Evaluation of Electronic Speed Limit Signs on US 30

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Executive Summary

This study documents the speed reduction impacts of two dynamic, electronic school zone speed limit signs at United Community Schools between Ames and Boone, Iowa. The school facility is situated along US Highway 30, a rural four-lane divided expressway.

Due to concerns about high speeds in the area, the Iowa Department of Transportation (DOT) decided to replace the original static school zone speed limit signs, which had flashing beacons during school start and dismissal times (Figure 1), with electronic speed signs that only display the reduced school speed limit of 55 mph during school arrival and dismissal times (Figure 2).

The Center for Transportation Research and Education (CTRE) at Iowa State University (ISU) conducted a speed evaluation study one week before and 1 month, 7 months, and 14 or 15 months after the new signs were installed.

Overall, the new dynamic school zone speed limit signs were more effective in reducing speeds than the original static signs with flashing beacons in the 1 month after period. During the 7 and 14 month after period, speeds increased slightly for the eastbound direction of traffic. However, the increases were consistent with overall speed increases that occurred independent of the signs.

The dynamic, electronic signs were effective for the westbound direction of traffic for all time periods and for both start and dismissal times. Even though only modest changes in mean and 85th percentile speeds occurred, with the speed decreases, the number of vehicles exceeding the school speed limit decreased significantly, indicating the signs had a significant impact on high-end speeders.

Figure 1. Original static school speed limit sign with flashing beacons

Figure 2. Dynamic, electronic school zone speed limit sign at United Community Schools on US 30 between Ames and Boone, Iowa

Background

United Community Schools are located 5.6 miles east of Boone and about 5 miles west of Ames in Boone County, Iowa (Figure 3). The facility currently provides daycare (ages 3 and up) and pre-school through 6th grade elementary education, as well as before- and after-school programs.

The school complex is situated about 400 feet north of US 30, which is a rural four-lane divided expressway (Figure 4). The school entrance is off of U Avenue to the north of US 30. Both right and left turn lanes are present along US 30 at U Avenue.

The school is primarily accessed by vehicles turning right from the westbound lanes of US 30 or left from the eastbound lanes of US 30. The posted speed limit along US 30 is 65 mph. However, during school arrival and departure times, the speed limit within the restricted school zone is 55 mph.

Before September 2009, drivers were alerted to the school zone speed limit by a standard static speed limit sign that displayed Speed Limit 55 and a plate below the standard sign that indicated When Flashing (Figure 1). Two flashing beacons

