

FINAL REPORT
AP STATISTICS CLASS 2018-2019
DIESEL TRUCK COUNTING PROJECT

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Survey

The former site of the Crawford coal power plant, located on 34th and Pulaski, is scheduled to be converted to a distributing warehouse. Additionally, there is a new warehouse located on 33rd and Pulaski Rd. and another at 26th street and Kostner Ave. Each of these warehouses bring more diesel trucks through our neighborhood.

En el previo sitio de la planta de energía de Crawford, ubicada en la 34 y Pulaski, está planeada en convertirse en un almacén de distribución. Adicionalmente, corporaciones han establecido otros sitios de almacenamiento de distribuciones en la 33 y Pulaski y otra en la 26 y Kostner. Cada uno de estos sitios trae más camiones de diesel a nuestro vecindario.

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Prior to reading the information listed above, were you aware of the increase of diesel trucks in the neighborhood? *

¿Antes de leer la información de arriba, había usted notado un crecimiento en el número de camiones de diesel que pasan por nuestro vecindario?

yes/ si

no

Do you believe the expansion warehouses will benefit the Little Village Community members? *

¿Cree que la expansión de almacenes beneficia a los miembros en la comunidad de la Villita?

Do you or any of your family members suffer from asthma or other respiratory ailments and/or chronic health issues that are aggravated by asthma and respiratory issues? *

Alguno de sus familiares sufren de asma o de otras enfermedades relacionadas con las vías respiratorias?

Yes

No

Do you think that the rise in the number of diesel trucks traveling through Little Village community provide a safety threat? *

Usted cree que el incremento en el numero de camiones diesel que navegan por la villita amenazan nuestra seguridad?

Yes

No

Do any of your family members in the Chicagoland area drive diesel trucks as part of their job? *

¿Hay algún familiar suyo que maneje un camión de diesel dentro de la zona metropolitana de Chicago como parte de su trabajo?

Yes

No

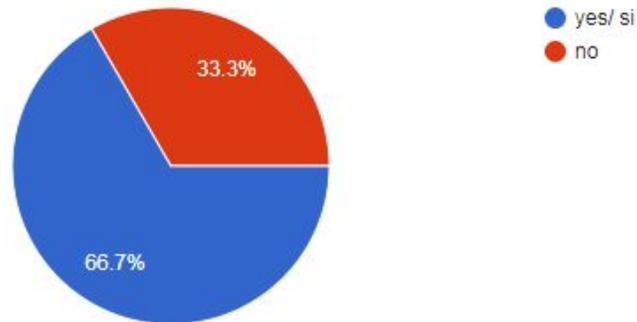
How many car accidents involving diesel trucks have you witnessed in the Little Village community throughout the last year? *

¿Cuántos accidentes automovilísticos involucrando un camión de diésel ha presenciado en la comunidad de La Villita durante el último año?

SURVEY QUESTION 1 (*Kevin*)

Prior to reading the information listed above, were you aware of the increase of diesel trucks in the neighborhood?

75 responses



This question was given to the sample respondents after reading the opening passage to ask if they had known about the diesel truck epidemic. We took samples of people at a report card pick-up where there would be an influx of potential survey takers giving us a large sample.

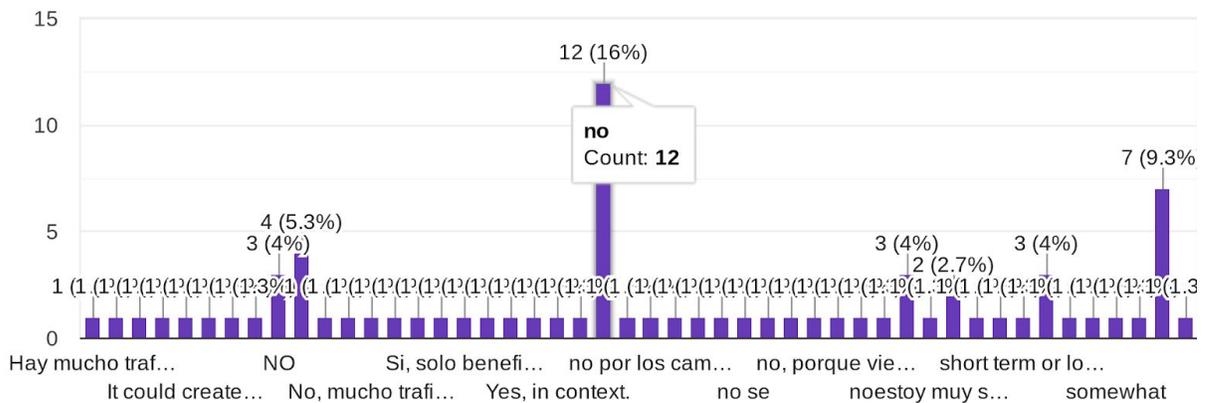
Although 2 out of 3 respondents had claimed that they had known about the diesel trucks, I believe this happened once the subject was brought up, via the passage, they THOUGHT they had noticed the change, but that is how the brain works. This would not be a problem if we ask them the question first and then read them the passage, this should then be an unbiased survey. The question could be rephrased into “Do you believe there is a CHANGE (as in increase or decrease) in the amount of diesel trucks in the neighborhood?”

