

Impact Analysis of Implementing School Safe Zones (Case Study: ZoSS at SMPN 15 Padang and MTsN 1 Padang)

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Received 19th April 2024; Revision 18th May 2024; Accepted 24th June 2024

ABSTRACT

The Padang city government has implemented the ZoSS program for two schools located close to each other in Koto Tengah District, namely SMPN 15 Padang and MTsN 1 Padang located on Jalan Adinegoro, Batipuh Panjang District. However, the function of the presence of ZoSS in these two schools is considered to be ineffective because there are still many motorbike drivers who travel at speeds exceeding the permitted speed limit when crossing the ZoSS area, even though the facilities are in accordance with the Director General of Land Transportation's regulations Number: SK3582/AJ.403/DRJD/2018. Therefore, the research aims to review the impact of implementing ZoSS on the speed of motorized vehicles and the characteristics of road crossing behavior on ZoSS in this area. The data used was obtained by conducting surveys and direct observations in the field. The survey carried out included a survey of instantaneous speed data (spot speed) of vehicles when crossing the ZoSS, and a survey of the characteristics of road crossing behavior on the ZoSS. after school. The results of the research concluded that the implementation of the ZoSS program at SMPN 15 Padang and MTsN 1 Padang, located on Jalan Adinegoro, was considered ineffective in terms of motor vehicle speed, because it exceeded the maximum speed limit (30 km /hour) when crossing the ZoSS with an average speed of 46.75 km/hour with the percentage of vehicles complying with the permitted speed still below 50%, and the behavior of pedestrians when crossing in the ZoSS area is categorized as "not yet safe" so there is the potential for accidents. Regulation.

Keywords: *ZoSS; Vehicle Speed; Pedestrian Behavior.*

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INTRODUCTION

Traffic accidents can occur and involve all groups, including students who are considered a group of road users who are less experienced and tend to be less careful. Based on data [1] shows that 80,641 high school students were registered as accident victims, while 17,699 junior high school students and 12,557 elementary school students. The profile of accident victims based on age mostly occurs in the 10-19 year age group with a record of 26,906 people. In order to reduce the number of accidents, the intervention of all parties is needed. It is not only the government and police that issue regulations, but users must be able to behave socially when driving so that traffic discipline can be achieved. One form of traffic management that aims to improve safety and provide a sense of security for road users, especially pedestrians, when crossing the road in the school environment is the implementation of the School Safe Zone (ZoSS). The implementation of the ZoSS program was issued by [2], then followed up by [3] which stated that ZoSS was implemented throughout Indonesia. ZoSS is a traffic control

activity that is equipped with supporting facilities so that it can regulate the speed of vehicles passing through the area. The speed limits at ZoSS locations are 20 km/h, 25 km/h, and 30 km/h [4] and [5].

Padang City is one of the large cities that has experienced a fairly high increase in the number of motorized vehicles. Conditions like this show that every day students have the potential to experience accidents while in the school environment. Research conducted [6] states that the speed of vehicles passing through the ZoSS area does not correspond to the permitted speed. In line with research [7] shows that the behavior of road crossings is still categorized as 'potential for accidents' with the percentage of students who cross not following procedures being 86.63%.

In the city of Padang, there are two schools located close to each other in Koto Tengah District, namely SMPN 15 Padang and MTsN 1 Padang located on Jalan Adinegoro, Batipuh Panjang District. At the location of the two schools the ZoSS program has been implemented by the Padang City Government. The aim is to realize protection for pedestrian crossings in traffic safety in the school environment. The ZoSS applied to this area is a plural ZoSS, namely ZoSS which is determined if there is more than 1 (one) school close to each other (Figure 1). The implementation of the ZoSS program is not only that these two schools are located on the side of the main road, but they are also in accordance with the requirements for implementing ZoSS, these two schools have more than 50 students, SMPN 15 Padang (613 students and 38 teachers), MTsN 1 Padang (915 students and 64 teachers)[8].