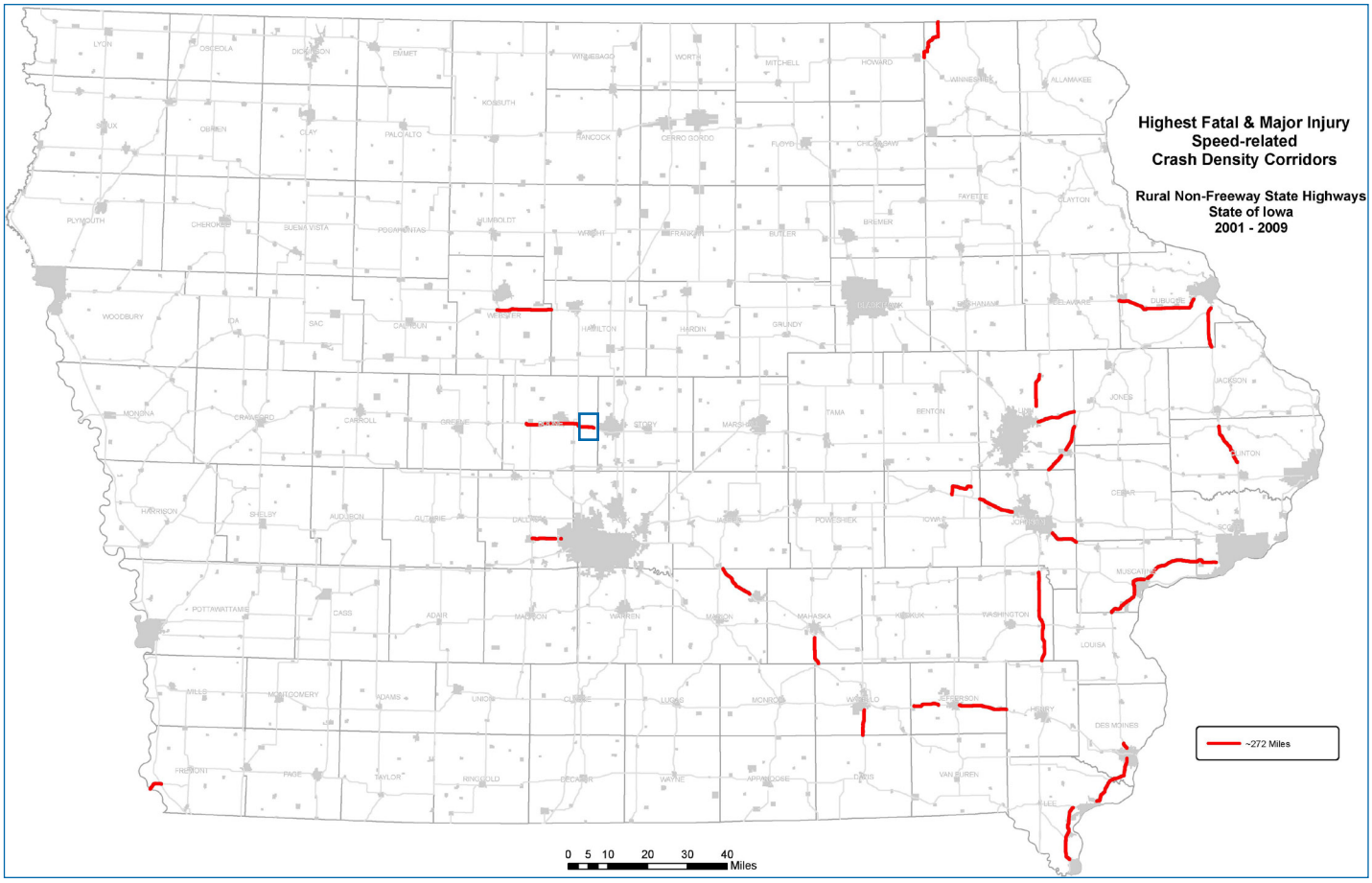

Figure 3. Iowa five percent corridor map with school site being part of the central section of US 30 with the small box around it

Figure 4. Satellite map of United Community Schools on US 30 between Ames and Boone, Iowa

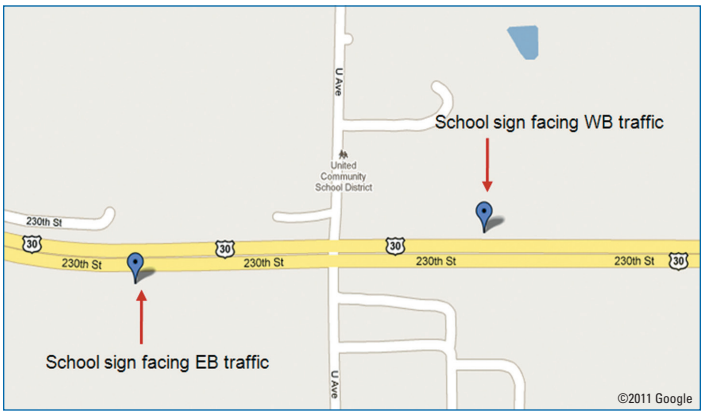

Figure 5. Map of US 30 with sign locations indicated by blue markers

were located at the top of the sign combination, which went into the flashing mode from 7:15 to 8:30 a.m. and 3:00 to 4:00 p.m. during the months when the school was in session.

The Iowa Department of Transportation (DOT) found that high speeds in the vicinity of the school created a safety concern and determined that the existing signs were not effective in getting drivers to comply with the school zone speed limit.

This site is included in Iowa's top five percent of Highest Fatal and Major Injury Speed-Related Crash Density Corridors for Rural Non-Freeway State Highways (Iowa DOT 2010) (Figure 3). The site is also part of the top five percent Highest Density Corridors of Unbelted Drivers and Passengers Killed or Seriously Injured on Rural State Highways (Iowa DOT 2010).

As a result, the Iowa DOT replaced the original signs with dynamic, electronic speed limit signs (Figure 2) that would only be visible during the same school start and end times indicated for the original signs. The new signs were installed by the Iowa DOT on September 8, 2009. Figures 4 and 5 show the locations of the school zone speed limit signs.

