Principles for School Road Safety Education

A Research Summary

School Drug Education and Road Aware (SDERA)

SDERA is the State Government's primary drug and road safety education strategy to help keep young people safer.

SDERA is a successful collaborative organisation of the Department of Education and Training, Association of Independent Schools of WA and the Catholic Education Office and is funded by the Drug and Alcohol Office and the Insurance Commission of Western Australia.

Principles for School Road Safety Education

CONTENTS

Introduction

Principles for School Road Safety Education: A Research Summary presents a set of principles for best practice in school road safety education. The Principles provide a framework of core concepts and values to guide the planning, implementation and review of road safety education programs, policies and practice in school communities.

This resource is intended to give a summary of the research and theory that underpins each Principle. It is not intended to provide examples of what the Principles look like in the school setting or to give an action plan for implementing road safety education in schools. This information is available in *Getting it Together: A Whole-School Approach to Road Safety Education* (SDERA 2009).

This research summary is complemented by:
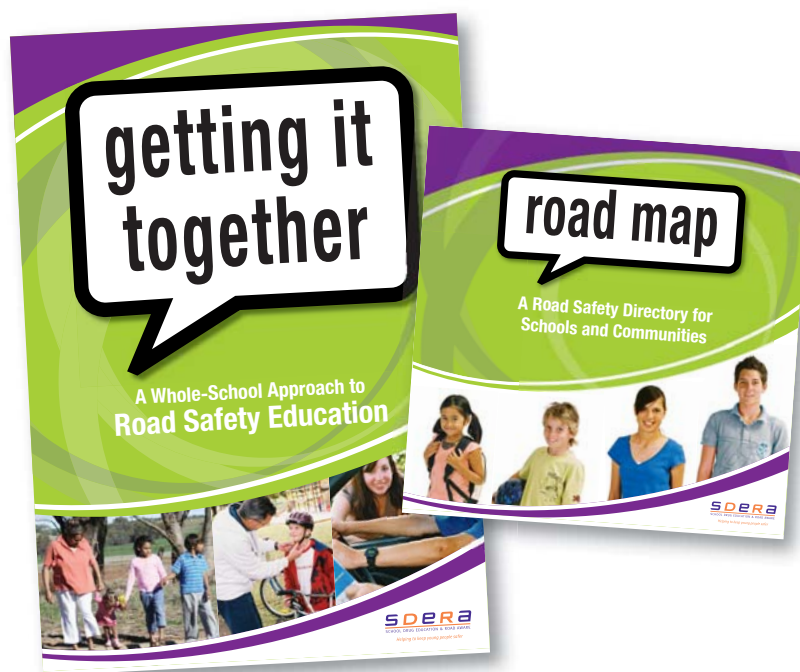
These resources are available from SDERA and can be viewed at www.sdera.wa.edu.au

Background

The National Road Safety Education Forum (NRSEF) is a nationally representative group of senior managers who oversee the implementation of road safety education in schools. The purpose of this group is to provide advice to the National Road Safety Strategy Panel on road safety education delivered through institutional and community settings, and provide advice on road safety education priorities relevant to the national road safety strategy. The NRSEF also aims to be the conduit for national discussion and information transfer between the states and territories of Australia to enhance the effectiveness of road safety education.

In 2006, the NRSEF agreed that a set of nationally-relevant principles of best practice would enhance the effectiveness of road safety education in schools. School Drug Education and Road Aware (SDERA) volunteered to commission the research project and contracted the Child Health Promotion Research Centre (CHPRC) at Edith Cowan University in Western Australia to develop the *Principles for School Road Safety Education*.

What is the purpose of the Principles?

Effective road safety education provides the best opportunity for achieving an improvement in behaviour change and reduction in road trauma for children and young people .

However, despite many innovative school-based interventions, there is an unfortunate lack of research which has demonstrated positive changes in children's road safety knowledge, skills, attitudes and behaviours[1]. This makes selecting and implementing effective road safety programs problematic for school staff.

Scarce resources and competing priorities for schools also contribute to the difficulties in implementing a new program and reinforce the need for evidence on what constitutes effective road safety education[1]. Barriers to effective road safety interventions are detailed in Appendix item 1 (pages 40-41).

The Principles were developed to:

- help school staff select the most effective road safety education programs for implementation in school communities

- guide the development of evidence-based resources and programs in road safety education

- help school staff and agencies develop and deliver effective road safety programs in school communities

- encourage consistency between programs and within jurisdictions for the implementation of road safety programs in school communities

- guide funding bodies to consider proposals for appropriate road safety education programs and initiatives.

What are the Principles based on?

The Principles have been developed from recent research on effective school road safety education[1]. They are based on current empirical, theoretical and practical evidence.

Scientific evidence
The Principle has been articulated and the nature of its contribution to effective road safety education specified in at least three reputable professional or scientific publications.