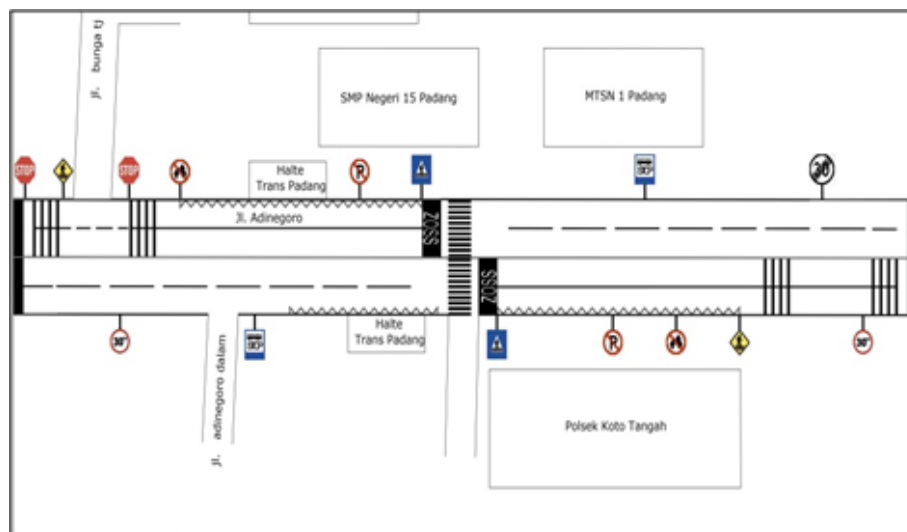


Figure 1. Location of ZoSS on Jalan Adinegoro

In Figure 1, you can see the locations of SMPN 15 Padang and MTsN 1 Padang facing the main road. The high volume of motorized vehicles passing through this area often makes it difficult for students to cross the road around the school. In addition, students' lack of knowledge regarding procedures when crossing the road is also a factor that can give rise to the potential for traffic conflicts and create opportunities for accidents. Therefore, it is very necessary to analyze the impact of implementing ZoSS, which will later affect the safety of students in the school environment. This research aims to determine the speed of vehicles when crossing ZoSS and the characteristics of pedestrian behavior on ZoSS using [5].

MATERIALS AND METHODS

The stages of this research are literature study, field observation, data retrieval and collection. Field observation _ carried out directly to find out the problem to be discussed, and in determining the location of the survey and the placement of surveyors in collecting research data. Data collection in the field was carried out by 4 (four) surveyors and the positioning of the surveyors can be seen in Figure 2 .

