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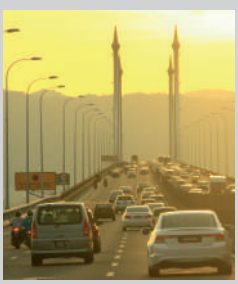

Research Report

The Utilization of Crossing Facilities at School Area

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Akmalia Shabadin
Sharifah Allyana Syed Mohamed Rahim
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Abstract

Pedestrian facilities at school zone have an important role to ensure the safety of school children. Although the planning authority has provided the guidelines and standards for the school component, there are still some differences between the facilities provided by among schools depending on needs of the area. The study of measuring school facilities performance is important to be taken in order to provide appropriate safety environment. The main objective of this study was to evaluate school crossing facilities in terms of utilisation rate of pedestrian crossing facilities among school children and factor influence student to the crossing the road. A total of duration 45 minutes' observation was conducted from end of school session at 60 selected schools (primary and secondary) in the Selangor. Observer was located around the range of 50 meter from main school gate and all data were recorded manually. The study found out of that, most of the primary school in Selangor provide pedestrian crossing facilities and it is located in distance less than 25meter from school gate as compared to secondary school. Study also found the utilization rate among school children was average 50% and the present of traffic warden was influencing the utilization rate. Most of the parent's pick-up the school children at opposite the school area. This is the main factor why the school children crossing the road.

1. Introduction

Pedestrian is an extremely vulnerable road user group. They travel for variety of reasons. In Malaysia, for 10-years trend pedestrian contribute over 7% of road death yearly (Figure 1). In addition, in 2016 out of 6,641 of death due to road accident 551 was pedestrian (RMP, 2017).

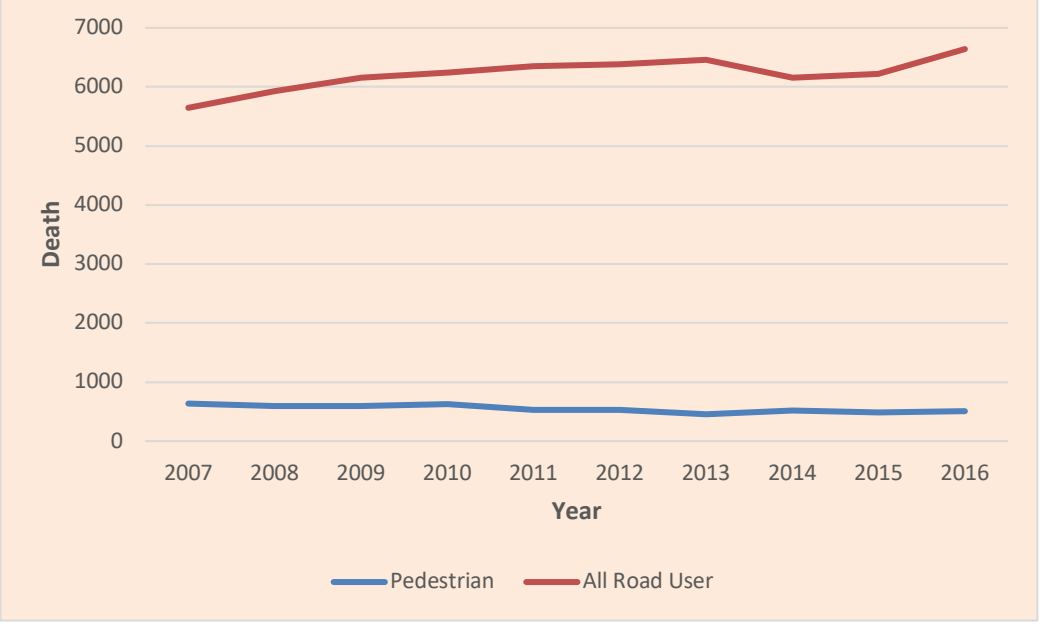

Figure 1 10 years' trend of death due to road accident

Pedestrians cross one or more roads at some point in their journey, whether at an intersection or not (WHO, 2013). Many studies show illegal pedestrian behaviour is commonly reported as a factor of pedestrian crashes. Based on the police report, not using pedestrian crossing was one of the factors contributing to pedestrian death due to a road accident in Malaysia and this figure shows increase year by year (Figure 2).

Figure 2 5 years' trend of pedestrian death due to not using pedestrian crossing

Accident statistic indicates that in 2016 around 3% of pedestrian death on road accidents was school children (Figure 3).