OR

Theoretical evidence
The theoretical or conceptual basis of the Principle has been described and justified comprehensively in at least one reputable professional or scientific publication.

AND

Practical evidence
The Principle has been identified in the scientific literature as an integral part of at least two road safety programs that have demonstrably improved positive road safety attitudes and/or behaviours.

OR

Real World evidence
The Principle has been implemented with fidelity in a real world setting so that the practicality of the Principle has also been assessed.
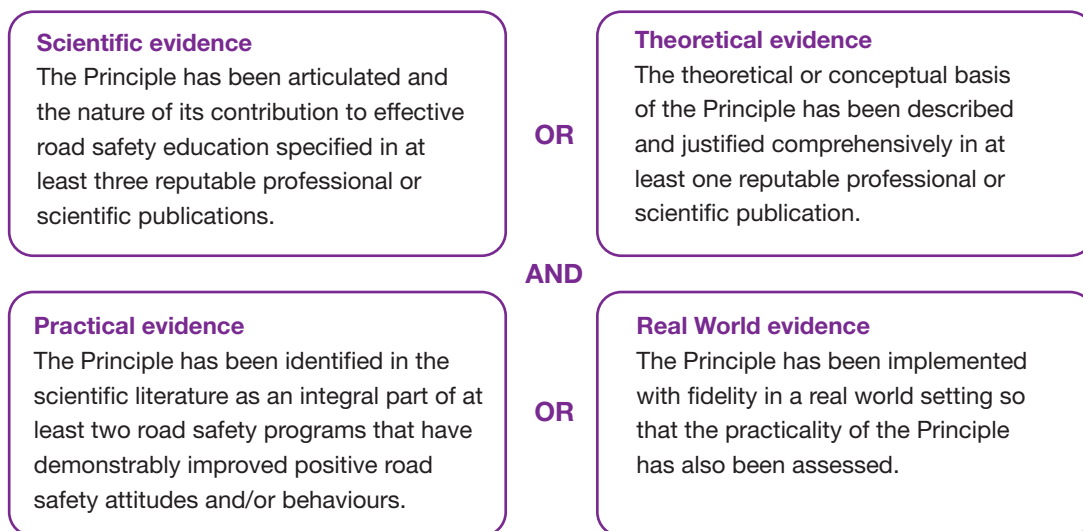
Figure 1: Inclusion criteria for the *Principles for School Road Safety Education*

Major limitations of previous research describing the development of principles of best practice for road safety and other health areas were reviewed and addressed by this study.

These limitations include:

- a lack of evidence on which principles were based
- a lack of criteria to define the type and amount of evidence required to ensure a principle is representative of 'best practice'
- an absence of non-peer reviewed sources, such as agency or research reports, in literature reviews which may significantly impact the amount of practical and real world evidence which could be included in resultant principles of best practice
- few examples of best practice had been validated with experts in the field
- few examples of best practice had been operationalised with examples of 'real world' practice of each principle[1].

The development of stringent inclusion criteria, expert validation and consideration of the applicability of the Principles in the real-world sets these Principles apart from those reviewed[1].

Practical and real world evidence: case studies.

Schools known to be implementing exemplar road safety education strategies were identified by members of the NRSEF. The purpose of these case studies was to identify and review examples of the validated *Principles for School Road Safety Education* being implemented in Australian school communities.

This case study evidence operationalises the Principles by providing specific strategies currently in use in Australian schools and supports the implementation of each Principle. Case study examples can be found in Appendix item 2 (page 42).

What process was used to prepare the *Principles for School Road Safety Education*?

The following figure represents the research process used to prepare the *Principles for School Road Safety Education*[1].

Comprehensive literature search and review.

Draft Principles prepared using stringent inclusion criteria.

Expert consultation and validation via a national panel of road safety education experts.

Draft Principles operationalised using a national network of case studies of best practice in practical road safety education.

Final revision of the Principles and a report presented.