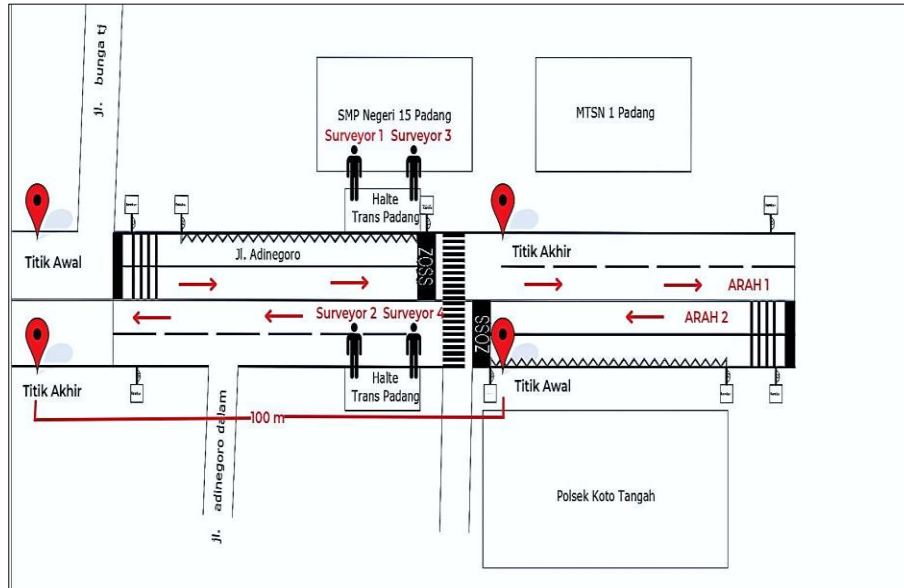


Figure 2. Surveyor Position

The primary data used in this final project includes several data , namely, local speed data (spot speed) of vehicles, data on the characteristics of road crossing behavior on ZoSS, while secondary data in the form of references, regulations and data on the number of students and teachers at SMPN 15 Padang and MTsN 1 Padang.

Data processing and analysis is carried out in several steps, the final results of which are compared with [5].

- Calculate the instantaneous speed of the vehicle according to the type of vehicle (SM, KR, and KB) for each direction with the formula:
Speed = (Mileage)/(Travel Time) [9]
- Calculate the average vehicle speed when crossing ZoSS according to vehicle type (SM, KR, and KB) for each direction with the formula:
Average Speed = (Sum Vehicle Speed)/(Sum Vehicle)
- Calculate the percentage of vehicles that meet the maximum speed limit using the formula:
% = (Sum Vehicles That Meet the Maximum Subdistrict) /(Sum Vehicles)
- Analyze the behavior of road crossers that comply with procedures and those that do not comply with procedures using the Z test [2].

$$Z_{hit} = \frac{P - 0,5}{\sqrt{\frac{P(1-P)}{n}}}$$

Information:

$$P = \frac{\sum \text{Kelompok}}{n} \quad P = \text{Average score} \quad n = \text{Number of samples} \quad Z = \text{Test value.}$$

If the confidence level is 95%, then the Z table value = 1.645

RESULTS AND DISCUSSION

Based on data obtained from field surveys, after tabulating every 15 minutes, processing was obtained with the following results:

1. Instantaneous Speed of Vehicle (km/hour)
 Instantaneous vehicle speed according to vehicle type (SM, KR, and KB) for each direction each survey day.
2. Average vehicle speed (km/h)
 Average vehicle speed when crossing ZoSS according to vehicle type (SM, KR, and KB) for each direction each survey day. The results can be seen in Figure 3-8.