SURVEY QUESTION 2 (Jose and Aldo)

Do you believe the expansion warehouses will benefit the Little Village Community members?

Do you believe the expansion warehouses will benefit the Little Village Community members?

75 responses



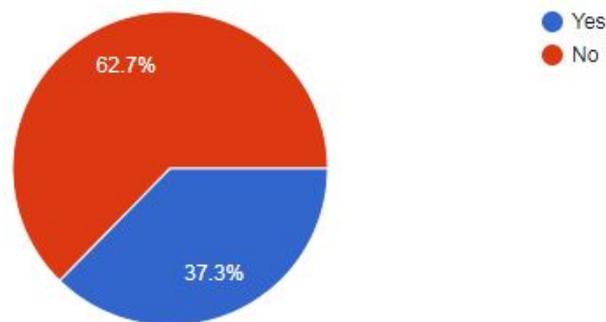
The question asked was designed to get a better view of the opinions that the Little Village people had to say. We conducted a simple random sample of size 75 people and asked them whether they thought that the warehouses had benefits or negative effects to them, however, later on we added an unsure classification due to some people not being sure.

In our sample of 75 participants, 20 expect positive effects by the recent warehouse expansions to occur to the people of Little Village. Some participants noted that some benefits of warehouse expansions might be the increase in jobs and the economy within Little Village. In the meantime, 47 participants expect negative effects to come to little village due to the warehouse expansions. Some participants said that some negative effects of warehouse expansion that might happen are the increase in pollution in which might increase the risk of asthma. Lastly, 8 participants responded with being unsure whether the effects would be positive or negative. Most of the unsure responses acknowledged the positive and negative effects but they couldn't decide. We would change the question to multiple choice answers rather than open response. This is because it would make gathering data more simpler.

SURVEY QUESTION 3 (Angel)

Do you or any of your family members suffer from asthma or other respiratory ailments and/or chronic health issues that are aggravated by asthma and respiratory issues?

75 responses



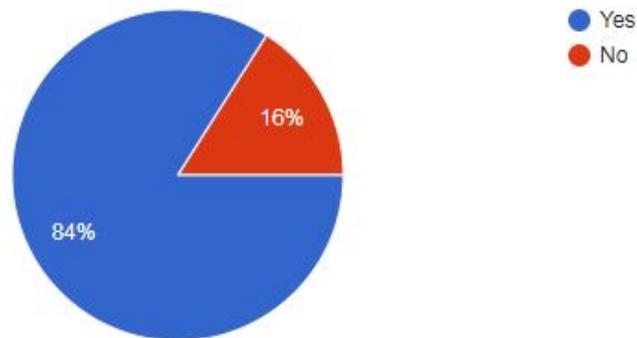
In our study, we asked the community a couple of questions. One of the questions we asked concerns about their respiratory health of their loved ones and themselves. 62.7% of 75 people said that they don't have or don't know someone that has respiratory illnesses. The other 37.3% have or don't know anyone that has a respiratory illness. This information was gathered during report-card pickup by convenience sampling at Infinity Math Science & Technology High School. This creates a biased set of data gathered, and since most of the surveyed were parents this can also factor in the fact that they'd have a higher chance of having a respiratory illness.

