

Analysis of the Effectiveness of Road Equipment to Support Rider Safety in Educational Areas (Case Study: Jl. Prof. Moh Yamin)

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Abstract — The Education Zone is an area with a very high intensity of activity for both drivers and pedestrians, especially among students, hence it requires adequate road facilities to enhance the safety of road users. This study aims to analyze the effectiveness of road facilities found in the Education Zone such as traffic signs, road markings, warning lights, bus stops, and speed control devices on Jl. Prof. Moh. Yamin. The methods used includes field observation and analysis of driver compliance with the availability road equipment facilities. The results of this study show that the existing road facilities, such as traffic signs and road markings, are less effective in improving safety for drivers and road users. In addition, the level of compliance among drivers regarding road equipment is very minimal, especially during peak hours. This study recommends improvements and additions to the road equipment according to the needs of the Educational Area to minimize accidents and enhance safety for drivers and road users. This research is expected to serve as a reference for designing a safe traffic movement system in the Educational Area.

Keywords: effectiveness of road equipment; Education area; rider safety.

I. INTRODUCTION

Daily life for most Indonesians involves the use of private vehicles. The involvement of Indonesians in the use of private vehicles compared to public transportation is very high and continues to increase each year. The high number of private vehicles leads to a significant impact on dense traffic volume. This situation encourages an understanding of safety while driving. (Balsas, 2003). Educational areas have many activities that cause a lot of traffic movement and trigger high vehicle movement and transportation needs (Handayasari et al., 2019).

Traffic safety is related to the discipline to the riders; the higher the level of discipline among riders, the greater the compliance of riders in understanding discipline and safety in traffic.. Menurut Bungin, 2010:94 Discipline in driving includes understanding traffic rules, being responsible for safety, and adhering to established traffic regulations. Driver discipline significantly determines the level of traffic safety in educational areas. The educational area has many private vehicles and heavy traffic, so people must prioritize safety while driving. The following factors affect traffic safety: individuals using the

road, vehicles, and road infrastructure. (Camacho-Torregrosa et al., 2013).

The high movement of traffic flow in the Education Area creates relationships between various types of driver behaviors. Without awareness of the importance of safety, conflicts arise among road users, resulting in accidents. The availability of adequate road facilities plays a crucial role in supporting safety. Based on research findings, 30 percent of accidents are caused by inadequate road infrastructure. (Camacho-Torregrosa et al., 2013). Therefore, in the development and provision of road equipment facilities in educational areas, it is necessary to pay attention to safety. Adequate road equipment facilities facilitate road users to be more orderly and safe. This refers to Law No. 14 of 1992 which states that to ensure safety, security, and smooth traffic, roads must be equipped with facilities such as traffic signs, markings, traffic lights, and safety devices as well as other supporting facilities.

This research aims to analyze the needs for road equipment facilities that are lacking in the Education Area, improve safety for students attending school on that road segment, redesign the road segment focusing on signage and markings in the Education Area, and provide

recommendations for adding signs, markings, and other road equipment facilities. (Despriadi et al., 2023) .

II. LITERATURE REVIEW

Traffic safety is a strategic issue that is a main concern in transportation planning, especially in areas with high pedestrian activities such as educational zones. (Hermawan et al., 2023). Road equipment such as traffic signs, road markings, traffic lights, and speed control devices (speed bumps) play an important role in providing information, warnings, and regulation for road users.

Based on Law Number 22 of 2009 concerning Traffic and Road Transportation, this regulation aims to create safe, comfortable, orderly, and smooth traffic and road transportation conditions, thus supporting various economic activities of the community (Firgian et al., 2014). In ensuring safety, order, security, and the smooth flow of traffic that is desired, individuals using the roads must be aware of traffic discipline and order. Road users are defined in Article 1 Paragraph 27 of Law Number 22 of 2009 as individuals who use the road for traffic purposes.

Traffic congestion, accidents, insecurity, discomfort, and traffic noise around schools are issues that the authorities and the community pay great attention to (Hidayat et al., 2020) . The safety level of students, teachers, and the community around the school is very low. Many accidents occur when crossing the road, both going to and from school, caused by drivers and students who do not adhere to traffic rules when crossing the road, understanding traffic signs, and many other drivers who are not careful on the road.

As stated in Law No. 22 of 2009, it includes road traffic, road infrastructure, vehicles, drivers, road transportation, and law enforcement (*UU Nomor 22 Tahun 2009*, 2009).