Development of *Getting it Together: A Whole-School Approach to Road Safety Education* and *Principles for School Road Safety Education: A Research Summary.*
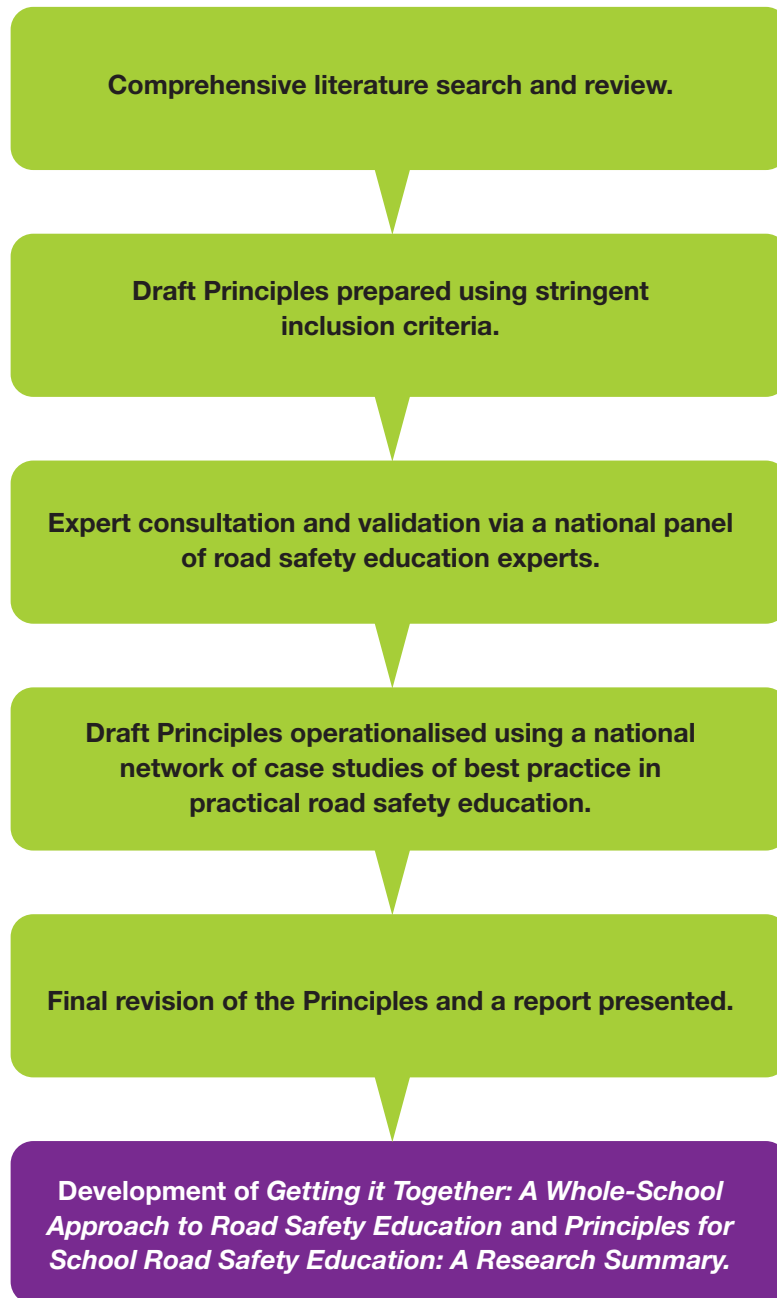
Figure 2: Research process to develop the Principles

Principles for School Road Safety Education

OVERARCHING PRINCIPLE

1. Implement evidence-based road safety education programs and initiatives in schools and include local research and current legislation where available.

CURRICULUM

2. Embed road safety education programs within a curriculum framework thereby providing timely, developmentally appropriate and ongoing road safety education for all year levels.

3. School management supports teachers to effectively implement road safety education by ensuring access to available resources and professional learning opportunities.

4. Use student-centred, interactive strategies to develop students' utility knowledge, skills, attitudes, motivation and behaviours regarding road safety.

5. Actively engage students in developing skills that focus on identifying and responding safely to risk situations.

6. Provide information to parents/carers that will encourage them to reinforce and practise road safety skills developed in the classroom, in the real road environment.

7. Encourage students to support and influence their peers positively as a way of improving road safety behaviour.

ETHOS AND ENVIRONMENT

8. Consult the wider school community when developing road safety guidelines and policies and then disseminate this information to families and monitor implementation.

9. School management actively promotes road safety education by supporting staff to plan and implement road safety education within the curriculum and other school programs and initiatives.

10. School management actively encourages staff to model appropriate road safety behaviour and attitudes consistent with the school's road safety guidelines.

11. Encourage and promote school-community participation in school road safety programs.

12. Review and update where necessary, in partnership with external authorities, the school road environment to encourage and support parents and carers to practise safer road safety skills.

PARENTS AND COMMUNITY

13. Provide parents and carers with information that will assist them to reinforce appropriate road safety messages and skills (including school guidelines and policies) at home.

14. Provide parents and carers with practical, opportunistic and planned, on-road training for modelling of appropriate behaviours to their children.

15. Establish and maintain links and involve community agencies and local government in the delivery of road safety messages that complement and support existing school road safety programs.

16. Engage, train and resource school health service staff to complement and support road safety education programs and other initiatives in schools.

What is a whole-school approach?

Research shows that health education is more effective when schools, parents and communities work together to provide a comprehensive, whole-school approach addressing health issues with the school community[2].

A whole-school approach to road safety education, where schools, communities and parents work together, is likely to be most effective in reducing road-related harms for children and young people[2].