62.7% of community members say that they don't have or don't know someone that have a respiratory ailment and/or chronic health issues such as asthma. While only 37.3% of people have or know someone with a respiratory illness. Now, 37.3% is a lot and we should definitely be alarmed by this. The reason for this is the pollution problem that Little Villita has. In the past the Crawford Power Plant, and other factories in the surrounding area were the main causes for the decay in quality of the air. After the Crawford Power Plant was shut down there's plans to tear down the old plant to build a warehouse at 33rd and Pulaski. This is a problem because it'll increase the, already large, amount of trucks coming and going through the neighborhood. These trucks are emitting NOx gases (Nitrogen Dioxide) into the air, these gases cause smog and acid rain. Not only that, but they also create fine particles in the air, which are associated with causing asthma and heart disease.

SURVEY QUESTION 4

Do you think that the rise in the number of diesel trucks traveling through Little Village community provide a safety threat?

75 responses



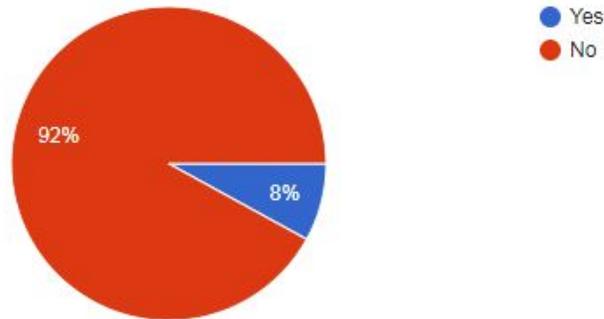
Our study is all about the safety threats and controversy revolving the amount of diesel trucks in our neighborhood, La Villita. One of the questions we asked community members (majority parents) was their opinion on this situation. Out of 75 people, 84% of them agreed that the rise in diesel trucks over the years provides a safety threat in La Villita while the other 16% don't agree. All of the information was gathered during report card pick-up for the students at Infinity High School by doing a convenience sample.

We think that a majority of the community thought it was a safety concern due to the fact that many trucks do pass by and can cause accidents. A new warehouse is being built where an old factory shut down by 33rd and Pulaski. The warehouse can potentially offer new jobs for the community but we're not sure who is getting them, how many are available, and the risks that can potentially come along with driving a diesel truck around. Some of the problems a truck driver could face are back problems, sleep deprivation, obesity, and depression/isolation. These health problems can be caused simply by being a long-time truck driver. Because of the amount of trucks around the community and a new warehouse being built, we could see the rise of pollution over time. This will only contribute to the pollution issues we face today. Asthma, lung cancer, and heart diseases can all be caused by air pollution and is a threat to the community. Residents in La Villita have noticed the amount of diesel trucks passing by 31st and Pulaski Rd, 26th and Kostner, and 31st and Kostner and so far with the information we have it's not looking like a bright future.

SURVEY QUESTION 5 (Juan)

Do any of your family members in the Chicagoland area drive diesel trucks as part of their job?

75 responses



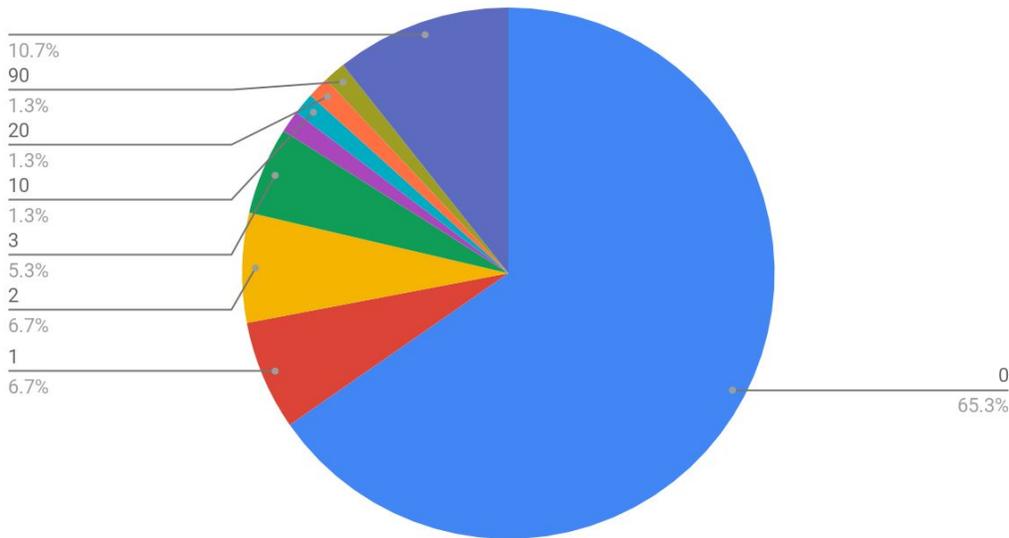
The idea for this survey is to see if people are generally aware of the amount of diesel trucks in the Little Village area. Before community members were asked to take the survey, we told them to read the information above to give sort of a background of the situation and the purpose of the project. One of these questions for example, was the 5th one where it was asking if any of the community members know any family members who drive diesel trucks as their a job. According to the pie chart, 92% of the respondents said they don't know any family member who drives diesel trucks while the 8% said yes.

