to be the least distracting secondary tasks while driving. This trend suggests that activities related to on-board in-vehicle technologies are perceived as inherently less distracting to teenage drivers rather than mobile devices. Results for each city on how distracting participants perceived specific activities while driving for before and after the information session are presented in Table 4.

The data on how often the participants engaged in these secondary tasks is shown as a dot plot in Figure 3.

Beyond the secondary tasks explicitly described in Table 4, students were asked to describe other secondary tasks that they commonly engaged in while driving (Figure 4). Approximately 38% of the respondents described additional secondary tasks. It was found that almost 27% of respondents changed clothes or shoes while driving, which was followed by singing or dancing in the car and interacting with passengers. Other activities during driving included cleaning, a variety of personal grooming tasks, changing contact lenses, and other activities.

3.3. *Impact of interactive presentation*

To determine if the interactive presentation improved teenage driver perceptions regarding the hazards of distracted driving, we conducted a paired t test between

the results of the pre- and postsurveys. The analysis was conducted at the aggregate level and on a per-city basis. Table 5 summarizes the mean values of the differences between the pre- and postsurvey responses. There was a notable difference in significant p values for the institutions that gathered postsurvey data immediately after the information session as compared to those that waited 2 weeks. This suggests that the impact of the information presented decreased over time for the students.

Figures 5a–d show the responses for the pre- and postsurvey question "which of the following do you think is a distraction while driving," at the aggregate level and for each University. The plot on the left shows presurvey data, whereas the right plots display the corresponding postsurvey responses. Again, these are based on a 7-point Likert-type scale with *no perceived distraction* corresponding to 1 and *highly distracting* at 7. Shifts toward the right in responses for each activity demonstrate increased perceived level of distraction.

3.4. *Confounding variables*

Gender and age were also considered, as literature suggests that these constructs can also influence driving behavior. A chi-squared test on the bipolar scale for change in self-reported perception as a result of the intervention was performed. The scale ranged from —6 (*much less distracting*) to 0 (*no change in perception*) to +6 (*much greater distraction*) and was calculated by subtracting the postsurvey scores from presurvey scores on perceived level of distraction for each student. This scale was further collapsed into three categories (negative, neutral, and positive scores) for data analyses. Gender-considered differences in the distributions of the scale for male versus female, whereas age compared the differences in the distribution of the scale for < 16 years old, $16 \leq x < 17$, $17 \leq x < 18$, and 18 and older. The test was performed on nine distracting activities: eating/drinking, talking on phone, daydreaming, thinking about something complex, tuning radio, adjusting climate, using external device, dialing on phone, and texting.

Table 6 shows the results of the chi-squared tests for gender and age, respectively. There were significant differences between the perceived change in distraction level for eating/drinking and talking on the phone between ages ($p < .05$). It is also notable that there were trends observed for differences in changed perceptions between genders for eating/drinking, and between ages for daydreaming and thinking about something complex ($p < .10$).

The directional results indicated that females responded more favorably to the intervention, in that their perception of eating/drinking became notably more distracting than for the males. Similarly, the positive change in perceived distraction appeared strongest in the older age groups as compared to the younger age groups. This could potentially be attributed to their increased maturity, or the increased in time since their driver's education training, which is usually accompanied by more parental supervision/feedback while driving.

Table 6. Influence of gender and age on perceptions of distraction type.

	Gender		Age	
	Post - Pre Score		Post - Pre Score	
Distraction	χ^2	*p* value	χ^2	*p* value
Eat or drink	**5.09**	0.0786	**64.71**	**<0.0001**
Talk on phone	0.92	ns	**17.47**	**0.0077**
Daydream	1.66	ns	12.05	0.0609
Think about something complex	0.47	ns	11.23	0.0816
Tune radio	2.85	ns	4.15	ns
Adjust climate	0.20	ns	7.26	ns
Use external device	0.95	ns	5.94	ns
Dial on phone	1.43	ns	1.61	ns
Text	1.16	ns	3.90	ns

4. Conclusions and discussion

Students report preferences for many different learning styles, and there are many models proposed to describe learning styles. Of these, the Felder-Silverman learning styles model (Felder & Silverman, 1988) has gained significant traction in the engineering community and is the basis for the interactive educational program described in this article.

Teenagers may not have the experience to recognize all the dangers associated with distractions, and as in other educational programs, one size does not fit all. Student learning outcomes can be improved if the content is presented in a way that resonates across the diverse learning preferences of students. The spectrum of teaching styles described by Felder and Silverman (1988) include concrete and abstract content, visual and verbal presentation, inductive and deductive organization, active and passive participation, and sequential and global perspectives. The interactive presentation described in this study demonstrates that successful interactions can be achieved using a variety of teaching styles.

In total, almost 1,400 teenagers from Corvallis, OR; Seattle, WA; Pullman, WA; and Moscow, ID participated in presentations, and 1,006 returned the surveys. Results from the surveys demonstrated that:

- Teenagers perceived working on homework and text messaging to be the most distracting; whereas adjusting climate controls, eating/drinking, tuning the radio, and changing CDs to be the least distracting. These findings are consistent with Westlake and Boyle (2012) using a similar survey.
- 38% of respondents identified additional secondary tasks that they regularly engaged in while driving. Specifically, 27% of respondents stated that they changed clothes or shoes while driving.
- Paired *t* tests showed that on average mean responses were higher in the post-survey, indicating improved perceptions of the risks associated with distracted driving. It was also determined that the shifts in perspectives were more significant for students who responded to the presentation immediately after as compared to 2 weeks after.

- Chi-squared tests showed that females responded more favorably to the intervention, in that their perception of eating/drinking became notably more distracting than for the males. Similarly, the positive change in perceived distraction appeared strongest in the older age groups as compared to the younger age groups.

These results should be interpreted in light of two study limitations:

- The data was self-reported by participants. As such, it may be reasonable to access perceptions of the participants, but extrapolation to actual driving behavior should be done with caution.
- The postsurvey data was captured two weeks after the interactive presentation. Over that timeline the materials had a clearly positive impact on perceptions, but we do not yet know the effect of the intervention over a longer timeline (one month or one year).

The method employed in this study is particularly useful in capturing self-identified behavior that may not otherwise be observed (Mann, Vingilis, Leigh, Anglin, & Blefgen, 1986). Although perceptions may not necessarily correlate with actual behavior in all research domains, previous research has shown that survey responses correlate strongly with actual driver behaviors (i.e., speed perception and selection) in the field and in studies using driving simulators (Hurwitz & Knodler, 2007).

This educational outreach project has demonstrated that it is feasible to shift self-reported teenage driver perceptions regarding the hazard of distracted driving, however more work needs to be done in this area. Future work should consider the following:

- 1,400 students participated in these efforts, but thousands more need to be engaged if social norms are to be influenced. To achieve this dozens of additional presentations need to be conducted by members of the project team as well as others trained in this content area.
- The presentations as well as the facilitators guide should be made readily available so that high school teachers and others can continue to engage high school students with the presentation around the region.
- The results from the pre- and postsurvey provided critical data that can contribute to the development of full scale driving simulator studies providing a means of directly observing teenage driving behavior in the Pacific Northwest.

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