These partnerships create a supportive environment for students to learn, understand and practise road safety.
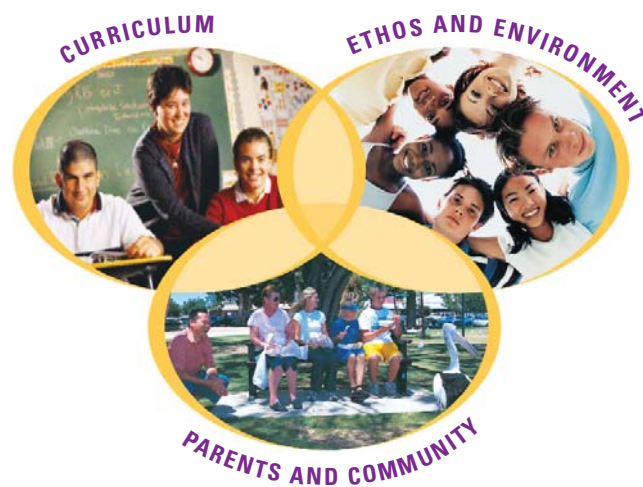
Figure 3: *Health Promoting Schools Framework* **(World Health Organisation, 1986)**

This whole-school approach will be more effective if schools also consider the set of evidence-based *Principles for School Road Safety Education*. These Principles are organised around the *Health Promoting Schools Framework* to reflect all components of a school that contribute to improvements in health behaviours.

These components are:

• Curriculum

• Ethos and Environment

• Parents and Community.

Effective School Road Safety Education Model

This model is based on the *Principles for School Road Safety Education* and the *Health Promoting Schools Framework.*

CURRICULUM

2. Embed road safety education programs within a curriculum framework.
3. School management supports staff to implement road safety education.
4. Use student-centred, interactive strategies.
5. Actively engage students in skill development.
6. Inform parents of classroom programs.
7. Help students to influence their peers as safe road users.

Effective school road safety education

ETHOS AND ENVIRONMENT

8. Consult the wider school community when developing road safety plans.
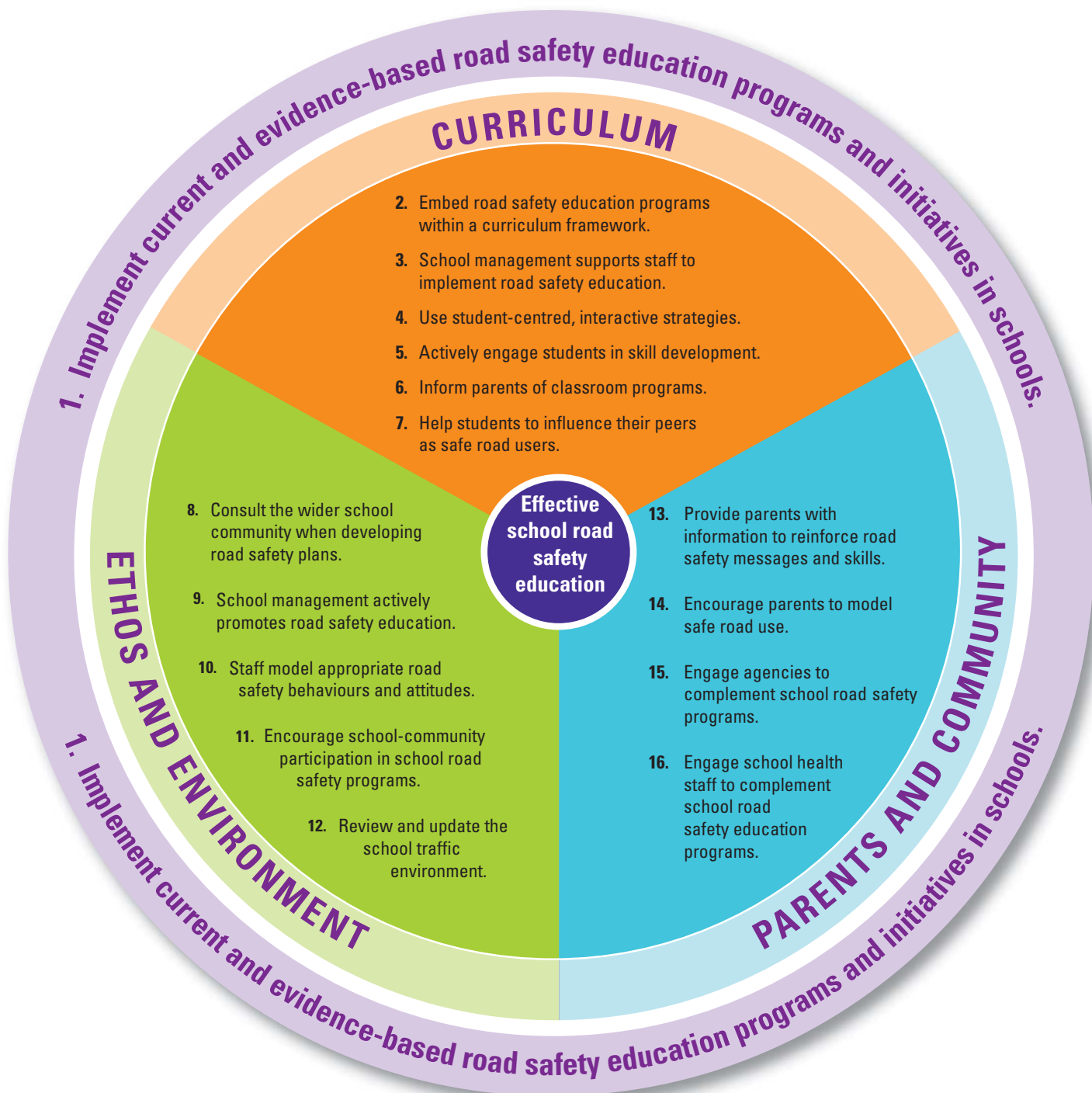9. School management actively promotes road safety education.
10. Staff model appropriate road safety behaviours and attitudes.
11. Encourage school-community participation in school road safety programs.
12. Review and update the school traffic environment.