It isn't easy to become a diesel truck driver. To begin with, you have to get a driver's license beyond the regular one that specializes with driving with trucks. It's recommended to take a school specializing in driving these trucks so you can obtain a driver's license called a CDL (Commercial Drivers License). With the license you can drive heavier trucks such as semi trailers and dumpster trucks. But it's expensive, getting into a full program is an estimation of \$3,000 to \$7,000. According to a website called niche, 37% of the Little Village community gets paid an yearly salary of under \$25k. In order to get a driver's license as an Illegal immigrant, you are required to prove you are authorized to be in the country, provide a valid passport or ID, pass vision, written and road exams, proof of insurance and proof of completing an adult driver course education. (Information provided is by illinoislegalaid.com)

SURVEY Question 6: (Maria and Amy)

How many car accidents involving diesel trucks have you witnessed in the Little Village community throughout the last year?

Number of diesel truck accidents in Little Village



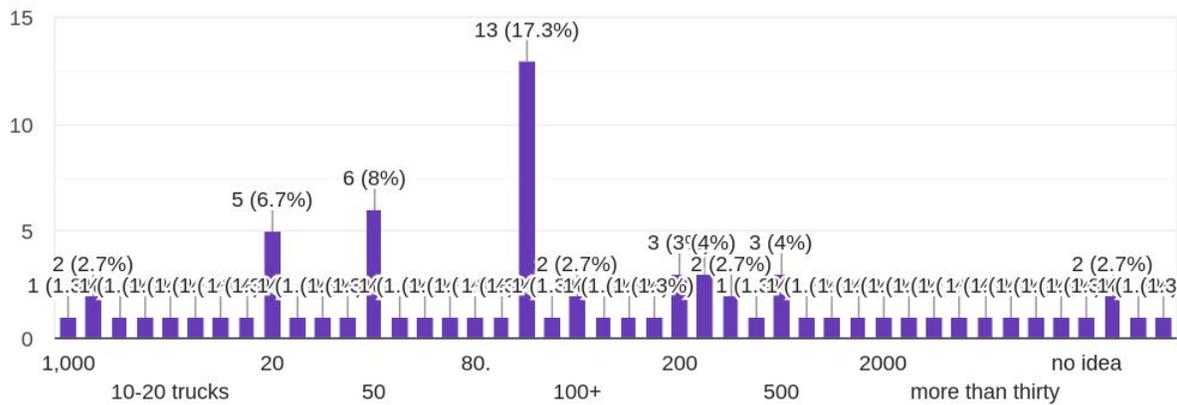
In our study we asked the parents in the community during a parent teacher conference if they knew on average the number of diesel truck accidents that occurred last year. This is the results we got from a survey we asked them to answer that same day. The minimum number accidents that parents thought occurred was 0, while the maximum was 90. The median or middle number of accidents was 4. On average the total mean number of accidents the parents thought of was about 16 accidents from the sample size of 75 parents. There were occasions where the parents preferred not to give a guess and just answered that they didn't know. That is the 10%(1 out of 10 people) of the sample we took in the surveys. Besides that 66% (2 out of 3 people) said they saw no accidents, 6% (3 out of 50) said only 1 accident, 7% said 2 accidents 5% (1 out of 20 people) said 3 accidents, 1% said 10 accidents, 1% said 20 accidents, and 1% said 20 accidents. With the results we got the answer of 90 accidents is an outlier, which means that the answer might've been influenced in a certain way to give such a drastic high number.

From this information we can see that it is a biased sampling distribution meaning this favors the least amount of car accidents rather than the most. It favors more the 0 car accidents because it was a convenience sample we took. This sample does not represent all possible samples of car accidents witnessed with a small sample number of 76. Based on this we can see that most parents are unaware of the accidents, or have never witnessed any accidents while others seem to

have witnessed a few car accidents. The outlier being 90 affects the mean making it a 16.37 amount of accidents witnessed. While if we were to take this outlier out it will give us an average of 5.85 diesel truck accidents witnessed. So we won't have big outliers in our data we could do this survey again we would make it a multiple choice , 0, 1-5, 6-10, 11-20, 21-25. This would help us get a more general idea and representation of the number of accidents witnessed by Little Village parents and without having outliers affecting our data.