The Center for Transportation Research and Education (CTRE), a research center administered by the Institute for Transportation (InTrans) at Iowa State University (ISU), was commissioned by the Iowa DOT to evaluate the speed reduction impact with the newer signs. Researchers compared speeds before and after installation of the new signs using pneumatic road tubes.

Data Collection Methodology

Data were collected using pneumatic road tubes with JAMAR Technologies, Inc. counters. The counters are designed to collect data continuously while in place and can record speed and vehicle class for individual vehicles.

The tubes were laid the week of August 31, 2009, one week before the new school speed limit signs were installed. The original school zone speed limit signs were present when the tubes were laid. Tubes were laid for each direction of traffic between each sign and the intersection of US 30 and U Avenue.

Data were collected approximately one month after (the week of September 28, 2009), 7 months after (the week of April 12, 2010) and approximately 14 months (November 17 and 18, 2010 for eastbound traffic and December 9 and 10, 2010 for westbound traffic) after the new signs were installed. Data were only collected on weekdays (Monday through Friday).

Data were collected for several days during each data collection period. Speed data were compared overall (a full 24 hour count for several days, and only those times when the school speed limit signs were operational). One day during the 1 month after data collection period, the school had an early dismissal. Data for this time period were not included, because traffic conditions on US 30 were expected to be somewhat different than those during the normal school dismissal times.

The researchers also experienced some trouble with data collection during the 14 month after period, when the westbound data were determined to be erroneous and therefore unusable. So, data were recollected as soon as the winter holidays had passed and weather conditions were favorable.

Data preparation included checking for faulty data and outliers. In some cases, the counters detected but could not classify a vehicle and instead recorded the vehicle type as unknown. When this occurred, vehicle speed was not calculated in most cases, resulting in a speed value of zero. Therefore, vehicles characterized as unknown were removed from the dataset.

Data preparation also included checking for unusually high or low speeds, which may indicate a problem with the tubes or counters. No unusual data were present and, as a result, the only data preparation necessary was to remove unclassified vehicles, which made up less than six percent of the vehicles.

As indicated, data were compared for the full day (24 hours) and, specifically, for periods when the signs were active during school start and dismissal times. The data were analyzed to compare speeds before and after installation of the new signs. The analysis for school start and dismissal times included the following:

- Mean speed and standard deviation of mean
- 85th percentile speed
- Percent of vehicles exceeding the posted school zone speed limit by 5, 10, and 15 mph

The analysis for the full day only included mean, standard deviation of mean, and 85th percentile speeds. The number of vehicles exceeding the posted speed limit was not calculated because the speed limit is different at school start and dismissal times (55 mph) than at other times of the day (65 mph) and it was, therefore, not possible to compare the number of vehicles traveling over the speed limit.

The statistical difference in mean speeds between the before and after periods was calculated using a t-test, assuming vehicle speeds are normally distributed. Differences in the number of vehicles exceeding the speed limit were tested using a test of proportions.

Results

Speeds were compared for various time periods before and after installation of the new school speed limit signs. A positive value in the tables indicates an increase in speed, while a negative value indicates a decrease in speed.

Key for Tables

EB = Eastbound traffic

WB = Westbound traffic

* = Difference not statistically significant at 95 percent confidence level

1 Month Results

Comparison of Speeds Overall

The results of the comparison of speeds for all time periods (24 hour) are shown in Table 1. Given the school zone signs are only operational for two hours per day, speeds were compared for a 24 hour time period to serve as a control. Increases or decreases for the 24 hour period would suggest increases or decreases in speed trends that were independent of the signs.

Table 1. 1 month results for 24 hour period for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	24,296	24,126		24,338	24,876	
Mean (mph)	64.0	64.1	+0.1	64.7	65.0	+0.3
Standard deviation (mph)	5.0	5.4	+0.4	6.1	6.0	-0.1
85th percentile speed (mph)	69	69	0	70	71	+1

As shown in Table 1, mean speeds increased slightly for the eastbound direction (0.1 mph) and the westbound direction (0.3 mph). The differences are irrelevant for practical purposes. The 85th percentile speeds did not change from the before to the after period for eastbound traffic. However, a 1 mph increase was seen at the 85th percentile speed for westbound traffic. This finding suggests that no relevant changes in speeds occurred that may have been independent of the sign.

