

**SPECIAL SESSION : MOBILITY FOR VULNERABLE ROAD USERS -
EDUCATION OF CHILDREN IN PEDESTRIAN SAFETY – A STRATEGY TO
ALLEVIATE ROAD DEATHS IN SOUTH AFRICA**

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ABSTRACT

**MOBILITY FOR VULNERABLE ROAD USERS -
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The number of deaths and injuries that take place in developing countries due to traffic crashes is recognised by the World Bank as a priority health issue. The socio economic climate in South Africa dictates that most families use public transport or walking to reach the primary destination - work or education. The most vulnerable group of learners is that between three and 12 years of age, as they participate in traffic without any real experience or training. . Engineering changes alone cannot prevent injuries; road safety education is essential to make children safe in their mobility and access to educational centres and schools. It is advocated in this paper through the experiences in Eldorado Park that a multi dimensional approach can be successful in changing attitude and behaviour to reduce fatalities. It is emphasised that road safety education for children requires a comprehensive approach, including involvement from parents, teachers and older family members. A comprehensive approach also includes innovative training programmes in the classroom, educating children with plays, booklets, games and training them in real life scenarios focussing on pedestrian activity. In focussing on a life skill for pedestrians a different breed of driver is developed by repetitive education during the formative years of primary school children.

1. INTRODUCTION

SANRALs core function is the development and maintenance of a National Road Network. This function is not carried out in isolation, but is closely related to wealth creation and development at several levels. “Wealth” is not merely monetary value, but also the wealth of sharing/learning of new skills, training, care of the environment to mitigate the effect of the road system, and road safety to ensure that the infrastructure is not a danger to communities and road users.

The number of deaths and injuries that take place in developing countries due to traffic crashes is recognised by the World Bank as a priority health issue. South Africa as a country in transition is part of this international trend with several factors contributing to the high death and injury rates. A concern is that 95% of all crashes in South Africa are a direct result of a traffic violation.¹ In South Africa several factors contributes to this high rate namely poor driver behaviour and attitude, the culture of impunity in respect of paying traffic fines, average age of vehicles, fraud and corruption and the mix of a first and third world situation where national highways cut through informal and rural settlements where there is high pedestrian activity.²

2. THE PEDESTRIAN AS VULNERABLE ROAD USER IN SOUTH AFRICA

Road Safety education programmes in South Africa varied in the past and addressed mainly the car owner. Children were educated to become responsible drivers. The socio economic climate in South Africa dictates that most families use public transport or walking to reach the primary destination - work or education. South Africa set to reduce road crashes by halve by 2015 and pedestrian deaths 5% annually and with 15% by 2014. Road fatalities amounts to more than 14 000 per year and in table 1 the comparative figures for the last three years are given. During 2006 841 pedestrians under the age of 18 died on South African Roads as explained in Table 1.

User groups per age groups					
2004					
User group	0-1years	2-5 years	6-12 years	13-16 years	17-18 years
Driver	0	1	13	27	26
Passenger	45	82	158	110	89
Pedestrian	27	202	416	137	72
Total	72	285	587	274	187
2005					
Driver	0	2	9	24	24
Passenger	45	78	116	87	79
Pedestrian	27	191	327	98	56
Total	72	271	452	209	159
2006					
Driver	0	2	14	19	31
Passenger	41	89	126	95	87
Pedestrian	30	207	399	141	64
Total	71	298	539	255	182

Table 1 : Road Deaths children under 18 – 2004 - 2006³

From the table it is clear that the most vulnerable age group is 6 – 12 years, the next group that are a concern is the ages between 2 and 5 years. The age group 6 – 12 years are primary school children and in South Africa either walk to school or make use of public transport – minibus taxi's.

3. IMPORTANCE OF ROAD SAFETY EDUCATION

The pedestrian environment in many urban areas in developing countries and countries in transition are known to be relatively unsafe. Several factors contribute to this situation, including unsatisfactory design and layout of roads, sidewalks and road furniture. Other problems are related to the poor condition of vehicles travelling on the roads. Unfortunately, it has also been found that there is a growing general tendency among drivers and pedestrians to ignore traffic rules and regulations. The situation is made worse by a deficiency of traffic rules and the lack of enforcement, as well as inadequate education. The most vulnerable group of learners is that between three and 12 years of age, as they participate in traffic without any real experience or training. The lack of experience and the consequent limitations influence the young learner's behaviour in traffic. The most important limitations of learners lie in their physical, intellectual and behavioural development. Engineering changes alone cannot prevent injuries; road safety education is essential to make children safe in their mobility and access to educational centres and

schools. Learners spend most of their days in the classroom. Here they are taught life skills, but road safety does not always form part of what they learn. Road safety education is not compulsory and seen as add on to certain learning areas. Unfortunately, road safety education is not clearly defined in the learning area of life skills and most educators do not recognise its place and value.

4. CHILD (LEARNER) DEVELOPMENT AND LIMITATIONS

When a learner starts school, new demands are made on him/her concerning participation in traffic. The young road user, and in particular the road user in Grade R, the foundation phase, is particularly vulnerable in traffic. Learners have certain limitations due to their particular stage of development. Developmental features can be positive, but can put young pedestrians at risk in traffic. It is crucial to educate young pedestrians on safety in traffic due to the following:-

- The road environment is not learner-friendly;
- Young road users often have little or no road sense;
- Streets / roads are potentially dangerous places for young learners; and
- A high percentage of learners are killed and injured on our streets / roads.