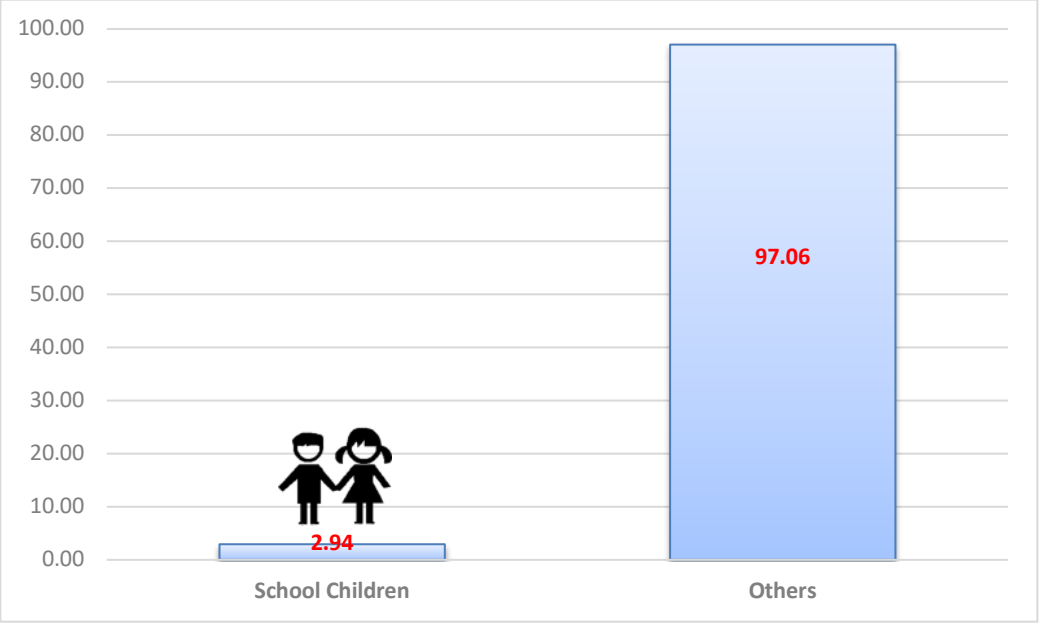

Figure 3 Percentage of pedestrian death in road accident, 2016

National statistics show that approximately 84% of school children collisions in 2016 occurred whilst the pedestrian was crossing the road away from a pedestrian crossing (RMP, 2016) and only 12% of pedestrian collisions occur on a pedestrian crossing, and nearly 4% occur within 50 m of a crossing (Figure 4). This support study conducted at Ghana, which 98% of pedestrian collisions occurred in locations further away from crossing facilities (Obeng-Atuah et al., 2017).

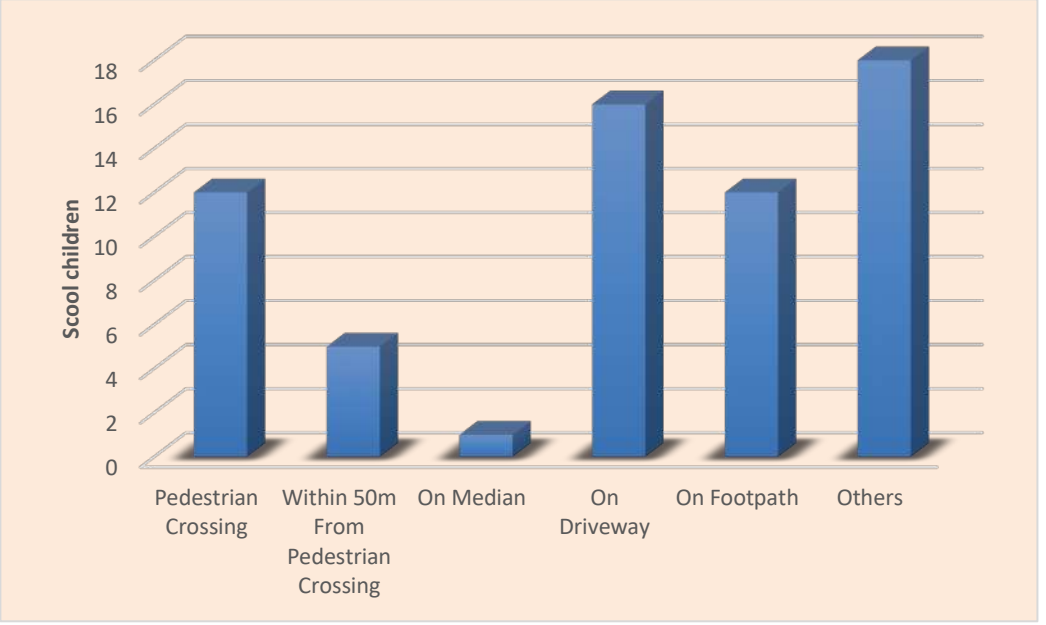

Figure 4 Number of school children casualties in pedestrian road accident by incident location (RMP, 2016)

Therefore, this study was conducted to evaluate the utilisation of pedestrian crossing facilities among school children at school zone and to identify the influencing factor of crossing.