PARENTS AND COMMUNITY

13. Provide parents with information to reinforce road safety messages and skills.
14. Encourage parents to model safe road use.
15. Engage agencies to complement school road safety programs.
16. Engage school health staff to complement school road safety education programs.

1. Implement current and evidence-based road safety education programs and initiatives in schools.

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The key aspects of each Principle are provided in the model, whereas the Principle is described in its entirety on pages 10-23 of this summary.

Principles and supporting evidence

Each of the *Principles for School Road Safety Education* are described and presented with the supporting evidence. The Principles are organised into the areas of the *Health Promoting Schools Framework* – Curriculum, Ethos and Environment, and Parents and Community, to provide ease of application into the school setting.

The diagram below is used to indicate the inclusion criteria that each Principle has satisfied (excluding the Overarching Principle).

Scientific	✔		Practical	✔
OR			*OR*	
Theoretical	✔		Real World	✔

Overarching Principle

Principle 1
Road safety education programs are evidence-based and include local research and current legislation where available.

Supporting evidence

This overarching Principle was included at the final stage of the research process to emphasise the importance of using an evidence-base when developing road safety education programs and initiatives in schools. Road safety education programs and initiatives based on research are more likely to be effective[1]. Including local research and current legislation will help ensure that road safety education programs and initiatives are appropriate and relevant to the context of the school community[1].
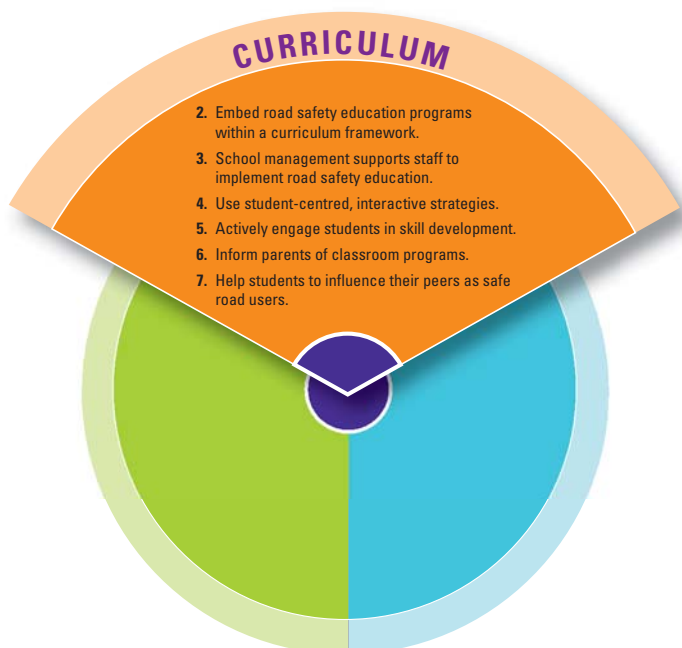
Curriculum

The formal curriculum should equip students with sufficient knowledge to make informed choices about their health as young people and adults, foster the development of a range of cognitive, physical and interpersonal skills and support aspects of intrapersonal development including personal values, positive self-concept and resilience[3].

Principles in this component of the *Health Promoting Schools Framework* relate to:

- the provision of culturally and developmentally appropriate road safety education within the curriculum

- ensuring adequate teacher support and resourcing is provided

- engaging students through interactive strategies of multiple-session duration where peer support is encouraged and valued

- emphasising the importance of identifying and choosing safer alternatives to risk situations in the traffic environment

- involving parents in classroom learning.

Specific pointers for developmental stages and high-risk groups are given on pages 26 - 37.