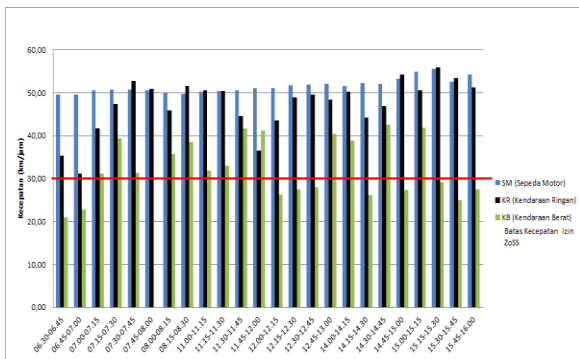


Figure 3. Average Vehicle Speed Graph Day 1 To City Center

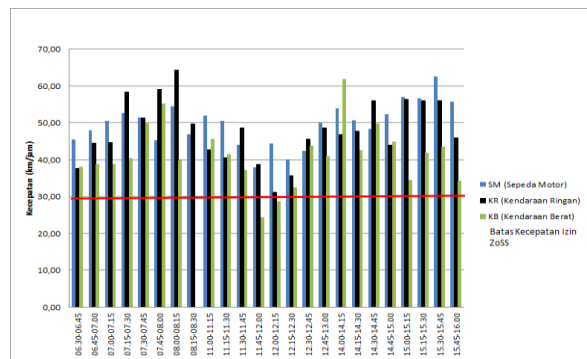


Figure 4. Average Vehicle Speed Graph Day 1 From City Center

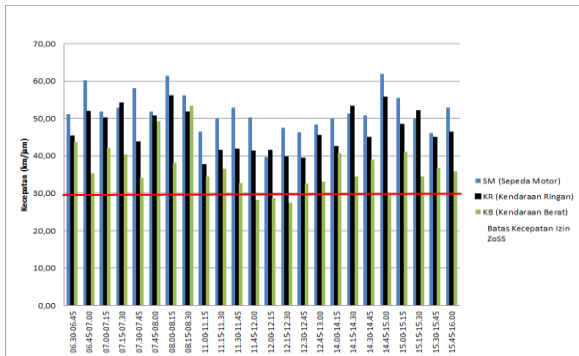


Figure 5. Average Vehicle Speed Graph Day 2 Heading to City Center

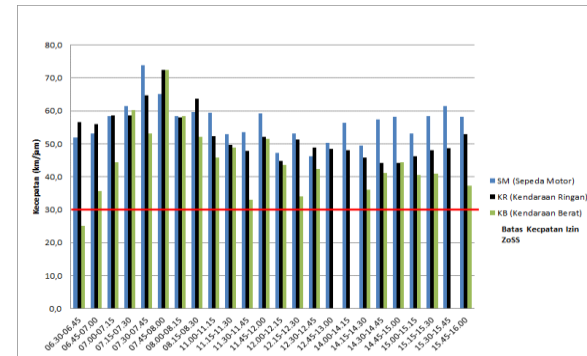


Figure 6. Average Vehicle Speed Graph Day 2 From City Center

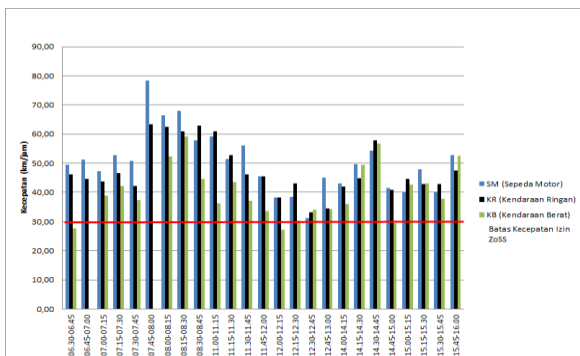


Figure 7. Average Vehicle Speed Graph Day 3 Heading to City Center

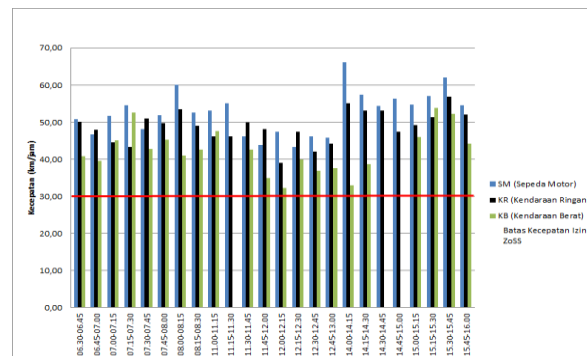


Figure 8. Average Vehicle Speed Graph Day 3 From City Center

he average vehicle speed from the 3 day survey results can be seen in Table 1.

Table 1. Average Vehicle Speed through ZoSS

Day	Traffic Flow	Average Speed (km/h)		
		Motorcycle	Light Vehicles	Heavy vehicle
Day 1	Direction 1	51.61	47.35	32.54
	Direction 2	49.74	47.94	41.29
Day 2	Direction 1	51.85	46.75	36.77
	Direction 2	56.50	52.58	44.80
Day 3	Direction 1	50.27	47.64	40.28
	Direction 2	52.50	48.77	42.36

- The percentage of vehicles that meet the maximum speed limit for each survey day. The results can be seen in Table 2 and Figure 9.