1.1 Aim and Objectives

This project is aimed to evaluate school crossing facilities in terms of utilisation and factor influence student to cross. Accordingly, the objectives of this study are:

i. To identify the factor influence student crossing.
ii. To evaluate crossing facilities utilisation among student.

1.2 Scope and Limitations

The total of 60 selected schools in Selangor including primary and secondary school was involved in this study. The total number of student crossing in the range between 50-meter radius from the main school gate was observed during the study period.

2. Literature Review

The review of the relevant literature regarding the school children (student) crashes, school crossing facilities and crossing behaviour among student are presented in the following section.

2.1 Pedestrian Road Accidents

More than one-fifth of the people killed on the world's roads each year are not traveling in a car, on a motorcycle or even on a bicycle – they are pedestrians (WHO, 2013). Pedestrian is an extremely vulnerable road user group due to lack of their protection and limited biomechanical tolerance to violent forces especially when impacted by a vehicle. And in Malaysia, on 2016 over 8% of pedestrian death occurs by road accidents (RMP, 2016).

Research suggests that younger children (between age 6 and 10) are the highest risk of death and injury, with an estimated minimum four times the risk of collision compared with adult pedestrians (Congiu, Whelan, Oxley, Charlton, Elia, & Muir, 2008). According to FHWA (2002), children under age 15 are the most overrepresented group in pedestrian crashes, and people over age 65 have the most pedestrian fatalities.

Children, with smaller body size and immature thinking, were the most at risk to cross a road. A study by Zeedyk, Wallace, and Spry (2002) indicated that crossing performance of children is very poor, as they did not stop and look before crossing a road. A high percentage of the child running to cross and not looking before crossing especially when they cross on their own (Zhang et al., 2013). Running into the street would cause a dart-dash accident, which becomes a common type of accident involving child pedestrian (Preusser, Wells, Williams, & Weinstein, 2002). In addition, children under 13 years old have low response rate and reaction time to traffic hazard (Meyer, Sagberg, & Torquato,

2014) and males were found to engage more often in unsafe crossing behavior and playing on the roads (Sullman, Thomas, & Stephens, 2012).

As an alternative option, improvement of behaviour or provide assistant to cross by an adult may be proposed through road safety education. In Malaysia, this programme has been implemented for primary school children. In reality, how effective the road safety module in school is still indefinite. In other countries, supervision of the adult to a group of the student walking to school, known as a 'walking school bus' may also help to increase their visibility to traffic (FHWA, 2002).

Supervision of adult is crucial, as an adult traffic judgment is better than children. An adult can be their parents or traffic warden that present in front of a school. Without adult supervision, a different measure should be proposed to school children as their behavior is different from adult pedestrian. Moreover, analysis results indicated that children who crossed the road alone had more violation and adventure crossing behavior than those had companions (Fu & Zou, 2016). Some study showed that a higher number of student crossings, a wider road width, the presence of crossing, student-friendly facilities at the intersection, and four-way intersections were significant and positively associated with perceived crash risk among school-aged children (Lee, Park, Kim, & Cho, 2016).

Moreover, the crossing decision significantly varies according to the environment. A study conducted by Granie, Brenac, Montel, Millot, and Coquelet (2014) found pedestrians were significantly more inclined to take the decision to cross in the city centre than in the other sites presented. The presence and function of the buildings, the quality of the sidewalks and the marked parking spaces are key factors to explain their crossing decision, by enabling them to infer the density of pedestrians and traffic and the vehicle speed.

2.2 Crossing Facilities

Environmental factors were also identified influence on crossing behaviors. Physical barriers that might prevent pedestrians from easily crossing between the roadway and sidewalk were present, pedestrians were also less likely to cross the roadway at unmarked non-intersection areas (FHWA, 2014).

Illegal pedestrian behaviour is commonly reported as a factor in pedestrian crashes. The risk associated with illegal road crossing is unclear, and better information would assist in setting a rationale for enforcement and priorities for public education (M. J. King, D. Soole, & A. Ghafourian, 2009). A study conducted at Ghana found pedestrian fatalities constitute 42% of road traffic fatalities in and 68% of the total pedestrian fatalities are related to pedestrian crossing facilities and behavior (Obeng-Atuah et al., 2017).

Purpose of designing crossing facilities is to allow pedestrians to cross the roads safely avoiding conflicts between pedestrians and motorized vehicles. However, pedestrians do not always comply with the crossing rules, whether it is timing (signalization) and/or location (crossing facility) (Onelcin & Alver, 2015). Study also shows 90% of the evidence that the crossing facilities location, relative to the origin and destination of the pedestrian, thus influence decision factor for pedestrians deciding to cross (Sisiopiku, & Akin, 2003).