CURRICULUM

2. Embed road safety education programs within a curriculum framework.
3. School management supports staff to implement road safety education.
4. Use student-centred, interactive strategies.
5. Actively engage students in skill development.
6. Inform parents of classroom programs.
7. Help students to influence their peers as safe road users.

Principle 2

Embed road safety education programs within a curriculum framework thereby providing timely, developmentally appropriate and ongoing road safety education for all year levels.

Supporting evidence

Elliott[4] suggests that when road safety education is embedded in the curriculum of all schools, students' and teachers' awareness and knowledge of the importance of road safety education

Scientific	✔	Practical	
OR		OR	
Theoretical		Real World	✔

would be enhanced. This view is supported by Catchpole and colleagues[5] and Dragutinovic and Twisk[6] who confirm that while there may not be consensus about content, there is consensus about the importance of road safety education. Elliott[4] further states that for primary schools, road safety education should be fully integrated across the curriculum, whereas in secondary schools, road safety education may be located within the health education curriculum.

Children and young people progress through a number of developmental phases of learning. Similarly, their ability to safely use the road environment depends on their acquisition of developmental skills throughout these phases[7]. Developmental Theory, based on the work of Gibson, Piaget and Vygotsky, is essential for the effective planning of road safety programs to ensure children learn key skills appropriate to their developmental phase[7], hence the need for road safety education across a student's school years.

More recently, road safety educators have argued for the introduction of road safety education as early as Kindergarten or Pre-primary. While children's developmental, cognitive and visual skills are not adequate to enable children as young as five to cross roads by themselves, there is increasing evidence supporting the introduction of road safety skill development at this early age[4,8,9,10,11]. In particular, children in lower primary school appear to benefit from practical road side learning[10,12,13] where the experience lays the foundation for future skill development and practice[9].

Dragutinovic and Twisk[6], Elkington, Hunter and McKay[14] and Elliott[4] describe the importance of multiple training sessions over a period of time to have greatest impact on children's road safety knowledge, skills and attitudes. Booth and Samdal[3] also provide support for curriculum content to be provided on a regular basis over a child's school career to reinforce existing concepts and introduce new skills as children develop.

Several programs have successfully used multiple sessions to improve children's road safety knowledge, skills and behaviour. A study by Stevens and colleagues[15] focussing on a range of safety behaviours, utilised child nurse home visitation sessions to deliver safety information to parents over a period of 36 months. The intervention was found to be successful in increasing adolescents' use of bicycle helmets[15]. The Walksafe program comprised daily half hour sessions including classroom education and video (Days 1 and 3), outside stimulation (Days 2 and 4) and a poster contest (Day 5), during Walksafe week[16]. This program demonstrated changes in pedestrian safety knowledge amongst Kindergarten to Grade 5 students[16]. Prelicence education and training programs, including Graduated Licensing Schemes implemented in many Australian states, allow progression through a series of stages over an extended period of time to enhance knowledge and skill transfer and build experience in the road environment[17].

> **Principle 3**
> **School management supports teachers to effectively implement road safety education by ensuring access to available resources and professional learning opportunities.**

Supporting evidence

Scientific	✔	Practical	☐
OR		OR	
Theoretical	☐	Real World	✔

Elkington, Hunter and McKay[14] identify a list of recommendations to enhance the effectiveness of injury prevention programs. Included in this list, is the recommendation that "programs should be delivered by teachers who were trained by experienced health educators" (p. 40)[14]. This recommendation is confirmed by Dragutinovic and Twisk[6] and Elliott[4], who cited teacher professional development and support as a fundamental principle in road safety education. Further, the *Health Promoting Schools Framework* also advocates for adequately trained staff to deliver health promotion interventions in the classroom[3].

Prior to implementation of the Child Pedestrian Injury Prevention Project (CPIPP), intervention teachers participated in a half-day training session to familiarise them with classroom materials and enhance their skills to deliver the road safety content[18]. In addition, ongoing support was provided to intervention teachers to ensure and enhance implementation of the pedestrian safety lessons[18]. Implementation of classroom lessons was carefully monitored through teacher logs, teacher post-test questionnaire and student workbook assessment, which resulted in 84% of the intervention completed across the study[19]. Results of this study found that intervention children were more likely to cross the road with adult supervision and play away from the road when compared to the control group[4].

Principle 4

Use student-centred, interactive strategies to develop students' utility knowledge, skills, attitudes, motivation and behaviours regarding road safety.

Supporting evidence

Renowned developmental theorists, Gibson, Piaget and Vygotsky, emphasise the importance of bottom-up processes involving learning through acquisition and refinement of specific

Scientific		Practical	✔
OR		*OR*	
Theoretical	✔	Real World	✔

actions in specific contexts, followed by generalisation of these understandings to varied contexts[10]. They suggest that methods of instruction will be most effective when based on this concept in full, compared to working against it or addressing only part of the process[10].