Physical and perceptual development goes hand in hand. This particular phase comprises the ability to collect information through the senses from the external or internal environment and integrate it into the existing information patterns in the brain.

4.1 Physical development

The young learner is physically small in relation to cars, taxis, buildings and traffic signs and therefore has a limited view of his/her environment. Vulnerable body parts such as the head, chest and abdomen are at the same height as a car's bonnet and are most often hit in a crash. The young pedestrian's movement in traffic is often quick, uncertain and clumsy.⁴

4.1.1 Gross motor co-ordination

Gross motor muscles develop before the fine motor muscles. The learner reacts slowly in traffic – the younger the learner, the slower the reflexes and movements. The learner does not have the muscle power to react immediately and to move fast and forcefully out of the way of a vehicle.⁵

4.1.2 Fine motor co-ordination

Fine motor muscle development is essential for eye-hand and eye-foot muscle co-ordination. The young learner shows an inability to move his or her eyes in all directions to check for oncoming vehicles. In traffic, the learner must be able to develop the ability to look to the side (peripheral vision). If peripheral vision is not developed, the learner will not be able to notice oncoming traffic from the sides.⁶

4.2 Perceptual development

Up to eight years of age the learner is subject to certain perceptual limitations, such as the underdeveloped concepts of speed, time and distance and concepts such as near-far, high-low, big-small, fast-slow, in front-behind and left-right. They have limited perception of

movement, underdeveloped spatial relations, underdeveloped perceptual skills and lack of concrete experience, limited ability to distinguish between right and left. Therefore the young learner cannot judge the time it will take an approaching vehicle to reach him/her.⁷

4.2.1 Visual perception

A young pedestrian of six years old has a lower eye level (± 110 cm). Written signs mean nothing to the young pedestrian who will then fail to obey warnings. A young pedestrian has foreground/background discrimination and will be unable to distinguish between near and far, small and big.

4.2.2 Auditory perception

Lowest level of sensitivity to sound is 5 years of age. This gradually improves until the age of 12. Girls show greater hearing sensitivity than boys. Learners are easily distracted and have a tendency to select irrelevant and unfamiliar sounds. Thus the learner will often select sounds that are not necessarily relevant to the traffic situation and may not discern the meaning of a hooter as a warning of danger.⁸

4.3 Cognitive development

Typical characteristics of young pedestrians are that thinking patterns are at a basic level, with an inability to think in abstract terms, limited ability to think in terms of possibilities, the young learner is easily distracted by movement, sound and colour, has no fixed concepts of number, shape, time, mass, speed or volume. They function egocentric, cannot anticipate danger in the traffic situation, imitates wrong behaviour.⁹

4.5 Social development

Learners often become so engrossed in games that they pay no attention to traffic. Boys play outdoors and their games are more risky, therefore they are more at risk than girls. Small learners are unpredictable, impulsive and inquisitive and will easily follow and imitate a (reckless) friend. Primary school learners moving in groups in traffic are therefore at greater risk. Learners start considering other people from the age of 6 to 7 years, therefore traffic safety education must include the cultivation of courteousness, consideration and responsibility in the early stages. The peer group becomes increasingly important. Risky behaviour may be less important than the acceptance of the peer group.¹⁰

4.6 Moral development

Learners in Grade R and the foundation phase will adhere to traffic rules simply to avoid punishment. Learners in the intermediate phase will adhere to rules because they want to receive praise and satisfy personal needs. Learners memorise rules without really understanding them. Egotism – the whole world revolves around the young learner and his/her comfort and pleasure, therefore the learner will not be interested in the safety of others. The young learner normally has strong religious beliefs, therefore traffic safety education must include aspects such as the cultivation of a positive attitude, internal discipline and obedience.

5. METHODS AND TOOLS FOR ROAD SAFETY EDUCATION

A research study by the University Of Dundee, United Kingdom found that there should be a distinction between road safety knowledge and behaviour. Children who know more do

not necessarily behave safer in a traffic environment. Teaching children about road safety requires a multi medium approach over several years with repetition, revision and review exercises. A multi medium approach is necessary as a specific medium will be effective with one child, but not with the others. The most important medium of educating children is through parents, older family members and teachers setting a good example and consistently adhering to the rules of the road. The following media are normally used to educate children:

- Lectures in class. This is where the fundamental rules can be taught to children.
- Plays. These capture children’s imagination.
- Booklets. Several booklets exist with graphics that attracts children’s attention and learn them through little characters about traffic safety.
- Games.
- Junior Traffic Training Centres (simulating a real life traffic scenario).
- Supervised real life traffic situations. This includes accompanying children on their route to school and is probably one of the best forms of education, because it allows the parent / older person to set a real life example.¹¹

6. INTERNATIONAL PRACTICE

There is a vast amount of information available on the internet on road safety education for children. In many cities over the world there are training programmes that focus on the child environment and education programmes include playful training centres, traffic clubs, booklets, etc. Some of these programmes are shown in Figure 1.