At many schools, crossing facility was provided to promote the safety of school children crossing a road in front of their school. However, inappropriate placement of the crossing facility, for example, if it is located far away, a majority of pedestrian tend to jaywalk (Zheng, Chase, Elefteriadou, Schroeder, & Sisiopiku, 2015). And national statistic shows in 2016 almost 12% of school children casualties in pedestrian road accident was occur during to/from school (RMP, 2016).

Yearly government spend over million to enhance pedestrian facilities (Utusan Malaysia, 2011). To see how crossing facilities can reduce the risk and factor influence of children crossing, this study is aimed to examine the utilisation crossing facilities among student and how land use activities affect their crossing behaviour. Results from this study will provide insight into the importance of land uses planning around the school area.

3. Methodology

This study was conducted at 60 schools in Selangor, including secondary and primary (Appendix). The data for this study consists of the number of student crossing, land use activities around the school zone and pedestrian facilities. The process used in collecting the data in order to achieve the objectives of the study are described further in section 3.1 and 3.2. Figure 5 below shows the methodology framework in this study.

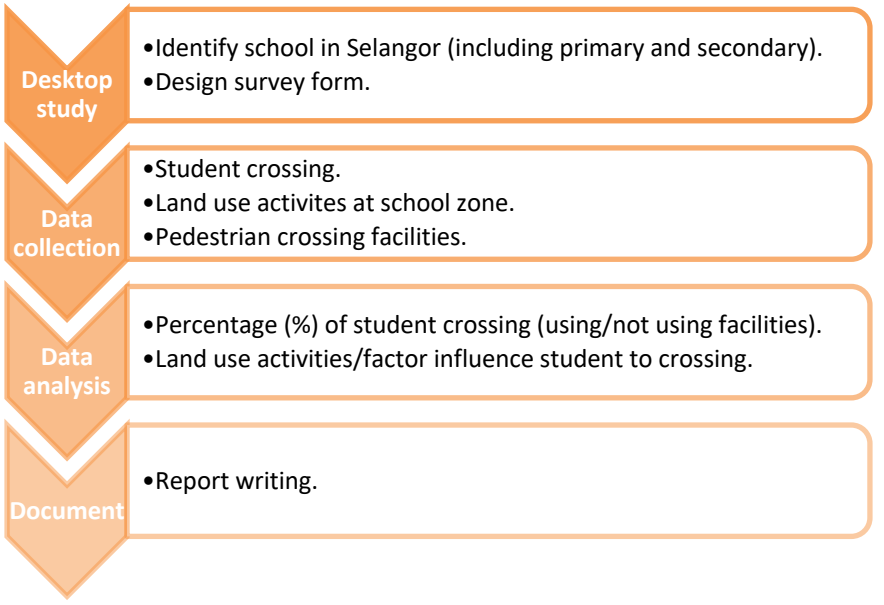

Figure 5 Methodology framework

3.1 Desktop Study

School selection for this study was randomly selected from the list of school in Selangor provided by Ministry of Education. Total 60 schools were selected as study area. From this number 32 was primary school and 28 was the secondary school. Selected school in Selangor was chosen to represent urban and rural area.

3.2 Data Collection

Data collection was conducted manually at school zone in radius 100 meters on the weekday (Figure 6). The observation was conducted for 45 minutes starting from the end of the school session (e.g., 1315 hrs. to 1400 hrs.) and all data were recorded manually using form (Figure 7). Data in this study include as discuss below.