Previous road safety recommendations have also encouraged student-centred activities such as those which promote play, social interaction, self-awareness and personal reflection and exploration of the world[4]. The *Western Australian Curriculum Framework* also advocates for developmentally appropriate activities which actively engage students, satisfy their natural curiosity in learning and encourage peer interaction during the learning process[20].

In their systematic review of group based injury prevention interventions targeting young children, Bruce and McGrath[9] identify that successful program components incorporate the use of interactive learning tools, including group activities and rehearsal opportunities. Interactive strategies were also identified by Elkington and colleagues[14] as successful program components, suggesting they may also be combined with relevant learning theories. Numerous studies provide examples of using interactive strategies to engage students to develop their knowledge, skills, attitudes and values. Hotz and colleagues[21] used interactive strategies including videos, workbooks and practical training (as part of the Walksafe program in Florida) in their study showing improved pedestrian safety knowledge amongst Kindergarten to Grade 5 students. Computer training and peer group and adult-led discussion were used by Tolmie et al.[22] to investigate the effectiveness of practical training in improving children's pedestrian safety skills. A combination of peer group and adult-led discussion using the interactive computer tool was found to be most effective in skill improvement[22].

Principle 5

Actively engage students in developing skills that focus on identifying and responding safely to risk situations.

Supporting evidence

According to developmental theorists, Gibson, Piaget and Vygotsky, emphasis should be placed on learning new skills and then applying these to a variety of contexts[10]. Piagetian Theory states that learning is dependent on active engagement with a task, and as such, the process of choosing a safe place to cross the road is the secondary action, following development of skills to identify the safe place[10]. Elkington and colleagues[14] confirm that this process is specifically related to improvement of injury prevention behaviours, listing this principle as a key recommendation to enhance program effectiveness. In particular, Elkington[13] recommends skill development is central to road safety education and that these skills are best developed during on-road practice.

Scientific OR Theoretical	✔	Practical OR Real World	✔

In their study investigating five year old children's perceptions about the safest places to cross the road in real traffic situations, Thomson et al.[23] found changes between pre-test and post-test in the proportion of routes categorised as 'safe' to be greater in trained children compared to controls. This intervention comprised table-top training to model safe crossing behaviour, in combination with real traffic environment training to reinforce learning and encourage skill development[23].

Principle 6

Provide information to parents/carers that will encourage them to reinforce and practise road safety skills developed in the classroom, in the real road environment.

Supporting evidence

Due to their developmental ability, young children are not capable of understanding and adopting all road safety behaviours alone. Schools should therefore aim to enhance and encourage strong relationships with families and communities[3] and draw upon these relationships to provide culturally appropriate programs[20]. Much road safety evidence also supports this by recommending parents/carers of young children are involved in the road safety education of their children. In particular, while classroom curriculum can be effective in changing children's and adolescents' road safety knowledge, attitudes, skills and behaviours, it is not enough to encourage longer term behaviour change[24,25]. Parents are best placed to provide opportunistic, practical, on-road practice[10, 23-28] to support learning in the classroom. By engaging parents in the classroom curriculum, similar content, messages and strategies can be used by parents to practise and model safer road user behaviours to their children[18,29].

Scientific OR Theoretical	✔	Practical OR Real World	✔

Principle 7

Encourage students to support and influence their peers positively as a way of improving road safety behaviour.

Supporting evidence

Social Learning Theory purports that individuals learn by observing others perform specific behaviours[8]. This theory implies that peers are often the most influential role models in peoples'

Scientific		Practical	
OR		*OR*	
Theoretical	✔	Real World	✔

social learning[8]. The literature investigating adolescent risk taking behaviour suggests that adolescents who have friends who engage in anti-social behaviours are at increased risk of participating in these behaviours also[30]. So too then, does engagement with pro-social peers promote pro-social behaviour[30]. Social Learning Theory suggests that encouraging adolescents to engage in safe road use behaviour, in peer situations, may be effective in improving this behaviour.

Tolmie and colleagues[22] conducted a study investigating the impact of adult guidance and peer discussion on child pedestrian skills. Whilst adult guided training was found to be effective in improving children's road crossing behaviour, assessed by computer and roadside evaluation, the impact was enhanced when combined with peer discussion[22]. Tolmie[22] concluded adolescents had greater learning gains through peer discussion than when adult guidance strategies alone were used.
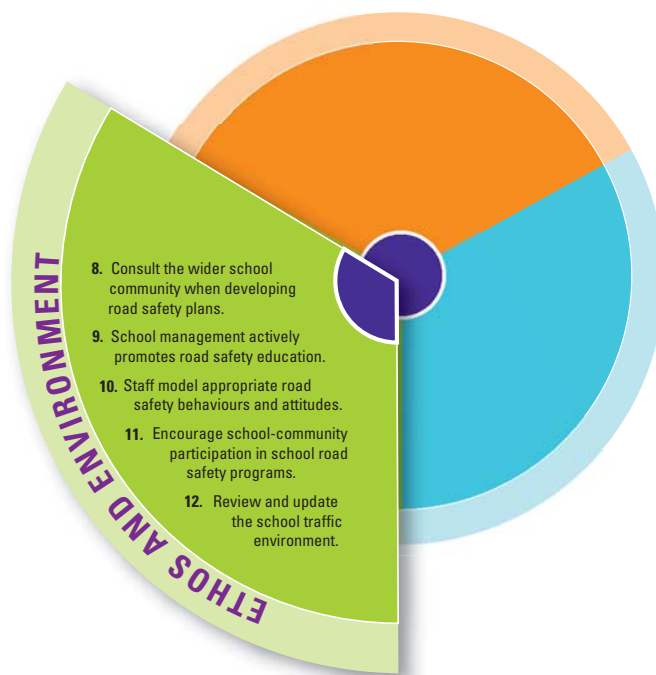
Ethos and Environment