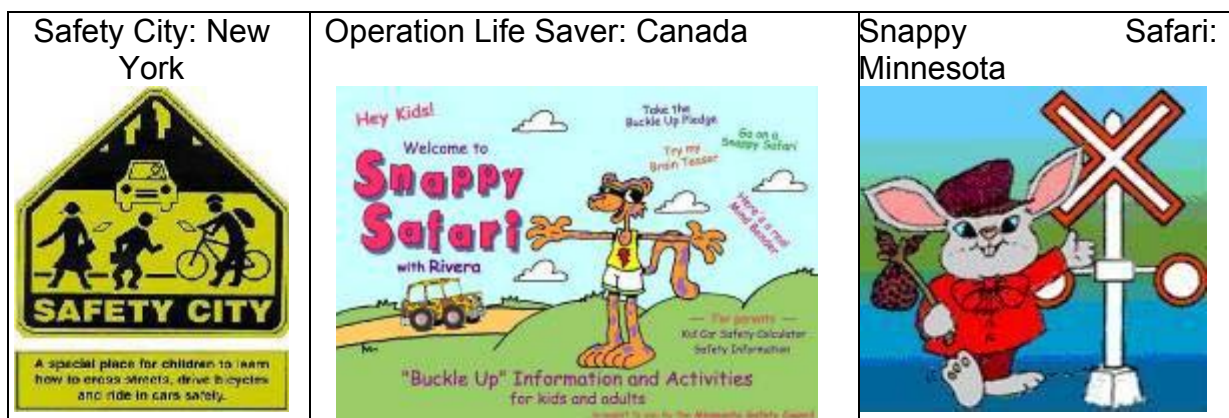


Figure 1: International Child Traffic Training Programmes

Safety Cities in New York City consist of a street section that is closed to traffic and used for educating children in a safe, real life traffic environment. Typical practices used in other countries also include parental guidance classes where parents are taught to make their children aware of road safety. Characters are also widely used, like in the Canadian “Operation Lifesaver Canada” – see the rabbit below. There are also programmes such as “Snappy Safari” of the Minnesota Safety Council. These characters are used to relate to the children, get their attention and teach them road safety.¹²

7. LOCAL PRACTICE

Road Safety education in South Africa is addressed at several levels. Unfortunately, road safety education is not part of the formal curriculum of the Department of Education and the responsibility is with the Provincial governments and is normally handled by the

provincial department of community safety or a traffic department. School teachers mostly use their own initiative and educate children on a few basic aspects of road safety. In most cases, this is however not adequate and because it is not part of the curriculum, it does not receive the attention and priority it should.

Several Junior Traffic Training Centres have been constructed over South Africa. Various forms exist – some are equipped with tri-cycles, some with two wheel scooters (the famous black plastic ones). The layout in most cases is focussed around the children driving in the road with these vehicles and learning the basics of stopping, obeying a traffic signal etc. A typical layout of existing training centres is shown in Figure 2 with photos of other existing facilities. The observation made at all these facilities, was the fact that they all focus on teaching children driving rules and not so much road safety rules that apply to pedestrians. It was also found that the temporary training facilities that are marked out on parking areas for example, do not provide a realistic environment to act as a simulation of real life.

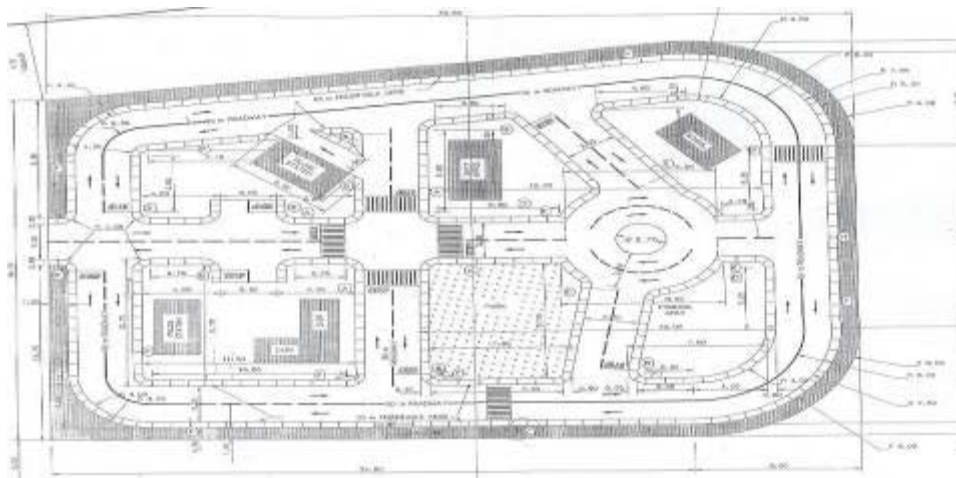


Figure 2: Existing Local Junior Traffic Training Centres

Centre in Benoni



Centre in Kempton Park



8. A CASE STUDY OF INTEGRATING ROAD SAFETY EDUCATION AND ENGINEERING IN ELDORADO PARK.

A pedestrian safety project was initiated in the community of Eldorado Park during 2003. The Eldorado Park community was established southwest of Johannesburg by the forced

removal of people from various areas around Johannesburg such as Sophiatown and Vrededorp under the former Group Areas Act. It is adjacent to the N12 Freeway to the south and Golden Highway to the east. Most of its residents are working class or unemployed people. Eldorado Park is a densely populated residential area of approximately 1100 ha (3,7 x 3,0 km) which includes 23 schools with between 600 and 1400 learners per school.¹³ Approximately 18,000 learners attend school in Eldorado Park, many of which travel to and from the surrounding areas (Soweto, Freedom Park, Slovo Park and Kliptown). The estimated population is 65,000, of which approximately 55% is unemployed. The area has been described as having high levels of violence, crime, school drop-out rate, unemployment, rape, alcohol abuse, teenage pregnancy, gang warfare, racism, and poverty. In 1993, it was reported to have the highest rate of intentional and interpersonal homicide in the greater Johannesburg area. In addition, the area has relatively poor infrastructure regarding transport and public health services such as medical facilities and sanitation, as well as recreational facilities for its youth.