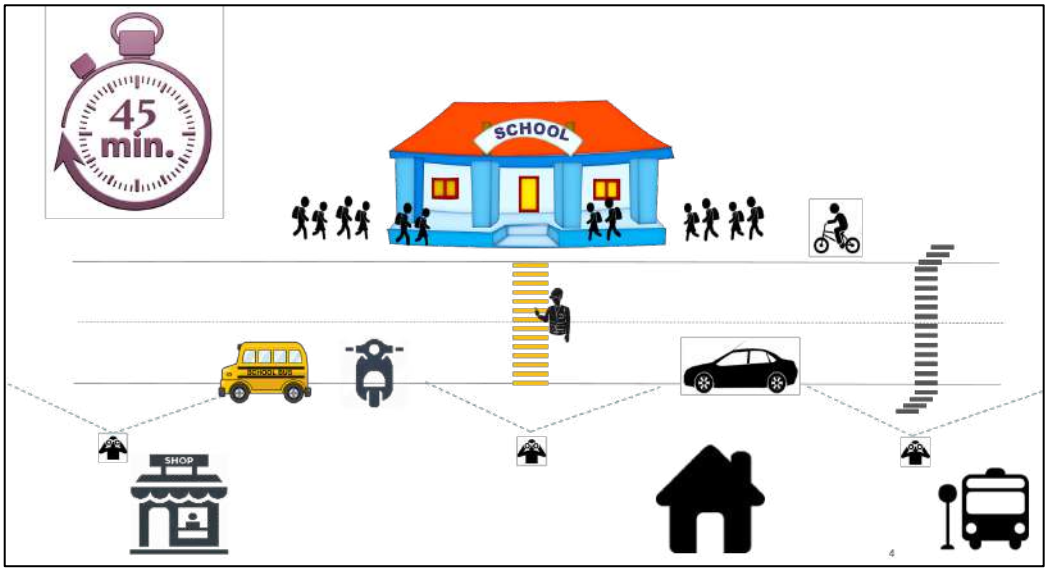

Figure 6 Observation method at school zone

NO			FACILITY	FACTOR					
	M	F	(/) (X)	Transit (S/K)	V-Parent (M/C)	Shop	Bus Stop	Home	Uknown
									(REMARKS)
1									
2									
3									

Figure 7 Observation form

3.2.1 Number of Student

The number of students that crossing the road at the major road at the school zone was observed within 45 minutes starting from the end of the school session. The student was grouped into two (2) categories; male and female.

3.2.2 Crossing Facilities at School Zone

The existence and type of crossing facilities at the school zone were obtained in this study. The percentage of compliance of crossing facilities among student at school zone was obtained during observation.

3.2.3 Factor Influence Student to Crossing the Road

During the observation, observers will observe the student and land use activities or factors, which influence the student to the crossing. For this study the factors, which identified as the reason for student crossing was grouped into six (6):

i. Transit – including the school bus, school van, public bus
ii. V Parent – parent's vehicles such as motorcycle and motorcar

iii. Shop – shop lot and stall
iv. Bus stop
v. Home
vi. Unknown

3.2.4 Road Geometry Factors

The distance between the school gate and crossing facilities and distance from one facility to others, crossing facilities was being measured. Other's information included a number of road lane, road carriageway type and the existence of drop/zone or layby area also been recorded in this study.

4. Results and Discussions

This section discusses the results and findings obtained from the study. The characteristic of schools, type of pedestrian crossing facilities at the school zone and the utilisation of the facilities were being discussed. As been highlighted in chapter 3.0, this study was conducted at 60 schools in Selangor which label as 'Primary 1', 'Primary 2' etc. for primary school and secondary school label as 'Secondary 1', 'secondary 2', etc.

4.1 Characteristic of Study Area

This section was discussing the findings obtained from the observation conducted during the study period. The distance between school gates and pedestrian crossing facilities and the distance (D) between crossing facilities to others facilities also been recorded and grouped into 2:

i. Distance < 25 meters from school gate; and
ii. Distance > 25 meters from school gate.

4.1.1 School Area

From the observation, Table 1 below shows the characteristic of the school area. Based on observation, the study identified from 32 primary schools, 12 schools were located in the rural area while 20 schools were located in urban area. The study also found 20 primary schools were located at single carriageway while 12 schools were located at dual carriageway. Meanwhile, out of 28 secondary school 11 was located at rural area and 17 was located in urban area. In terms of carriageway type, total 21 secondary schools were located at single carriageway while seven (7) schools were located at dual carriageway.

Table 1 Characteristic of school area

School Type	Area		Carriageway type	
	Rural	Urban	Single	Dual
Primary (n=32)	12	20	20	12
Secondary (n=28)	11	17	21	7
Total = (n=60)	23	37	41	19

4.1.2 Pedestrian Crossing Facilities

Study also found only 38 schools were providing pedestrian crossing facilities; including zebra crossing and pedestrian bridge (table 2). The school, which not provided with any pedestrian crossing facilities were excluded from this section. Thus, the study can conclude that most of the zebra crossing, which provided at primary school zone in Selangor, was in distance range between 0 to 25 meters when the result found most of the pedestrian crossing facilities were located nearest to school gate (<25 meter). Meanwhile, 13 was located more than 25 meters from school gate. Result also found that 17 primary and 4 secondary schools were provided with traffic warden. Observation also show, 9 primary and 8 secondary schools were also provided with drop and pick zone or layby area (d & p zone).

Table 2 Characteristic of crossing facilities at school area

School	Crossing facilities		Distance		Traffic warden	D&P zone
	Zebra	Bridge	< 25 m	> 25 m		
Primary (n=32)	18	5	18	5	17	9
Secondary (n=28)	11	4	7	8	4	8
Total = (n=60)	29	9	25	13	21	17

4.2 Use of Pedestrian Crossing Facilities among School Children

To meet the objective of this study, an average of 45 minutes observation was conducted in the school zone. The observer was located at a few locations and observed the number of students crossing the road in the school zone. This data was counted and

recorded manually. The section below discussed the utilisation of crossing facilities among school children in Selangor.