Comparison for School Start and Dismissal Times

Speed differences between the periods before and after the new signs were installed were compared for school start and dismissal times when the signs were active (7:15 to 8:30 a.m. and 3:00 to 4:00 p.m.). Results are presented for start and dismissal times together in Table 2. Mean speeds decreased by 1.4 mph for the eastbound direction of traffic and by 2.6 mph for the westbound direction. The percentage of drivers exceeding the 55 mph school zone speed limit by 5, 10, and 15 or more mph dropped 11.5, 5.8, and 0.6 percent, respectively, for eastbound traffic and 18.7, 11.6, and 4.1 percent, respectively, for westbound traffic. All of the decreases were statistically significant.

Table 2. 1 month results during school start and dismissal times for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	4,550	4,618		4,076	4,009	
Mean (mph)	59.7	58.3	-1.4	59.4	56.8	-2.6
Standard deviation (mph)	5.4	5.1	-0.3	6.0	5.2	-0.7
85th percentile speed (mph)	65	64	-1	66	62	-4
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	48.1	36.6	-11.5	43.2	24.5	-18.7
≥ 10 mph	18.9	13.1	-5.8	19.5	7.9	-11.6
≥ 15 mph	2.9	2.2	-0.6	6.2	2.2	-4.1

Speed differences for heavy vehicles before and after new sign installation were also evaluated given the speeds of heavy truck traffic can vary significantly from the speeds of passenger cars. Heavy vehicles made up about 11 percent of eastbound traffic and approximately 13 percent of westbound traffic. As shown in Table 3, heavy vehicle speeds decreased for all speed metrics, and these results were similar to those for all vehicles.

Table 3. 1 month results during school start and dismissal times for heavy vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	601	494		510	503	
Mean (mph)	59.0	57.7	-1.3	58.3	56.1	-2.2
Standard deviation (mph)	4.9	4.9	0	5.3	4.9	-0.4
85th percentile speed (mph)	64	63	-1	64	61	-3
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	44.6	32.0	-12.6	36.9	21.3	-15.6
≥ 10 mph	13.6	9.1	-4.5	14.3	5.8	-8.5
≥ 15 mph	0.8	1.6	+0.8	1.4	0.4	-1.0

Heavy vehicles included Federal Highway Administration (FHWA) classes 4 through 13 (FHWA 2001). Comparison results showed a 1.3 mph decrease in mean speed for eastbound traffic and a 2.2 mph decrease for westbound traffic. The 85th percentile speed decreased by 1 mph for eastbound traffic and 3 mph for westbound traffic.

The percentage of heavy vehicles exceeding the school zone speed limit by 5 or more and 10 or more mph decreased by 12.6 and 4.5 percent, respectively, for eastbound traffic, while the percentage exceeding the school zone speed limit by 15 or more mph increased by 0.8 mph. This latter increase, however, was not statistically significant at the 95 percent level of significance. The percentage of heavy vehicles exceeding the school zone speed limit by 5, 10, and 15 or more mph for westbound traffic decreased by 15.6, 8.5, and 1.0 percent, respectively. These differences were statistically significant.

Comparison for Start and Dismissal Separately

Differences in traffic speeds before and after installation of the signs were also evaluated for school start and dismissal times separately. The results of these comparisons are shown in Tables 4 and 5. For the most part, the two periods show moderate reductions in mean speeds, 85th percentile speeds, and the percentage of vehicles exceeding the school zone speed limit.

Table 4. 1 month results during school start times for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	3,743	4,087		2,642	2,551	
Mean (mph)	59.3	58.2	-1.2	59.3	57.7	-1.6
Standard deviation (mph)	5.2	4.9	-0.3	6.0	5.5	-0.5
85th percentile speed (mph)	65	63	-2	66	63	-3
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	45.1	35.3	-9.8	43.6	31.2	-12.4
≥ 10 mph	16.2	11.4	-4.8	19.5	10.7	-8.8
≥ 15 mph	2.2	1.9	-0.3*	6.3	3.2	-3.1

Table 5. 1 month results during school dismissal times for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	1,870	1,609		2,132	2,149	
Mean (mph)	60.4	59.0	-1.4	59.0	56.3	-2.7
Standard deviation (mph)	5.3	5.4	+0.1	5.9	5.1	-0.8
85th percentile speed (mph)	66	65	-1	65	61	-4
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	54.4	41.6	-12.7	40.2	21.3	-18.9
≥ 10 mph	23.9	17.2	-6.8	17.5	6.7	-10.9
≥ 15 mph	3.6	3.2	-0.5*	5.6	1.5	-4.0

7 Month Results

Comparison of Speeds Overall

The results of the comparison of speeds for all time periods (24 hour) are shown in Table 6. Mean speeds increased for the eastbound direction (1.3 mph) and decreased for the westbound direction (1.7 mph). The 85th percentile speeds increased for the eastbound direction by 1 mph, and the westbound direction saw a decrease in the 85th percentile speed of 1 mph. This finding suggests that possible relevant changes in speeds occurred that may have been independent of the signs.