A high percentage (between 50 and 80%) of the road users travel on foot. Certain roads are flooded with learners before and after school. The presence of pedestrians in the road network is significant throughout the day and even the night. The vehicle population includes a substantial percentage of taxis and buses. There are also relative busy vehicle routes in the area, resulting in conflict between vehicles and pedestrians. It is estimated that 60% of road traffic accidents in Eldorado Park involve pedestrians. Approximately 1.8 pedestrian fatalities and 10.3 pedestrian accidents occurred per month in 2003.¹⁴ Traffic-related injuries were also a significant concern in the area. Pedestrians in Eldorado Park were especially vulnerable due to the high volumes of traffic on some of the main roads, the Golden Highway and the N12. Engineering problems were as follows:-

- Alarming road traffic crash record: 1 fatality every ± 1.6 months, $\pm 60\%$ pedestrians
- Relatively high learner density: $\pm 1600/\text{km}^2$ from 23 schools
- Insufficient road safety measures incl. public transport facilities

Traffic problems were associated with some of the social problems, and this contributed to the rate of traffic-related injuries. The social environment influenced walking patterns of people, which at the same time contributed to opportunities for crime. School pupils were obliged to walk long distances to school without supervision, in undeveloped areas and on undeveloped roads. This was considered a health and safety risk for children and contributed to the injury rate in Eldorado Park.

8.1 Main objectives of the project

The main objectives of the project were to improve traffic safety, to relieve poverty and to transfer skills. A phase approach was used to implement the necessary remedial measures. Phase 1 – Traffic Safety Improvements :-

- Implementation of engineering solutions to traffic and pedestrian safety problems. The following were implemented:

-

Speed Humps	39	Golden Highway Lay-bys	4
Raised Pedestrian Crossings	12	Golden Highway Median	0,40km
Painted Pedestrian Crossings	50		
Block Pedestrian Crossings	6		
Road Signs	41		
Taxi Lay-bys	27	Traffic Signal Upgrade	9 Sites
Bus Lay-bys	27		
Paved Walkways	10,73km	New Lighting &	2,40km
Barrier Kerbs	4,22km	Repair Lighting	304
Pedestrian Ramps	112		
Main Road Physical Median	1,29km	Junior Traffic Training Centres	2
Guard Rails	1,59km		
Drainage	5 Sites		

- Traffic safety awareness targeting the learners in 23 schools, teachers and the community at large. A comprehensive investigation to determine the real needs of the community was launched with the following aims:-

- To determine the perceptions and opinions of community members regarding traffic safety in Eldorado Park
- To identify traffic safety problems and possible solutions
- To provide general traffic safety education targeted at Eldorado Park teachers and pupils
- To provide specific education regarding existing and new road infrastructure and road furniture
- To evaluate the implementation of the traffic safety education interventions

- Development of appropriate material to use in education of teachers and learners
- Empowerment of the community
- Job creation
- Technical skills transfer and training

Phase 2

- The construction of two Junior Traffic Training Centres
- Empowerment of historically disadvantaged entities
- Training of teachers in the practical application of theoretical traffic safety education knowledge using the Junior Traffic Training Centres

A large proportion of the Eldorado Park community was involved in the social awareness component of the project. Five hundred and twenty-eight households comprising 2 263 residents completed the household questionnaire. Various stakeholders (including local authorities), 25 principals and 17 teachers also took part in the process. In addition, pupils, teachers and community volunteers participated in the focus group discussions. Participation by schools was of the utmost importance as educators play an essential role in the education of the youth. Teachers often spend more time with pupils than the primary educator (parent/caretaker). Considering that these school pupils are the road users of tomorrow, appropriate road safety education plays a major role in reducing future accident rates and changing attitudes towards road safety within Eldorado Park. Council Members, Metro Police, Bus and Taxi Associations were involved in the planning, design and implementation of the project. Local contractors completed 60% of phase 1 and 100% of phase 2.¹⁵

8.2 Traffic Safety Forum

The traffic safety awareness programme led to the establishment of a traffic safety forum. All schools in Eldorado Park have a representative on the forum. The forum is responsible for the coordination of learning activities at the Junior Traffic Training Centres, coordination of traffic safety week and liaison with the community regarding traffic safety issues.

8.3 Junior Traffic Training Centres

8.3.1 Design Principles

The focus on road safety education for children in the age group 3 to 13 should be on their role as pedestrians in traffic. Training should be focussed on repeating the basic lessons of crossing a street, walking on the right side of the road and other basic skills. A Junior Traffic Training Centre is a safe environment where the road environment is simulated, allowing the child to, in a playful manner, learn the rules of the road. Consideration was given to the principle of providing a permanent facility versus as opposed to a temporary facility that can be constructed by erecting temporary road signs and marking a road, on for example, a parking area. Providing a permanent facility has the benefit that it becomes a visible asset of the community and when situated within a school yard, the children can also play there during breaks.¹⁶

8.3.2 Functional Design

The South African Department of Transport developed a lecture series called “Child in Traffic”. The 10 fundamental lessons that a primary school child should learn form the basis of this lecture series together with a range of pamphlets, booklets and play material. The lessons included in “Child in Traffic” focus on the fundamentals of walking on the right side of the road, crossing a street, understanding and recognising basic road signs and understanding a traffic signal.