4.2.1 Utilisation Rate among School Children

Table 3 below shows the utilization rate obtain from the observation conducted at the study area. The school, which not provided with any pedestrian crossing facilities were label as NA at column “utilisation”. Observation found even there was no pedestrian crossing facilities provided at school area, the number of students crossing the road was higher. This as show at primary school P5, P6, P20 and P28 also secondary school S1, S3, S4, S5, S11, S15, S16, S18, S23, and S26. This can expose school children into risk. Some school also show the utilization rate low when there was a pedestrian bridge at school area (school P12).

The presence of traffic warden shows also influence the utilization rate. This as see at school P1 (0%), P23 (5.53%) and P29 (4.14%) which the utilization rate was low due to the traffic warden did not stand at the zebra crossing during study period. Meanwhile, the school provided with pedestrian crossing facilities show the utilization rate more than 50%. Result also show, most of the school show the utilization rate among male student was higher as compared to female students.

The dangerous crossing behaviour can see at secondary school colour by red (S9, S10, S12, S13, S19, S22, and S27) which evens the pedestrian crossing was provided at school area the utilisation among school children show less than 10%. This might due to the location of pedestrian crossing facilities was located over 25meters from school area.

Table 3 Utilization rate among school children

Primary school	School children crossing the road		
	Crossing	Utilisation (%)	
		Male	Female
P1	209	0	0
P2	44	NA	NA
P3	150	23.33	25.33
P4	67	47.76	25.37
P5	213	NA	NA
P6	133	NA	NA
P7	65	40	27.69
P8	3	0	33.33
P9	3	NA	NA
P10	85	3.53	3.53
P11	148	42.57	41.22
P12	260	9.62	11.92
P13	161	39.75	47.83
P14	201	45.27	29.35
P15	253	29.64	24.9
P16	39	23.08	38.46
P17	67	10.45	11.94
P18	26	42.31	53.85
P19	81	13.58	13.58
P20	223	1.79	0
P21	40	NA	NA
P22	4	75	25
P23	287	1.05	3.48
P24	49	53.06	46.94
P25	89	0	0
P26	139	11.51	5.76
P27	11	9.09	0
P28	130	NA	NA
P29	145	0	4.14
P30	203	25.12	19.7
P31	51	37.25	45.1
P32	31	0	0

Secondary school	School children crossing the road		
	Crossing	Utilisation (%)	
		Male	Female
S1	404	NA	NA
S2	335	27.46	37.91
S3	290	NA	NA
S4	247	NA	NA
S5	111	NA	NA
S6	32	NA	NA
S7	406	36.7	29.56
S8	28	NA	NA
S9	131	0	0
S10	252	0	0
S11	496	NA	NA
S12	268	0	0
S13	431	3.71	3.25
S14	339	24.19	52.21
S15	183	NA	NA
S16	393	NA	NA
S17	117	10.26	10.26
S18	81	NA	NA
S19	87	0	0
S20	146	52.05	47.95
S21	28	NA	NA
S22	211	0	0
S23	147	NA	NA
S24	432	21.99	31.48
S25	99	NA	NA
S26	241	NA	NA
S27	226	0.44	0
S28	101	11.88	5.94

4.2.2 Factors Influenced Primary School Children to Crossing the Road

This study also identifies the main factors (table 4) influence primary school children to crossing the road associated with parent's vehicle pick-up them at opposite the school area. Result show over 50% of them crossing due to vehicle parents waiting opposite the school area (P1, P3, P4, P7, P9, P10, P11, P13, P15, P16, P17, P19, P21, P22, P24, P25, P26, P27, P30, P31 and P32). In addition, some of the vehicle transit such as school bus also pick school children opposite the school area. This can see on school P12, P14 and P28.

Meanwhile, some of the school children crossing the road due to shop lots opposite the school area as school P2 (48.15%), P6 (56.10%) and P20 (63.01%). Others reason for school children crossing the road was due to back home or bus stop.

Table 4 Factors influenced primary school children to crossing the road

School	Factors (%)					
	Transit	Parent Vehicle	Shop	Bus stop	Home	Unknown
P1	20.75	**60.38**	5.66	5.66	0	7.55
P2	12.4	**55.37**	19.01	0	1.65	11.57
P3	0	**82.81**	15.63	0	1.56	0
P4	0	**89.47**	0	0	10.53	0
P5	0	0	0	0	0	0
P6	41.18	**50**	2.94	0	5.88	0
P7	0	**69.77**	27.91	0	2.33	0
P8	**39.76**	3.01	33.13	0	3.01	21.08
P9	16.13	**83.87**	0	0	0	0
P10	**36.9**	25	11.9	1.19	0	25
P11	4.64	**56.95**	32.45	3.31	2.65	0
P12	21.74	**78.26**	0	0	0	0
P13	7.32	**80.49**	0	2.44	4.88	4.88
P14	0	0	0	0	5.88	**94.12**
P15	0	**94.87**	0	0	5.13	0
P16	3.42	30.82	**63.01**	1.37	1.37	0
P17	0	**66.67**	0	33.33	0	0
P18	0	**38.27**	20.99	0	25.93	14.81
P19	25	**66.67**	0	0	8.33	0