Table 2. Percentage of Vehicles Complying with the Permit Speed of 30 km/h

Date and time	Traffic Direction	Number of Samples			Number of Vehicles Complying with Permit Speeds			Percentage of Vehicles Complying with Permitted Speeds		
		BC	KR	KB	BC	KR	KB	BC	KR	KB
Day 1	Direction 1	176	176	92	6	6	32	3.4%	3.4%	34.8%
	Direction 2	176	176	75	5	7	15	2.8%	4.0%	20.0%
Day 2	Direction 1	176	176	94	1	8	21	0.6%	4.5%	22.3%
	Direction 2	176	176	55	5	1	4	2.8%	0.6%	7.3%
Day 3	Direction 1	176	176	45	7	6	9	4.0%	3.4%	20.0%
	Direction 2	176	176	64	1	4	4	0.6%	2.3%	6.3%

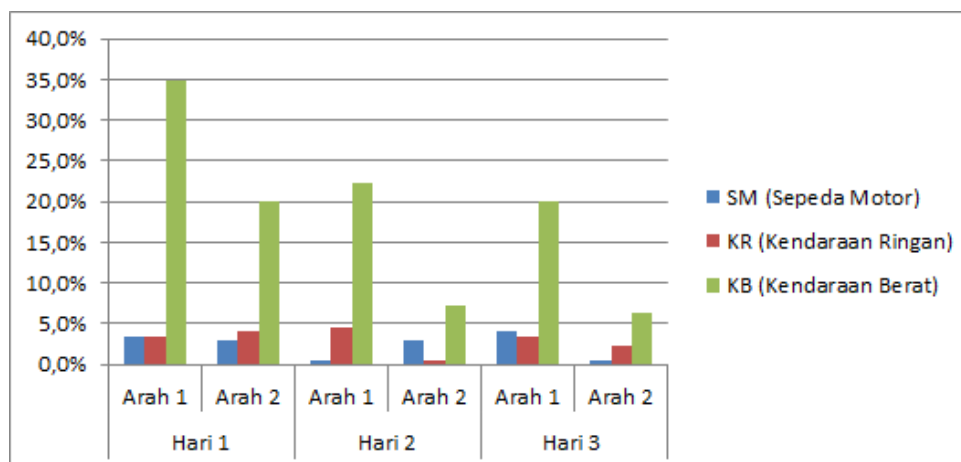


Figure 9. Graph of Percentage of Compliant Vehicles Permitted speed 30 km/h

4. Analysis of road crossing behavior that complies with the procedure and that does not comply with the procedure using the Z test . The crosser behavior survey was conducted over 6 hours, divided into 3 times from school entry to school leave, which included standard procedures for how to cross, the facilities used, and the status of the crosser. The survey data was tabulated based on the values for each criterion and the results were obtained (Table 3).

Table 3. Results of the Road Pedestrian Behavior Survey

Day	Traffic Flow	Number of Samples	Standard Procedure for Crossing the Road		How to Cross		Facilities Used		Ex
			4T way	Non 4T	Run	Walk	Zebra Cross	No Facilities	
Day 1	Direction 1	335	332	2	107	266	5	330	5
	Direction 2	449	449	0	177	272	1	448	1
Day 2	Direction 1	244	243	1	80	164	2	242	2
	Direction 2	447	446	1	143	304	3	444	3
Day 3	Direction 1	308	308	0	42	266	2	306	2
	Direction 2	421	421	0	173	248	4	417	4

DISCUSSION

A recapitulation of the results of processing can be seen in Table 4 - 6 and Figures 10 - 11

Table 4. Recapitulation of Average Vehicle Speed in the ZoSS Area Per Direction

Traffic Direction	Average Speed (km/h)		
	Motorcycle	Light Vehicles	Heavy vehicle
Direction 1	51.24	47.25	36.53
Direction 2	52.91	49.76	42.82
Average	52.08	48.51	39.67