As mentioned above, most local training centres focus on playing and actually on a vehicle environment. The layout of the design adopted for the new Junior Traffic Training Centres in Eldorado Park is shown in Figure 3. The fundamental decision was made that the training centres should be used to teach children the basics of behaving as pedestrians.

The layout resembles a small “town” with streets, sidewalks, taxi lay-byes, a traffic signal and a few “buildings”. The focus of the training facility is on pedestrians, and a numbered pedestrian route was developed through the town with a series of “tests” where different skills of the child as pedestrian can be learned and tested. The “conflicting” traffic is generated by a different group of children that drive on small vehicles or tri-cycles on the road. They also have to obey stop signs, a traffic signal and pedestrian signs. The tests are shown in the Table2.

Nr	Description of test	Objective – Teach child to
1	Crossing road at a pedestrian crossing	Stop on side of road, observe traffic both sides and wait for vehicles to stop before crossing.
2	Waiting for a taxi at a lay-by	Wait at designated taxi bay, away from road, ensure visible to taxi driver. How to enter a taxi. Do not run / walk into road behind the back of the vehicle.
3	Crossing an intersection diagonally via 2 pedestrian crossings	Cross traffic streams one after the other at an intersection. Do not walk diagonally across.

4	Crossing the road midblock at a raised pedestrian crossing with scholar patrol	Obey scholar patrol, the different signals they give, where they should wait.
5	Walking on a walkway next to the road	Be aware that although no conflicting traffic, need to be aware, give way to other pedestrians
6	Crossing at a T junction via two crossings	Repeat of 3, but at T junction
7	Walking in the road where no walkway exists and crossing where there is no pedestrian crossing.	Walk facing oncoming traffic, increase awareness if traffic approaches. Observe traffic to both sides before crossing the road.
8	Crossing the road where no pedestrian crossing exists	Stop at side of road, observe both sides before entering, do not run across.
9	Crossing the road at a signalised pedestrian crossing	Wait for green man before walking, do not enter when flashing red. Stop and wait if red man. Remain alert and look left and right when crossing.
10	Crossing the road at a mid-block raised pedestrian crossing	Repeat of 1, but at raised crossing

Table 2 : Activities and tests to be conducted at junior traffic training centres.¹⁷

8.3.3 Visual Design

The materials selected for the road surface, side walks and adjacent buildings should be such that it should as far as possible resemble real life. A black top road surface with kerbs and paved sidewalks was therefore used to resemble the road. Children act or role play what they see adults do on a scale that is equal to the environment they live in. It is therefore important that the training facility resembles as close as possible the real “adult” life, but on a different scale.

8.4 Capacity and Management

The success of a facility like this is dependent on the proper utilisation thereof. Building a dedicated facility and then have it utilised a few hours per week will be a waste of resources. Unfortunately this is what happens in many cases where these facilities are built with much fanfare and then collect dust afterwards and the grass grows through the paving blocks. To successfully educate a child on road safety, repetition is necessary and one visit to the centre in his or her primary school career will not be adequate. German literature refers to 30 hours road safety training per year per child (almost 1 hour per week). This is substantially more than what is being done in South Africa, given that it is not part of the formal curriculum. A simplistic calculation, shown in Table 3, was done to determine how many children can be taken through a facility like this per year. A typical group will consist of 36 children at a time. The total capacity is 180 children per day or approximately 30,000 children per year.

Description	Number
Group A: Pedestrians (3 groups of 4)	12
Group B: Drivers and Assistants	
- Drivers of miniature vehicles	6
- Traffic Officers	2
- Scholar Patrol	2
- Taxi Driver	1
- Petrol Pump attendant	1
Group C: Play and rotate	12
Total	36
Number of Groups per day	5
Children per day	180

School days / training days per year	170
Total children per year that can be trained	30,600

Table 3: Capacity of Junior Traffic Training Centres in Eldorado Park

It should be noted that the concept assumed allows for three groups that are in the facility simultaneously: Pedestrians (who receive the real pedestrian education), the “conflicting traffic” of children in miniature cars and a third group of children playing or observing what the others do. This allows 20 minutes per child for a specific task and the idea is that they rotate, as it is assumed that the attention span of children of this age group is limited. This allows them to perceive problems from various perspectives and thus gaining more insight into traffic operations.

To maintain this capacity, it will be essential to appoint a dedicated, qualified and motivated person who liaises with schools and arranges training. The challenge of providing adequate capacity is shown in Table 4 below with Eldorado Park as an example.¹⁸

Description	Number
Number of Schools	23
Total learners (all ages)	20,000
Learners from ages 7 to 11 (20 000 / 12 classes x 4 age groups)	Approx 6,000 – 7,000
Frequency of 1 hour training sessions per year, where they “act” as pedestrians for 20 minutes	4 (1 per school term)
Training demand (7000 x 4)	28,000 children per annum

Table 4: Training Demand in Eldorado Park

In the case of Eldorado Park 2 training centres were constructed, that allows larger capacity and more flexibility in the use thereof. It is critical to note that to use the facility successfully, an operational budget should be provided for the centre. This must allow for a manager / trainer, training material such as vehicles, booklets, transport to the facility and maintenance. Without an operational budget, the success of the facility is likely to be limited.