Question 7: (Brianna and Bryanna)

On average, how many diesel trucks do you think pass the intersection of 31st and Kostner Ave. daily (every 24 hours)?



For our project, we surveyed 75 people on multiple questions about diesel trucks. For this question specifically, we asked how many trucks the participants think pass through the intersection of 31st and Kostner Ave every 24 hours. We got a variety of responses ranging from 2 to 2,000 diesel trucks per 24 hours. Based on the data we have collected the most occurring guess was 100 diesel trucks per 24 hours. The average number of trucks we got from participants guesses was 207 diesel trucks per 24 hours. We also have gotten some responses in which participants didn't know how to respond. We also had some responses that weren't specific enough that would interfere with our data, but about 10 individuals said they "didn't know" or "a lot". We also didn't want to leave out the "a lot" and "I don't know" responses because we didn't want there to be any bias. These individuals didn't give a quantitative response but still had an idea that there were multiple trucks that passed by the intersection. We already have an approximate number that passed by in the morning or afternoon but within an hour. We can use statistics to predict about how many trucks will cross or pass the intersection of Kostner & 31st within 24 hours. Then we can see if the individuals were far from the statistics or close them.

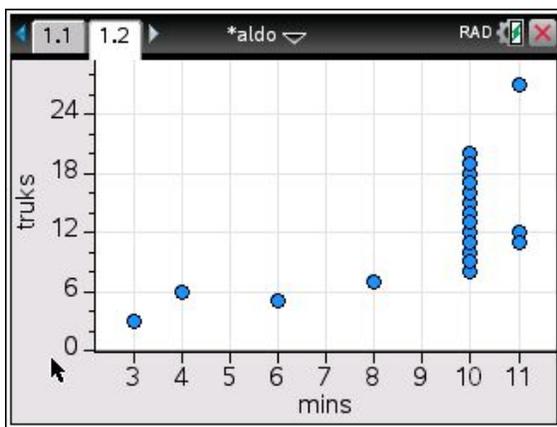
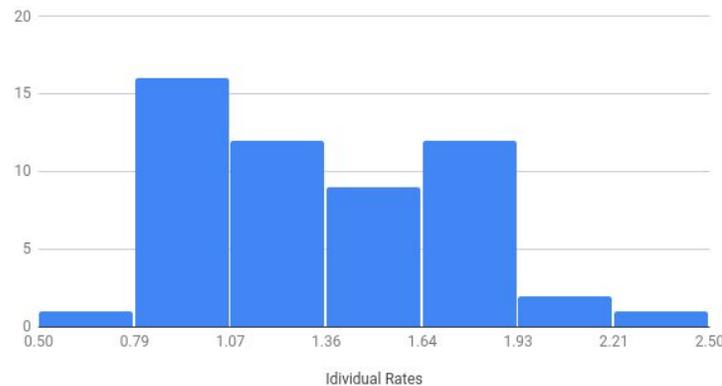
Since there were about 10 “I don’t know” and “a lot” responses, we can modify the question by including “must be a number” in parenthesis.

Diesel Truck Counting Analysis Location 1
31st and Kostner

The results in our data show that there are 1.311 trucks per minute that go through the intersection of Kostner and 31st. If we multiply 1.311 trucks per minute by 10, then it means that there are 13 trucks per 10 minutes. Using the same technique we found that about 78 trucks pass through this intersection every hour. During one day, we calculated 1887 trucks pass through the intersection of 31st and Kostner. For 25% of our data, which is quartile 1, we got 10 trucks and for 75% of our data, which is quartile 3, we got 17 trucks. The IQR is acronym for inter quartile range being $75\% - 25\% = 50\%$. The IQR was 7 trucks which tells us that 50% of our data showed 7 trucks. For the maximum trucks that we calculated was 27 trucks and for the minimum we got 3 trucks. The mean of our data is 13 trucks and the standard deviation of our data was 4.57. The standard deviation tells us that the average number of trucks away from the mean was 4.57 trucks.