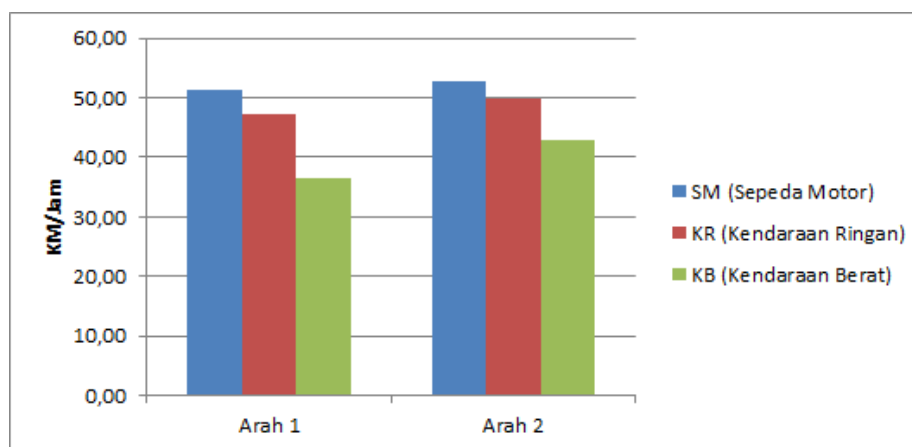


Figure 10. Summary graph of average vehicle speed in the Per Direction ZoSS Area

Table 5. Recapitulation of % of Vehicles Based on Permitted Speed Per Direction

Traffic Direction	Percentage of Vehicles Complying with Permitted Speeds		
	Motorcycle	Light Vehicles	Heavy vehicle
Direction 1	2.7%	3.8%	25.7%
Direction 2	2.2%	2.7%	14.8%

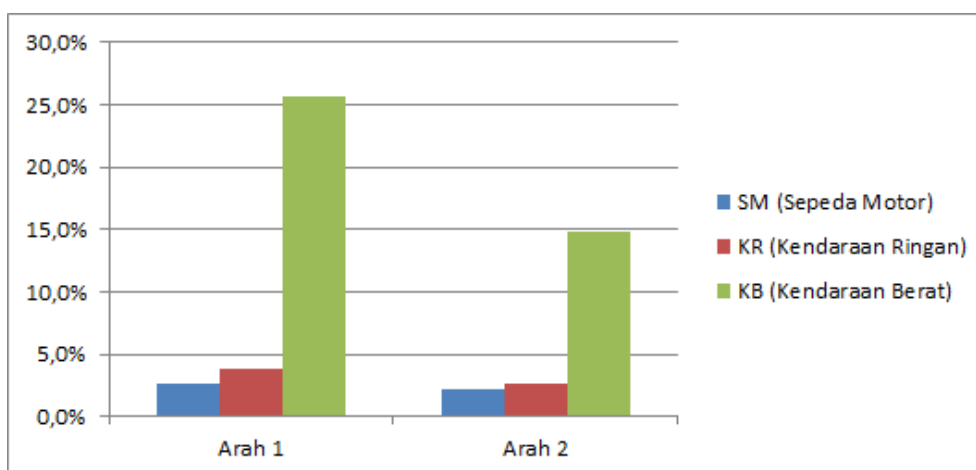


Figure 11. Recapitulation graph of % of vehicles based on permitted speed per direction

Table 6. Recapitulation of Road Pedestrian Behavior Survey Results

Day	Traffic Flow	Number of Samples	Standard Procedure for Crossing the Road		How to Cross		Facilities Used		Ex	Z count	Ket
			4T way	Non 4T	Run	Walk	Zebr a Cros s	No Facilitie s			
Day 1	Direction 1	335	332	2	107	266	5	330	5	-73.22	Not safe yet
	Direction 2	449	449	0	177	272	1	448	1	-224.00	Not safe yet
Day 2	Direction 1	244	243	1	80	164	2	242	2	-85.20	Not safe yet
	Direction 2	447	446	1	143	304	3	444	3	-127.73	Not safe yet
Day 3	Direction 1	308	308	0	42	266	2	306	2	-107.83	Not safe yet
	Direction 2	421	421	0	173	248	4	417	4	-103.74	Not safe yet

From the research results and recapitulation of research results, the following discussion can be given:

1. Average Vehicle Speed When Passing ZoSS

The average vehicle speed in direction 2 (from the city center) tends to be higher than the average vehicle speed in direction 1 (towards the city center). This is caused by the location of the school which is located on the road in direction 1, so that the side obstacles in the form of pedestrians, most of whom are students in direction 1, are greater.