8.5 Construction Materials and Cost

The JTTC was constructed to resemble a real life “town”. The material selected for streets was therefore a slurry that is visually black like asphalt and kerbs were installed on the sides. The paving selected was red in colour and road markings similar to that on a road were used. The materials were also selected to keep the cost as low as possible.

The construction of the JTTC provided an ideal opportunity to do labour based construction by an emerging contractor. The total construction value of the JTTC was R300 000, excluding the road signs and traffic signals that were sponsored.

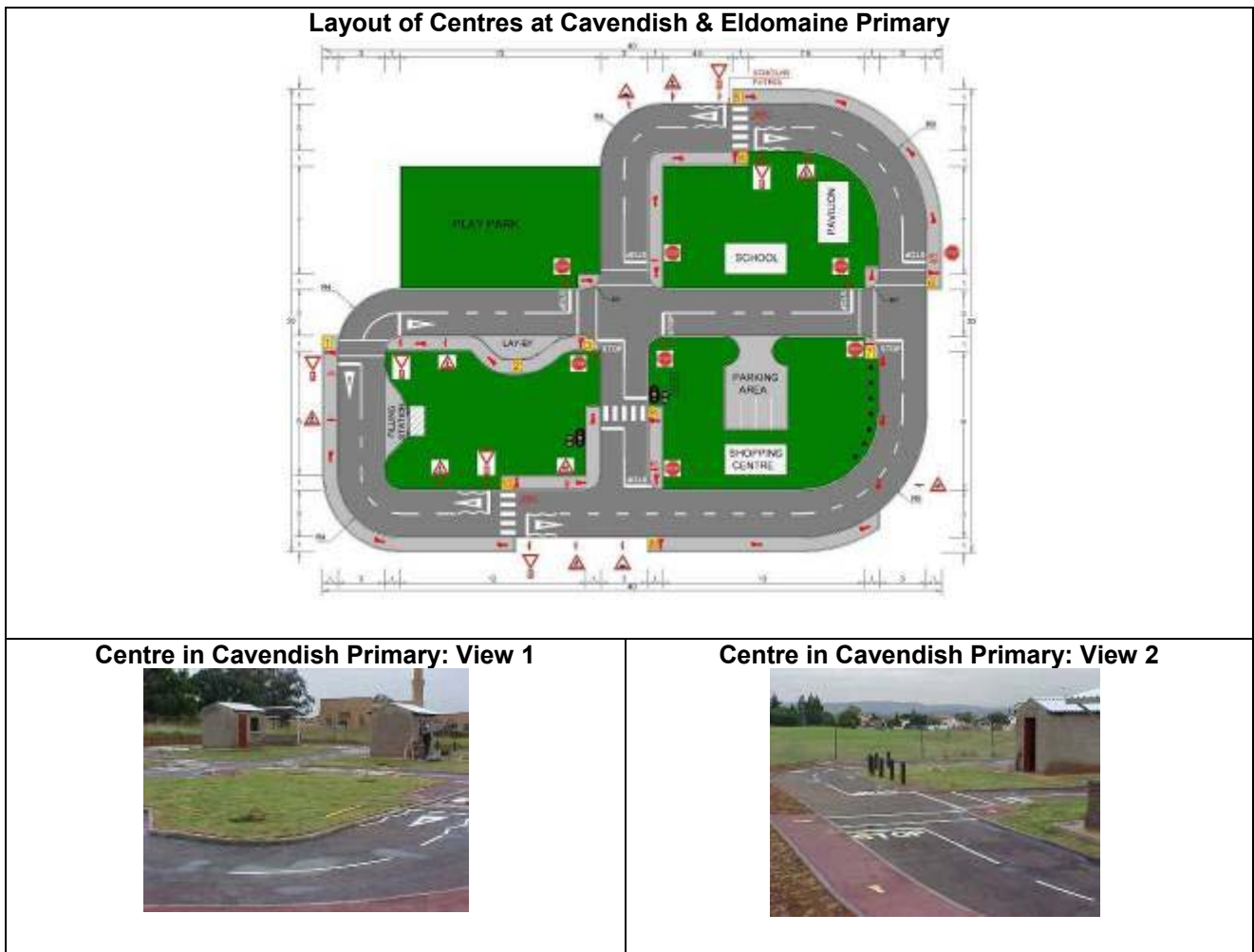


Figure 3 : Design and Layout of junior traffic training centres in Eldorado Park

8.4 Streetwise

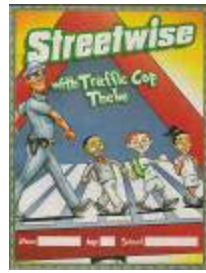
The STREETWISE booklets were developed to serve as a tool for teachers to teach road safety during school hours. The series contains 4 booklets aimed at learners of ages 5-6, 7-9, 10-12 and 13 years. In addition, a teachers manual will alert teachers to the limitations of learners and assist them with the education of basic traffic safety principles. The booklets were developed keeping the limitations and development of children in mind, the characters used are current day and keep themselves busy with activities popular in the South African society. The booklets were developed using a popular storyline and include games and fun activities which are in line with outcomes based education suitable for South African schools.¹⁹

The activity booklets are divided into the following themes: -

- *Safe places to play, to walk and to cross;*
- *The traffic environment;*
- *Road signs;*
- *Visibility; and*
- *Passengers.*