Table 6. 7 month results for 24 hour period for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	24,296	22,719		24,338	24,509	
Mean (mph)	64.0	65.3	+1.3	64.7	63.0	-1.7
Standard deviation (mph)	5.0	5.5	+0.5	6.1	5.8	-0.3
85th percentile speed (mph)	69	70	+1	70	69	-1

Comparison for School Start and Dismissal Times

Speed differences between the periods before and 7 months after the new signs were installed were compared for school start and dismissal times (when the signs were active from 7:15 to 8:30 a.m. and 3:00 to 4:00 p.m.). The results of this comparison are shown in Table 7.

Table 7. 7 month results during school start and dismissal times for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	4,550	4,239		4,076	4,140	
Mean (mph)	59.7	60.1	+0.4	59.4	56.4	-3
Standard deviation (mph)	5.4	5.1	-0.3	6.0	5.2	-0.8
85th percentile speed (mph)	65	66	+1	66	62	-4
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	48.1	49.8	+1.8	43.2	24.0	-19.2
≥ 10 mph	18.9	20.0	+1.1*	19.5	7.5	-12
≥ 15 mph	2.9	4.6	+1.7	6.2	1.4	-4.8

Mean speeds increased by 0.4 mph for eastbound traffic and decreased by 3 mph for westbound traffic. The percentage of drivers exceeding the 55 mph school zone speed limit by 5, 10, and 15 or more mph increased by 1.8, 1.1, and 1.7 percent, respectively, for eastbound traffic and dropped by 19.2, 12, and 4.8 percent, respectively, for westbound traffic. All changes, except the eastbound increase for 10 mph or more over the speed limit, were statistically significant.

Speed differences for heavy vehicles before and after new sign installation were also evaluated. As shown in Table 8, heavy vehicle speeds decreased for all speed metrics in the westbound direction, while an increase in mean speed and the percentage of vehicles exceeding the speed limit was observed in the eastbound direction. These results were quite similar to those for all vehicles.

Table 8. 7 month results during school start and dismissal times for heavy vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	601	481		510	543	
Mean (mph)	59.0	59.5	+0.5*	58.3	55.1	-3.2
Standard deviation (mph)	4.9	4.8	-.1	5.3	4.5	-0.8
85th percentile speed (mph)	64	64	0	64	59	-5
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	44.6	45.9	+1.4	36.9	13.3	-23.6
≥ 10 mph	13.6	14.6	+1	14.3	2.9	-11.4
≥ 15 mph	0.8	2.1	+1.3	1.4	0.2	-1.2

A comparison of results for heavy vehicles showed a 0.5 mph increase in mean speed for eastbound traffic but the increase was not statistically significant. A 3.2 mph decrease was observed for westbound traffic. The 85th percentile speed saw no change for eastbound traffic and a 5 mph decrease for westbound traffic. The percentage of heavy vehicles exceeding the school zone speed limit by 5, 10, and 15 or more mph increased by 1.4, 1, and 1.3 percent, respectively, for eastbound traffic. None of these increases, however, were statistically significant at the 95 percent level of significance. The percentage of vehicles exceeding the school zone speed limit by 5, 10, and 15 or more mph for westbound traffic decreased by 23.6, 11.4, and 1.2 percent, respectively, with the percentage of vehicles 5 or more and 10 or more mph over the speed limit being statistically significant.

Comparison for Start and Dismissal Separately

Differences in traffic speeds before and 7 months after installation of the signs were also evaluated for school start and dismissal times separately. The results of these comparisons are shown in Tables 9 and 10. Overall speeds were slightly higher during morning arrival times than during afternoon dismissal times. Changes in speed for the two periods show reductions in mean speeds, 85th percentile speeds, and the percentage of vehicles exceeding the school zone speed limit for westbound traffic, as well as reductions during the afternoon dismissal period for eastbound traffic. The eastbound arrival period saw an increase in all speed metrics.