Based on Table 4 and Figure 10, the average speed of vehicles over three days shows that the average speed of motorbikes is 52.08 km/hour, the average speed of light

vehicles is 48.51 km/hour, and the average speed of heavy vehicles is 39.67 km/hour. This proves that the average speed on these three days as a whole exceeds the permitted speed on ZoSS, namely 30 km/hour. The average speed of motorbikes is very high compared to light vehicles and heavy vehicles, this is because motorbikes have freedom to move because their dimensions do not require much space.

2. Percentage of Vehicles Complying with Permitted Speeds

Table 5 and Figure 11 show the small percentage of vehicles that comply with speed rules when in the ZoSS area,

It can be seen that from this data the highest number of vehicles complying with the permitted speed of 30 km/hour is only 34.8% of those driven by heavy vehicles. This may also be because the vehicles are heavy with loads so they cannot go fast.

Of the total percentage, less than 50% of the figures indicate vehicle speeds that are below the permitted speed in the ZoSS area. This shows that there are a lot of speed violations committed by drivers when passing through the ZoSS area. The lack of public awareness of the function of ZoSS causes ZoSS as a form of traffic management which aims to provide a sense of security for students to be ineffective.

3. Behavioral Characteristics of Crossers

From the analysis of crossing behavior for three days in each direction, it shows that all *Zhit values* $< Z$ table = 1.645, so the behavior of school children when crossing the road is categorized as "not safe" and has the potential to have an accident. So when students cross the road they still need help monitoring or guarding traffic from school security officers or local police to be safe.

Based on the data in Table 6, almost all students crossed without using the available zebra *crossing facilities*. It was recorded that only 17 students crossed the zebra *crossing* during the data collection process. This shows the need to provide direction for students to always use crossing facilities when crossing.

The discussion above shows that the impact of implementing ZoSS on the speed of vehicles passing through the ZoSS area at SMPN 15 Padang and MTsN 1 Padang which are located on Jalan Adinegoro is considered to be ineffective. This is seen in terms of the speed of motorized vehicles when crossing the ZoSS which still violates the permitted speed limit and the behavior of pedestrians when crossing the ZoSS area which is still categorized as unsafe. The ZoSS program, which is an effort to regulate speed on a road section in a school area which aims to prevent accidents, has not been fully achieved because there are still many motorized vehicle drivers who do not comply with permitted speeds in the ZoSS area. Meanwhile, in terms of the characteristics of students' behavior when crossing the road, the existing ZoSS program is still not functioning optimally due to the lack of awareness of students to always use the available crossing facilities, which causes students to still be categorized as unsafe and have the potential to experience accidents in the school area.

Although in terms of completeness and suitability of road equipment facilities, the facilities at ZoSS at SMPN 15 Padang and MTsN 1 Padang largely meet the standards as regulated in [5]. To improve safety in the ZoSS area, the existing facilities need to be maintained regularly within a certain period of time. And it is necessary to carry out further outreach to the community and school elements, so that they better understand the purpose of holding the ZoSS area, especially since the location of the school is right on the side of the road which is an arterial road with an average speed of 60 km/hour and is passed by various compositions of vehicles.

CONCLUSION

Based on the results of research data processing and analysis that has been carried out, the following conclusions are obtained:

1. The vehicle speed when crossing the ZoSS averages 46.75 km/hour, exceeding the maximum speed limit that has been determined, namely 30 km/hour, and the percentage of vehicles that comply with the permitted speed is very low, still below 50%.
2. The behavioral characteristics of pedestrians when crossing the road in the ZoSS area of SMP N 15 Padang and MTs N 1 Padang are categorized as "not safe" and have the potential for accidents.

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