Grade R&1



Grade 1&2&3



Grade 4&5



Grade 6&7

8.5 Surveys

Specific safety aspects were surveyed both before and after implementation of the engineering measures. This was done to assess the effectiveness of the engineering measures implemented. The before surveys were done on Wednesday 16 July 2003. The after surveys were done on Tuesday 2 August 2005; approximately one year after implementation. Each aspect is discussed below:

8.5.1 Pedestrians Walking in the Road

Sidewalks are of the most important facilities that can be provided for pedestrians. It improves pedestrian mobility and is associated with significant reductions in crashes with pedestrians. It also improves the character of a neighborhood. Where sidewalks are not provided, it is often more convenient for pedestrians to walk in the road. Pedestrians that walk in the road are more exposed to pedestrian – vehicle crashes. The percentage of pedestrians that used to walk in the travelway of Buckingham and Boundary Road reduced by 34% and 49% respectively. The surveyed results are given in Table 5. ²⁰

Boundary Road			
Walking Position	Before	After	Improvement
Pedestrians on Sidewalk	51%	100%	49%
Pedestrians in Road	49%	0%	
Buckingham Road			
Walking Position	Before	After	Improvement
Pedestrians on Sidewalk	56%	90%	34%
Pedestrians in Road	44%	10%	

Table5: Pedestrians Walking in the Road - Reduction

8.5.2 Public Transport Vehicles in the Road or on Sidewalk

Limited bus and taxi lay-by facilities used to exist in Eldorado Park. Passengers were either picked up or dropped off directly from the street or sidewalk. The hazards associated with such operations are discussed below:

a) On-street Loading and Off-loading

Stationary vehicles normally interrupt traffic flow and instantaneously reduce the capacity of the road to service other vehicles. This causes a delay to the vehicles being interrupted and increases both the probability for a crash as well as the severity of crashes once they occur. In addition, stationary vehicles in the street, can block the vision of approaching drivers to respond to other road users such as pedestrians crossing the street from in front of the stationary vehicles.

b) On-walkway Loading and Off-Loading

Pedestrians are vulnerable to be knocked down by vehicles pulling off onto the sidewalks. Normally the sidewalks are not wide enough to accommodate both vehicles and pedestrians. Pedestrians are then forced into the road where they are even more vulnerable to traffic crashes. The number of busses and taxis that load / off-load passengers at the Main Kremetart intersection reduced by 86%. At Heerengracht Primary and Silver Oaks Secondary schools the reduction was 10%. Refer to Table 6 for the surveyed results.²¹

Main - Kremetart			
Loading / Off-loading Position	Before	After	Improvement
Busses / Taxis in Lay-by	0%	86%	86%
Busses / Taxis in Road	100%	14%	
Heerengracht Primary - Silver Oaks Secondary			
Loading / Off-loading Position	Before	After	Improvement
Busses / Taxis in Lay-by	43%	53%	10%
Busses / Taxis in Road	57%	47%	

Table 6: Loading / Off-Loading in the Road - Reduction

The conflict between vehicles and pedestrians as a result of vehicles that pull of onto the sidewalk was measured at Eldomaine Primary School as well as at the Main (Turf) – Ascot intersection. Lay-bys and barrier kerbs were provided at both locations to reduce the conflicts. The results are given in Table 7.

Main - Ascot			
Loading / Off-Loading on Sidewalk	Before	After	Improvement
Pedestrian - Vehicle (Far)	41%	86%	45%
Pedestrian - Vehicle (Close)	55%	14%	41%
Pedestrian - Vehicle (Dangeous)	3%	0%	3%
Main - Eldomaine			
Loading / Off-Loading on Sidewalk	Before	After	Improvement
Pedestrian - Vehicle (Far)	76%	100%	24%
Pedestrian - Vehicle (Close)	22%	0%	22%
Pedestrian - Vehicle (Dangeous)	1%	0%	1%

Table 7: Loading / Off-Loading on Sidewalk - Reduction

8.5.3 Questionnaires

Questionnaires were used to assess the community's perception of the success of the project. 267 people completed the questionnaires. 63% of the people perceived the roads to be safer after the project. According to 99% Eldorado Park is looking better after the project. The complete list of results is given in Table 8.²²

Persons Interviewed	Total	Male	Female	Ave Age
	267	55%	45%	37
Mode of transport	Walk	Car	Bus	Taxi
	54%	13%	5%	28%
Occupation	Learner	Work	None	
	14%	31%	55%	

Table 8: Summary of Questionnaire Results

Is it safer for children to walk to school?	Much Safer	A bit Safer	Not really	Safer
	35%	28%	37%	63%
Is speeding less of a problem?	Much Less	A bit Less	Not Really	Less
	40%	23%	37%	63%
Are passengers picked up and dropped off in lay-byes?	Mostly	Sometimes	Not Really	Yes
	40%	53%	7%	93%

Did pedestrian accidents decrease in the last year?	Big decrease 49%	Some decrease 37%	No decrease 14%	Decrease 86%
Is main road safer for children to cross?	Much safer 64%	A bit safer 10%	Not really 25%	Safer 75%
Have you become more aware of road safety in the last 2 years?	Much More 83%	A bit More 15%	Not Really 2%	More 98%
Are the roads looking better after the Road Safety Project?	Much Better 78%	A bit Better 22%	Not Really 1%	Better 99%
Are there enough sidewalks, lay-byes, speed humps in the major roads?	Yes 54%	Need bit More 34%	Need More 12%	Many Need More 46%
Do you know of pedestrians that have been killed / injured in Eldorado Park ?	% Knows 20%	Ave Number of Peds 2.6	Ave Age of Peds 14	
Do you know people that worked on the Road Safety Project?	% Knows 9%			