P20	1.79	**98.21**	0	0	0	0
P21	1.02	**50**	6.12	7.14	35.71	0
P22	0	**80**	0	0	20	0
P23	13.33	**45.56**	22.22	3.33	15.56	0
P24	6.17	**65.43**	1.23	20.99	4.94	1.23
P25	0	**61.11**	0	0	38.89	0
P26	30.43	**69.57**	0	0	0	0

4.2.3 Factors Influenced Secondary School Children to Crossing the Road

As a factor influence secondary school children crossing the road, the result shows almost a similar trend with school children at primary school (table 5). Which most of the school children crossing the road due to vehicle parents or buses waiting for pick them opposite the school. This can see on secondary school S3 (60.00%), S5 (35.14%), S6 (37.50%), S8 (92.86%), S12 (34.65%), S14 (47.62%), S15 (86.98%), S17 (80.43%), S18 (86.30%), S19 (51.72%) and S28 (78.46%).

This factor follows by transit vehicle (transit) such as school bus waiting for the school children opposite the school area. This as show at secondary school S4 (51.61%), S9 (87.22%), S20 (42.62%), S21 (80.00%), S23 (52.44%), S25 (54.55%), and S27 (29.70%).

Table 5 Factors influenced secondary school children to crossing the road

School	Factors (%)						
	Crossing	Transit	Parent	Shop	Bus stop	Home	Unknown
S1	404	0.00	2.79	29.61	1.12	6.15	**60.34**
S2	335	9.71	24.27	0.00	18.45	**44.66**	2.91
S3	290	17.00	**60.00**	2.00	0.00	11.00	10.00
S4	247	**51.61**	18.06	1.94	28.39	0.00	0.00
S5	111	31.53	**35.14**	0.00	12.61	20.72	0.00
S6	32	18.75	**37.50**	40.63	3.13	0.00	0.00
S7	406	2.63	23.68	14.47	14.47	2.63	**42.11**
S8	28	7.14	**92.86**	0.00	0.00	0.00	0.00
S9	131	**87.22**	8.27	0.00	0.00	4.51	0.00
S10	252	2.01	12.71	20.40	0.00	4.01	**60.87**

S11	496	21.21	24.24	6.06	0.00	0.00	**48.48**
S12	268	0.00	**34.65**	20.79	2.97	9.90	31.68
S13	431	11.42	17.81	2.74	**39.73**	17.81	10.50
S14	339	29.37	**47.62**	12.70	0.00	3.97	6.35
S15	183	5.33	**86.98**	0.00	0.00	7.69	0.00
S16	393	9.92	19.83	**62.81**	0.00	7.44	0.00
S17	117	17.39	**80.43**	0.00	0.00	2.17	0.00
S18	81	0.00	**86.30**	0.00	0.00	2.74	10.96
S19	87	0.00	**51.72**	0.00	0.00	0.00	48.28
S20	146	**42.62**	27.87	0.00	0.00	21.31	8.20
S21	28	**80.00**	20.00	0.00	0.00	0.00	0.00
S22	211	0.00	12.35	**49.38**	8.64	19.75	9.88
S23	147	**52.44**	37.80	0.00	3.66	0.00	6.10
S24	432	6.22	25.36	0.00	3.35	**59.33**	5.74
S25	99	**54.55**	34.85	1.52	0.00	0.00	9.09
S26	241	0.68	15.65	24.49	14.97	**31.29**	12.93
S27	226	**29.70**	22.77	9.90	28.71	3.96	4.95
S28	101	4.62	**78.46**	0.00	0.00	15.38	1.54

5. Conclusion and Recommendation

In Malaysia, police statistic in year 2016, 3% of pedestrian death due to road accident was school children and 12% of them involved in road accident from/to school. In addition, almost 84% of the crash occurred while the pedestrian was crossing the road away from a pedestrian crossing. Therefore, the main objective of this study was to evaluate school crossing facilities in terms of utilisation rate of pedestrian crossing facilities among primary and secondary school children and factor influence student to the crossing the road. The total 45 minutes' observation was conducted at 60 selected schools in Selangor. Out of that only 36 was provided with pedestrian crossing facilities. Observation found, most of the pedestrian crossing facilities at school area was located in range 0 to 25meter distance from school gate. For summary, the dangerous crossing behaviour was identified during study period. The number of school children crossing the road was higher. The presence of traffic warden show influences the utilization rate. Study also identify most of the factor influence school children to crossing the road was due to their parents and transit vehicle such as buses pick-up them opposite of the school area. In additional, the presence of shop lot opposite at school area are also influence school children to crossing. Through this study can be suggested that the of pedestrian crossing facilities in the school area is necessary as the number of students crossing at this area is high although there were no any pedestrian crossing facilities provided. School children was expose to risk when there were no any pedestrian crossing facilities provided at school area.