Table 9. Change in speed characteristics during school start times for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	3,743	3,905		2,642	2,690	
Mean (mph)	59.3	60.1	+0.8	59.3	56.9	-2.4
Standard deviation (mph)	5.2	5.0	-0.2	6.0	5.2	-0.8
85th percentile speed (mph)	65	66	+1	66	62	-4
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	45.1	49.9	+4.8	43.6	25.4	-18.2
≥ 10 mph	16.2	19.3	+3.1	19.5	8.4	-11.1
≥ 15 mph	2.2	4.0	+1.8	6.3	1.8	-4.5

Table 10. 7 month results during school dismissal times for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	1,870	1,343		2,132	2,173	
Mean (mph)	60.4	60.0	-0.4	59.0	56.1	-2.9
Standard deviation (mph)	5.3	5.2	-0.1	5.9	5.2	-0.7
85th percentile speed (mph)	66	65	-1	65	61	-4
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	54.4	49.3	-5.1	40.2	22.7	-17.5
≥ 10 mph	23.9	18.8	-5.1	17.5	7.0	-10.5
≥ 15 mph	3.6	4.5	+0.9*	5.6	1.1	-4.5

14 Month Results

Comparison of Speeds Overall

The results of the comparison of speeds for all time periods (24 hour) are shown in Table 11. Mean speeds increased for the eastbound direction (2.7 mph) and decreased for the westbound direction (0.3 mph). The 85th percentile speeds increased for the eastbound direction by 3 mph, while the westbound direction saw no change. This finding suggests that possible relevant changes in speeds occurred that may have been independent of the signs.

Table 11. 14 month results for 24 hour period for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	24,296	11,764		24,338	8,341	
Mean (mph)	64.0	66.7	+2.7	64.7	65.0	-0.3
Standard deviation (mph)	5.1	5.6	+0.5	6.1	5.7	-0.4
85th percentile speed (mph)	69	72	+3	70	70	0

Comparison for School Start and Dismissal Times

Speed differences between the periods before and 14 or 15 months after the new signs were installed were compared for school start and dismissal times (when the signs were functioning from 7:15 to 8:30 a.m. and 3:00 to 4:00 p.m.). The results of this comparison are shown in Table 12.

Table 12. 14 month results during school start and dismissal times for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	4,550	2,417		4,076	1,375	
Mean (mph)	59.7	62.0	+2.3	59.4	58.8	-0.6
Standard deviation (mph)	5.4	5.5	+0.1	6.0	4.5	-1.5
85th percentile speed (mph)	65	68	+3	66	64	-2
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	48.1	64.0	+15.9	43.2	38.3	-4.9
≥ 10 mph	18.9	31.1	+12.2	19.5	12.9	-6.6
≥ 15 mph	2.9	9.6	+6.7	6.2	5.1	-1.1*

Mean speeds increased by 2.3 mph for eastbound traffic and decreased by 0.6 mph for westbound traffic. Speeds increased overall for the eastbound direction of traffic, so this may reflect a general increase in speed independent of the signs. The percentage of drivers exceeding the 55 mph school zone speed limit by 5, 10, and 15 or more mph increased by 15.9, 12.2, and 6.7 percent, respectively, for eastbound traffic and dropped by 4.9, 6.6, and 1.1 percent, respectively, for westbound traffic. All changes, except the decrease in the percentage of westbound vehicles exceeding the speed limit by 15 mph, were statistically significant.

Speed differences for heavy vehicles before and after new sign installation were also evaluated as shown in Table 13.

Table 13. 14 month results during school start and dismissal times for heavy vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	601	290		510	181	
Mean (mph)	59.0	60.7	+1.7	58.3	57.6	-0.7*
Standard deviation (mph)	4.9	4.8	-0.1	5.3	4.9	-0.4
85th percentile speed (mph)	64	66	+2	64	63	-1
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	44.6	55.5	+10.9	36.9	26.0	-10.9
≥ 10 mph	13.6	21.0	+7.4	14.3	7.2	-7.1
≥ 15 mph	0.8	4.5	+3.7	1.4	1.7	+0.3

Heavy vehicle speeds increased slightly for the eastbound direction of traffic. However, speeds increased overall for the eastbound traffic independent of the signs. Decreases were noted for all speed metrics for the westbound direction, except for the percentage of vehicles traveling 15 mph or more over the speed limit.