Table 9: Summary of Questionnaire Results (Continued)

8.5.4 Crash statistics

The pedestrian crash statistics were obtained from the Eldorado Park Police Station for 2003 and 2005. Effective implementation of the engineering safety measures occurred between November 2003 and July 2004. Thus the crash statistics can be considered as before and after implementation statistics. The average number of pedestrian fatalities in 2003 decreased from 1.83 to 1.14 per month in 2005 (38% reduction). The average number of pedestrian injuries in 2003 decreased from 10.92 to 8.86 per month in 2005 (19% reduction). The overall vehicle - pedestrian crashes reduced by 22%. The before and after crash statistics for the major roads are given in Table 10. ²³

Per Month Road	Fatalities			Injuries			Total		
	Before	After	Decrease	Before	After	Decrease	Before	After	Decrease
N12	0.75	0.00	100%	0.42	0.29	31%	1.17	0.29	76%
Main	0.50	0.29	43%	2.50	1.43	43%	3.00	1.71	43%
Golden Highway	0.33	0.29	14%	0.75	2.14	-186%	1.08	2.43	-124%
Union	0.17	0.14	14%	0.25	0.29	-14%	0.42	0.43	-3%
Boundary	0.08	0.00	100%	0.58	0.71	-22%	0.67	0.71	-7%
Mahonie	0.00	0.00	-	0.67	0.14	79%	0.67	0.14	79%
Cavendish	0.00	0.00	-	0.58	0.29	51%	0.58	0.29	51%
Concorde	0.00	0.14	-	0.42	0.29	31%	0.42	0.43	-3%

Table 10: Pedestrian Fatalities / Injuries (Per Month)

Per Month Road	Fatalities			Injuries			Total		
	Before	After	Decrease	Before	After	Decrease	Before	After	Decrease
Stockwell	0.00	0.14	-	0.42	0.29	31%	0.42	0.43	-3%
Cumming	0.00	0.00	-	0.25	0.00	100%	0.25	0.00	100%
Silver	0.00	0.14	-	0.42	0.00	100%	0.42	0.14	66%
Goud	0.00	0.00	-	0.25	0.14	43%	0.25	0.14	43%
Buckingham	0.00	0.00	-	0.17	0.14	14%	0.17	0.14	14%
Kremetart	0.00	0.00	-	0.17	0.29	-71%	0.17	0.29	-71%
Milnerton	0.00	0.00	-	0.17	0.29	-71%	0.17	0.29	-71%
Other	0.00	0.00	-	2.92	2.14	27%	2.92	2.14	27%
TOTAL	1.83	1.14	38%	10.92	8.86	19%	12.75	10.00	22%

Table 11: Pedestrian Fatalities / Injuries (Per Month) (Continued)

8.5.5 Results

The measured improvements as a result of the Eldorado Park Pedestrian and Traffic Safety Project include:

- ❖ The percentage of pedestrians that used to walk in the travelway of Buckingham and Boundary Road reduced by 34% and 49% respectively.
- ❖ The percentage of busses and taxis that load / off-load passengers reduced by 86% at the Main – Kremetart intersection. At Heerengracht Primary and Silver Oaks Secondary schools the reduction was 10%.
- ❖ The vehicle – pedestrian conflicts at Eldomaine Primary and the Main (Turf) – Ascot Intersection reduced by 23% and 44% respectively.
- ❖ 63% of the people questioned perceived the roads to be safer. According to 99% Eldorado Park is looking better after the project.
- ❖ The average number of pedestrian fatalities in 2003 decreased by 38% in 2005. The average number of pedestrian injuries in 2003 decreased by 19% in 2005. The overall vehicle - pedestrian crashes reduced by 22%.
- ❖ It is concluded that pedestrian safety improved and the quality of life for the community was improved as a result of the Eldorado Park Pedestrian and Traffic Safety Project.

9. CONCLUSION

The unacceptable high rate of pedestrian deaths in South Africa requires a dramatic approach to design, implementation and usage of road infrastructure. Driver behaviour in South Africa reflects a society that is ignorant to traffic laws and consideration for others. The mobility of the vulnerable road users – pedestrians and cyclists – is in grave danger due to this phenomenon. Pedestrians are dependent on public transport but in most cases walk long distances from home to make use of these facilities. It is believed and proof through the project in Eldorado Park that a multi dimensional approach can be successful in changing attitude and behaviour. It is emphasised that road safety education for children requires a comprehensive approach, including involvement from parents, teachers and older family members. A comprehensive approach also includes innovative training programmes in the classroom, educating children with plays, booklets, games and training them in real life scenarios focussing on pedestrian activity. This approach leads to a reduction of fatalities and change in behaviour by acting as a safe pedestrian using public facilities.

The focus on road safety education for children in the age group 5 to 13 should be on their role as pedestrians in traffic. Training should be focussed on repeating, revision and review of the basic lessons of crossing a street, walking on the right side of the road and other basic skills.

A Junior Traffic Training Centre has the benefit that it provides a safe environment where children can be taught these basic skills in a semi real life environment. The different skills can be taught in a specific sequence and the child can be tested repetitively. The facility also becomes an asset to the community and a visible symbol of road safety.

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