Appendix

No.	School name (Primary)
1.	Sekolah Kebangsaan Hulu Kelang
2.	Sekolah Kebangsaan Ampang
3.	Sekolah Kebangsaan Taman Kosas
4.	Sekolah Kebangsaan Beranang
5.	Sekolah Kebangsaan Tun Abdul Aziz Majid
6.	Sekolah Kebangsaan Dusun Nanding
7.	Sekolah Kebangsaan Tambak Jawa
8.	Sekolah Kebangsaan Saujana Impian
9.	Sekolah Jenis Kebangsaan Cina Ying Wah
10.	Sekolah Kebangsaan Telok Gadong
11.	Sekolah Jenis Kebangsaan Cina Pandamaran B
12.	Sekolah Kebangsaan Seksyen 9 Kota Damansara
13.	Sekolah Jenis Kebangsaan Tamil Castlefield
14.	Sekolah Kebangsaan Pusat Bandar Puchong
15.	Sekolah Kebangsaan Pulau Meranti
16.	Sekolah Kebangsaan Sinaran Budi
17.	Sekolah Kebangsaan Sungai Leman
18.	Sekolah Kebangsaan Taman Sungai Besi Indah
19.	Sekolah Kebangsaan Taman Universiti
20.	Sekolah Kebangsaan Seksyen 6 Shah Alam
21.	Sekolah Kebangsaan Bukit Rimau
22.	Sekolah Kebangsaan Seksyen 13 Shah Alam
23.	Sekolah Kebangsaan Putra Heights 2
24.	Sekolah Kebangsaan Sungai Haji Dorani
25.	Sekolah Kebangsaan Sungai Pelek
26.	Sekolah Kebangsaan Tanjong Karang
27.	Sekolah Kebangsaan Abdul Samat
28.	Sekolah Kebangsaan Jalan Semenyih
29	Sekolah Kebangsaan Sungai Binjai
30.	Sekolah Kebangsaan Bandar Baru Bangi Seksyen 7
31.	Sekolah Kebangsaan Batu 9 Cheras
32.	Sekolah Kebangsaan Taman Melawati 2

No.	School name (Secondary)
1.	Sekolah Menengah Kebangsaan Taman Kosas
2.	Sekolah Menengah Kebangsaan Puncak Alam
3.	Sekolah Menengah Kebangsaan Bukit Changgang
4.	Sekolah Menengah Kebangsaan Syed Mashor
5.	Sekolah Menengah Kebangsaan Selayang Bharu
6.	Sekolah Menengah Kebangsaan Bandar Tun Hussein Onn 2
7.	Sekolah Menengah Kebangsaan Dusun Nanding
8.	Sekolah Menengah Kebangsaan Sultan Abdul Aziz Shah
9.	Sekolah Menengah Kebangsaan Jalan Reko
10.	Sekolah Menengah Kebangsaan Tengku Idris Shah
11.	Sekolah Menengah Kebangsaan Convent
12.	Sekolah Menengah Kebangsaan Dato' Hj Kamaruddin
13.	Sekolah Menengah Kebangsaan Pengkalan Permatang
14.	Sekolah Menengah Kebangsaan Pendamaran Jaya
15.	Sekolah Menengah Kebangsaan Kelana Jaya
16.	Sekolah Menengah Kebangsaan Damansara Utama
17.	Sekolah Menengah Kebangsaan Bandar Utama Damansara (2)
18.	Sekolah Menengah Kebangsaan La Salle
19.	Sekolah Menengah Kebangsaan Bukit Sentosa 2
20.	Sekolah Menengah Kebangsaan Alam Megah
21.	Sekolah Menengah Kebangsaan Subang
22.	Sekolah Menengah Kebangsaan Bandar Baru Sungai Buloh
23.	Sekolah Menengah Kebangsaan Pantai Sepang Putra
24.	Sekolah Menengah Kebangsaan Sungai Burong
25.	Sekolah Menengah Kebangsaan Tanjung Sepat
26.	Sekolah Menengah Kebangsaan Batu Laut
27.	Sekolah Menengah Kebangsaan Telok Panglima Garang
28.	Sekolah Menengah Kebangsaan Setia Alam

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Research Report

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