A comparison of results showed a 1.7 increase and a 0.7 mph decrease in mean speed for eastbound and westbound traffic, respectively. However, the decrease in speed for the westbound traffic was not statistically significant. The 85th percentile speed increased by 2 mph for eastbound traffic and decreased by 1 mph for westbound traffic.

The percentage of eastbound heavy vehicles exceeding the school zone speed limit by 5, 10, and 15 or more mph increased by 10.9, 7.4, and 3.7 percent, respectively. All of these increases were statistically significant.

The percentage of westbound vehicles exceeding the school zone speed limit by 5 and 10 or more mph decreased by 10.9 and 7.1 percent, respectively, while the percentage of vehicles exceeding the school zone speed limit by 15 or more mph increased by 0.3 percent.

Comparison for Start and Dismissal Separately

Differences in traffic speeds before and 14 months after installation of the signs were also evaluated for school start and dismissal times separately. The results of these comparisons are shown in Tables 14 and 15. Mean speeds for westbound traffic were slightly higher during morning arrival times than during afternoon dismissal times, with the opposite being true for eastbound traffic. Changes in speed metrics for the two periods show increases in mean speed, 85th percentile speed, and number of vehicles a certain threshold over the limit for eastbound traffic. Modest reductions were noted for westbound traffic for all speed metrics. The decreases in vehicle traveling 5 and 15 or more mph over the school zone speed limit were not statistically significant for school start times for westbound traffic.

Table 14. 14 month results during school start times for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	3,743	1,947		3,642	618	
Mean (mph)	59.3	62.1	+2.8	59.3	59.1	-0.2
Standard deviation (mph)	5.2	5.4	+0.2	6.0	5.7	-0.3
85th percentile speed (mph)	65	68	+3	66	65	-1
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	45.1	64.5	+19.4	43.6	40.1	-3.5*
≥ 10 mph	16.2	30.4	+14.2	19.5	15.0	-4.5
≥ 15 mph	2.2	7.8	+5.6	6.3	6.1	-0.2*

Table 15. 14 month results during school dismiss times for all vehicles

	EB Before	EB After	Change	WB Before	WB After	Change
Observations	1,870	470		2,132	757	
Mean (mph)	60.4	61.6	+1.2	59.0	58.6	-0.4*
Standard deviation (mph)	5.3	5.8	+0.5	5.9	5.3	-0.6
85th percentile speed (mph)	66	68	+2	65	64	-1
Percentage exceeding posted school speed limit (55 mph)						
≥ 5 mph	54.4	62.1	+7.7	40.2	36.6	-3.6
≥ 10 mph	23.9	29.4	+5.5	17.5	11.0	-6.5
≥ 15 mph	3.6	9.1	+5.5	5.6	4.1	-1.5

Conclusions

Overall, the dynamic, electronic school zone speed limit signs were more effective at reducing traffic speeds during the 1 month period after installation than the original signs. The newer signs were effective for both directions of traffic and for both the school start and dismissal times. At the 7 month and 14 month after period, increases in speed were observed at the eastbound sign.

Data were also compared for a 24 hour period to serve as a control to assess whether speed changes had occurred that were independent of the sign installation. Speeds for the 24 hour period increased for the 7 and 14 month after periods and were similar to the increases seen during school start and dismissal times. This suggests that the signs were not effective at 7 and 14 months for eastbound traffic but the speed increases were not related to the signs.

The results of the data analysis showed that the signs were effective for westbound traffic during the 1 month, 7 month, and 14 month after periods. The results also showed that the impact was similar for the westbound sign for the 1 month and 7 month after periods. The smallest effect was noted during the 14 month after period. These findings indicate regular drivers of the expressway may become complacent with the sign.

Heavy truck speeds were compared separately for school start and dismiss times. Results show that heavy truck speeds increased or decreased at a similar rate as all vehicles. This suggests that truck drivers were not more likely to react to the signs.

Although only modest changes in mean and 85th percentile speeds occurred after the new signs were installed, the number of vehicles exceeding the school zone speed limit decreased significantly, indicating the newer signs had a very positive impact on high-end speeders for the time periods when decreases were noted.

Given this stretch of US 30 near the school is on three of Iowa's six* top five percent maps in its Most Severe Safety Needs Report, speed reductions along this expressway are needed to help reduce traffic fatalities and serious injuries on Iowa's public roads (Iowa DOT 2010).

* The seventh top five percent map for this period includes curves, only.

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