	C rate	D	E	F
=			=OneVar(
8	0.93	MinX		3.
9	0.906	Q ₁ X		10.
10	2.39	MedianX...		13.
11	1.087	Q ₃ X		17.
12	1.2	MaxX		27.

Histogram of Individual Rates

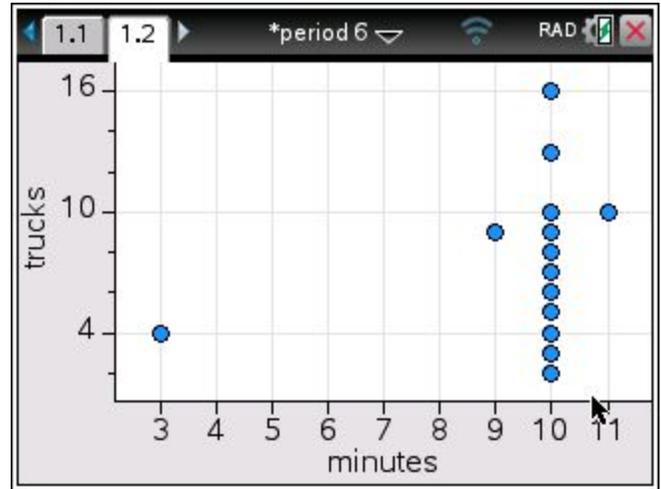


When we took a look at the data, observed that throughout the day the amount of truck would decrease. Most of our trials were 10 minutes long and were a total of 53 trials. The rate for trucks per minute was approximately 1.35 trucks per

minute. We determined these results by converting the number of minutes to seconds then from there we covered them back to minutes. We got a total of 509.88 minutes. From here we divided the total number of trucks (688) by the total number of minutes (509.88).

Diesel Truck Counting Analysis Location 2
26th and Kostner Ave.

In this study we observed the amount of trucks that passed the intersection 26th and Kostner Ave. We did this for every 10 minutes from a total of 534.63 minutes. We observed 53 videos each of them with a length of approximately 10 minutes each as shown in the scatterplot. There is only 14 dots because some videos from the same day were less than 10 minutes, so we combined them. During this time we counted approximately 354 trucks. With a rate of .67 trucks per minute, or approximately 1 truck every minute. Two years ago students found the rate to be 1.5 trucks per minute, while last year had 1.3 trucks per minute, compared to these results our intersection had a lower rate of .67 trucks per minute. The results gave us an average of 6.68 trucks every ten minutes and 40.08 trucks per hour. We got 4.5 trucks for quartile 1 that represents 25% of the total trucks and quartile 3 was 9 that regards to 75% of the trucks. The interquartile range was 5 trucks. Our data didn't have any outliers because when we used the 1.5 rule we got a lower bound of -2 trucks by subtracting $(1.5 * IQR)$ or 6.75 from quartile 1 (4.5 trucks), and an upper bound of 16 by adding $(1.5 * IQR)$ to quartile 3 (9 trucks). In order for it to



	C	D	E	F
	rate			=OneVar(
8	0.7	MinX	2.	
9	0.2	Q ₁ X	4.5	
10	0.5	MedianX...	6.	
11	0.4	Q ₃ X	9.	
12	0.6	MaxX	16.	

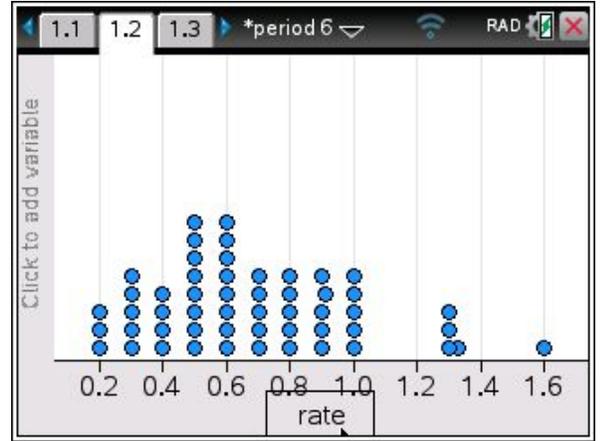
be an outlier it had to be less than the lower bound or greater than the upper bound which didn't occur. We got a minimum of 2 trucks which is the least number that we counted. We also got a maximum of 16 trucks that's the most we counted in a video. And our median was 6 trucks which is the middle number of trucks we counted from all the videos. The standard deviation of our data was about 3 trucks, this means that on average if we were to count trucks in our intersection the result would be 3 trucks away from our mean that is about 7 trucks. We are 95% confident that the interval from (.356) to (.983) captures the true mean value of trucks that pass by about every 10 minutes. A confidence interval are two values that capture the true parameter at a certain percentage. In this case, 95% that all samples of size 354 from this population will

result in an interval that captures the unknown average of trucks that pass by every 10 minutes at 26th and Kostner.