According to Regulation No. 34 of 2014 regarding road markings, road markings are divided into two categories: equipment and signs. The equipment category includes traffic guiding devices that have a minimum height of 75 cm, a maximum base width of 50 cm, and a minimum weight of 3.5 kg, as well as lane or track dividers. Then, the sign category consists of road studs that have a maximum thickness of 20 mm above the road surface that can reflect light (*PM 34 Tahun 2014*, 2014).

Based on their types, namely warning signs, prohibition signs, command signs, and guidance signs, this refers to Ministerial Regulation No. 13 of 2014 (*PM 34 Tahun 2014*, 2014).

Traffic Signal Devices (APILL) are divided into two types, based on Regulation No. 49 of 2014, namely APILL using three-color lights and APILL using single-color lights. Ministerial Regulation No. 27 of 2018 establishes a distance of 50 meters between streetlight poles.

According to Ministerial Regulation No. 82 of 2018, road user control devices include speed limiters, road safety barriers (guardrails), corner mirrors, and rumble strips”.

III. METHOD

In conducting the analysis, the author uses an evaluative quantitative approach that focuses on the analysis of road equipment effectiveness using the Indonesian Road Capacity Guidelines (PKJI) 2023 as a reference. This method aims to measure the extent to which road equipment on the Prof. Moh. Yamin road, which is an Educational Area, is effective. In the survey, the author took a sample of a distance of 550m, where there are 6 schools.

1. Research Place

This research was conducted along Prof. Moh Yamin Street, where this stretch of road crosses or is located around the Educational Area. Along this road, there are several schools including Elementary School (SD), Junior High School (SMP), and Senior High School (SMA). The location was chosen because there are many schools along Prof. Moh Yamin Street, but the road facilities such as traffic signs, road markings, traffic lights, and pedestrian control devices are still lacking.

2. Research Time

The research was conducted on: Thursday, June 19, 2015, from 08:00 to 11:30 AM WIB.

3. Data

Data was collected through direct observation and physical measurement of road equipment referring to the PKJI 2014 technical standards. Data collection

was carried out with two main focuses, namely:

- a. Geometric measurement of road
Measurements were taken to obtain physical data and geometric dimensions of the road at the research location, which includes:

- traffic lane width;
- road shoulder width;
- sidewalk width;
- drainage width;
- drainage depth.

The measurement is done using a measuring tool in the form of a roll meter.

- b. Data collection of road equipment facilities
- c. Observations were made to record the types, quantities, and existing conditions of the road equipment facilities located at the site, including:

- traffic sign;
- road sign;
- school safe zone (ZoSS);
- Speed bump;
- Zebra cross;
- public street lighting (JPU);
- traffic signal device (APILL).

After all data has been collected, the analysis will be conducted using the Indonesian Road Capacity Guidelines 2023. The research flowchart serves as the basis for conducting the research, and the stages are generally displayed in the following flowchart:

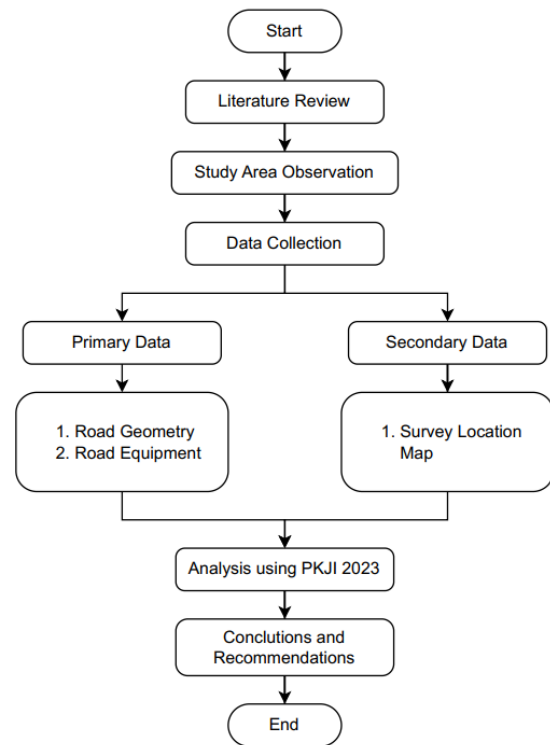


Image 1. Flowchart

IV. RESULTS AND DISCUSSION

The results of this research will present an analysis of the existing conditions at the study site compared to the conditions after recommendations for handling have been provided. The comparison is made to demonstrate the effectiveness of the proposed improvements that the researcher has made, regarding the enhancement of road safety aspects, particularly in the Educational Area.