When you glance at the data, we knew that the majority of it was going to be less trucks per minute. Most of the trials were in range of 10 minutes with a total of 53 videos.

Because we have less trucks per minute, the rate for trucks/minute was going to be a decimal (.67). In order to get the total average, we summed up the total count for trucks, added the minutes, and divided trucks/minutes. The total truck count we got was approximately 354 trucks and the total minutes was 534.63. From the data we were given we noted that perhaps the length of the videos may have had an effect on the data received since we had some videos that

were less than 10 minutes. The 53 videos that we got our data from were all in 5 days. This might have an affect on the amount of traffic that there was within the recording, thus affecting the amount of trucks that were present. The traffic throughout the 5 days might've had a potential effect on the average amount of diesel trucks that passed by. Last year, the other students had 2 weeks worth of videos to get data from compared to our 5 days worth of data but they only had to focus on one street compared to the 3 streets that the whole class had to observe.



Diesel Truck Counting Analysis Location 3
31st and Pulaski Rd.

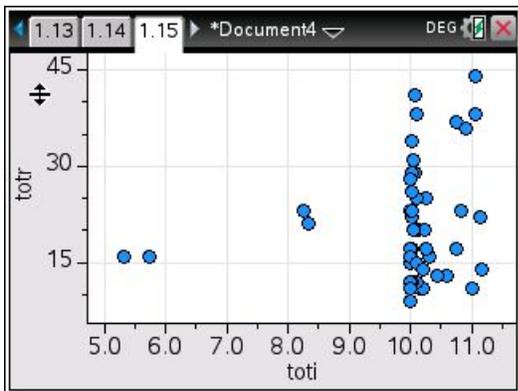
In order to understand each one of the images shown below. It is better to explain our method of finding the average amount of trucks for the days we have calculated. In order to find the average. What we had to do for starters is put in the number of trucks that were found in each video separate from each other. The way we separated them was by day. After that we typed into the calculator menu, Statistics, Stat Calculations and then One-Variable Statistics. Typing this in gave us multiple things. For example, the sum of all the trucks in monday, Tuesday, Thursday and Friday. This also worked with time. However, the issue we ran into at first was that we had to convert the seconds into decimals. The method we used is divide the number by 60 seconds. An example can be 20 seconds/ 60 seconds. That made the conversion easier. After that we repeated the same process we did with the trucks and found the average time or X bar. After doing so, we divided the average amount of trucks by the average time of every video. The final result would be the average amount of trucks passing by per minute. Here are our findings below. On Monday, an average of 1.52 trucks pass by every minute. On Tuesday, the average amount of trucks passing by is 2.02 trucks per minute. The Thursday truck average is 2.8 trucks per minute. The Friday Truck Average is 2 trucks per minute. The overall truck average was is 2.09 trucks per minute.

A	toti	B	C	D
=				=OneVar(
1	10.76		Title	One-Va...
2	10.31		\bar{x}	9.99694
3	10.03		Σx	489.85
4	10.13		Σx^2	4952.36
5	10.83		$s_x := s_n...$	1.07396

D1 = "One-Variable Statistics"

A	totr	B	C	D
=				=OneVar(
2	16		\bar{x}	20.8776
3	17		Σx	1023.
4	20		Σx^2	25305.
5	23		$s_x := s_n...$	9.06833
6	23		$\sigma_x := \sigma_n...$	8.97532

A2 16



When looking at the data you'd see that the videos tended to be around 10 minutes and in that short time there'd be a large amount of trucks that drove by. This would explain the large rate of trucks per minute when compared to the other intersections. Now, a factor for why there were so many trucks could be that there could be warehouses that are nearby this intersection. This can be the case since the industrial zone is closer to this intersection, so that can explain the large amount of trucks passing by. One other thing to note is the days and the time. Some days had more trucks pass by compared to others, and for those days more passed by during the morning than in the afternoon. This would explain with some differences in the rate of trucks per minute for some days since traffic can affect the amount of trucks that pass by per day.