The visualization is presented in the form of images showing the conditions before and after recommendations were made, including the addition of safety elements such as traffic signs, zebra crossings, bump markings, and safe school zones. Each change is analyzed based on its relevance to the potential risk of accidents and the needs of road users in that location.

The proposed improvements are visualized through three images to facilitate the comparison between before and after the handling in order to support the enhancement of safety for both riders and road users.

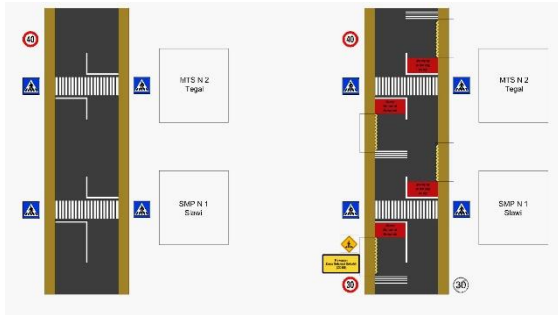


Figure 1. Segmen 1

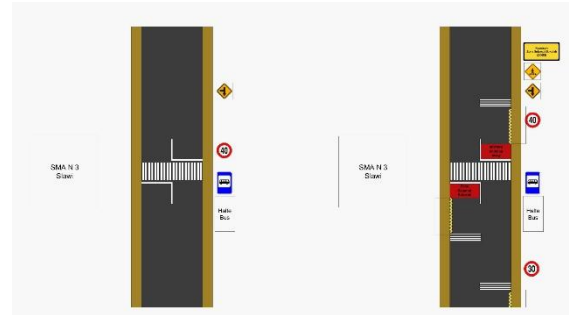


Figure 3. Segmen 3

Aspect	Before	After
Maximum speed	40 km/h	30 km/h
Sign ZOSS	none	There is and complete
Road safety sign	Minimal	More striking and complete
Zebra cross	Yes, but it's usual.	Equipped with safe zones and additional markings
School sign	Standard	More striking with yellow color
Purpose sign	general	Focused on student safety

Aspect	Before	After
Sign ZOSS	None	There is, complete with a board & symbols
Zebra Crossing Mark	Standard	More visible and reinforced with signs
Zig-zag mark	None	On both sides of the zebra crossing.
Bump Strip (rumble strip)	None	There are before and after the school zone
Speed Limit	40 km/h	30 km/h
Bus Stop	There is but without a safety zone.	Ada dan terpisah dari area penyeberangan
Visual Warning	Minimum	More striking and informative

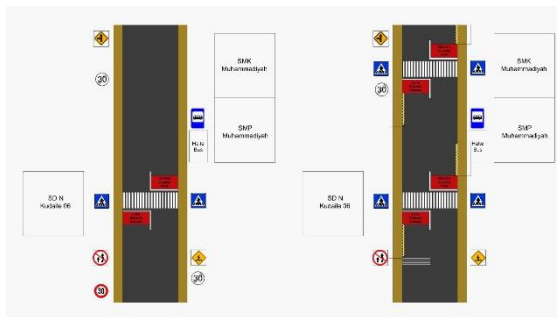


Figure 2. Segmen 2

Aspect	Before	After
School Safe Zone	Just a dot, not striking	Two clear points, with red markings & signs
Zigzag Mark	none	There is on the right side of the zebra cross.
School Sign	There is a standard	More complete and strategic
Bus Stop	Not given a safety limit	Equipped with a safe zone around it
Speed Limit	30 km/h	Maintain 30 km/h, but visually reinforced.
Student Crossing Pedestrian Safety	Only one zebra crossing Not optimal	Two strategic zebra crossings Safer, more structured, and clearer

V. CONCLUSION

1. The road equipment available in the educational area along the Moh. Yamin Provincial Road is still not fully available and effective in supporting the safety of road users, especially students as vulnerable road users. This is evidenced by the presence of several facilities such as school signs, rumble strips, and crosswalks that are not clearly visible or poorly maintained.
2. The factors of visualization and maintenance of road equipment can affect the effectiveness of protection in educational areas. Lack of maintenance leads to a decline in the functionality of the equipment, resulting in road users not receiving optimal warnings or information.
3. The level of compliance of road users with the availability of adequate road equipment can be influenced by the clarity and position of the installation. Signs or markings that are not clearly visible or do not meet standards can lead to a low response from drivers to warnings about the importance of driving to maintain safety.
4. To support maximum safety, road facilities need to be improved in terms of quantity, strategic placement, visualization standards,

and periodic maintenance. Cooperation between the Transportation Department, Public Works Department, as well as schools and the community is necessary to maintain the effectiveness of road safety facilities that have been provided in the education area.

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