This component of the *Health Promoting Schools Framework* encompasses the school's social and physical environment. In order to enhance effectiveness, school road safety initiatives need strong leadership and support from school management; should be developed in consultation with a wide range of school community members; be clearly written and well-communicated; and be consistently enforced[3].

The school's physical environment should support the school community to practise safe road user behaviour and should be monitored and reviewed on a regular basis[1].

ETHOS AND ENVIRONMENT

8. Consult the wider school community when developing road safety plans.
9. School management actively promotes road safety education.
10. Staff model appropriate road safety behaviours and attitudes.
11. Encourage school-community participation in school road safety programs.
12. Review and update the school traffic environment.

Principle 8
Consult the wider school community when developing road safety guidelines and then disseminate this information to families and monitor implementation.

Supporting evidence

In his findings to achieve quality in road safety education in schools, Elliott[4] suggests support from senior school staff would influence the level of implementation of road safety education and identifies school road safety and road safety education policies as one way of communicating this support to the whole-school community.

Scientific		Practical	✓
OR		OR	
Theoretical	✓	Real World	✓

While not often described as best practice in the empirical or theoretical road safety literature, the *Health Promoting Schools Framework* advocates for the development, implementation and evaluation of policies to support any health promotion intervention in schools[3]. Further, policy implementation has been central to the success of many health interventions in Australia including bullying[31], smoking cessation[32], drug use[33], nutrition[34] and sun safety[35].

To ensure policies are well implemented, schools are encouraged to involve parents in policy development and implementation. By inviting parent feedback on draft policy versions, schools encourage parental ownership of the resultant policy. Further, providing parents with copies of the school's policy ensures parents model the behaviours and attitudes specified in the policy[31].

Principle 9

School management actively promotes road safety education by supporting staff to plan and implement road safety education within the curriculum and other school programs and initiatives.

Supporting evidence

Schools are often faced with many barriers when implementing a new program, which can influence the success of program outcomes. Schools need to have in place capacity building strategies alongside their road safety strategies to support implementation. This includes assessment of school structures, processes and people and how these may be a barrier or enabler to implementation.

Scientific OR Theoretical	✔	Practical OR Real World	✔

In particular, this involves having school management that actively provides leadership and support to the school community in their efforts. Demonstrated School Principal commitment is crucial to a successful program but should also involve senior staff within the school. Verbally expressing their support, attending meetings and program activities, allowing in-school staff time to be allocated for program planning and ensuring the road safety strategies are included in school priority planning and staff work plans are examples of these. Schools that include capacity building in their planning processes, increase their chances of success[36].

Principle 10

School management actively encourages staff to model appropriate road safety behaviour and attitudes consistent with the school's road safety guidelines.

Supporting evidence

Coutts and Styles[8] describe the Social Learning Theory as a process by which individuals learn by observing others perform a particular behaviour. Dragutinovic and Twisk[6] agree that

Scientific OR Theoretical	✔	Practical OR Real World	✔

modelling is an important factor in effective injury prevention programs. Positive student-teacher interactions has been found to improve students' connectedness to school as well as reduce problem behaviours and improve attendance and academic achievement[37-39]. Teachers are therefore important role models who may exert considerable influence on the behaviours of young children and adolescents.

Principle 11

Encourage and promote school-community participation in school road safety programs.

Supporting evidence

Social Learning Theory explains that learning occurs through observation of others performing specific tasks[8]. Thus, when the whole-school community is involved in addressing and modelling

Scientific OR Theoretical		Practical OR Real World	
Scientific		Practical	
OR		OR	
Theoretical	✔	Real World	✔

safe road use, children and young people will in turn learn to adopt these behaviours. Further, the *Health Promoting Schools Framework* recommends that interventions to improve the health of young people in a school setting should be inclusive of the whole-school community to maximise the potential for long term behaviour change[3]. Road safety, as a complex health issue, must also be addressed by applying an ecological approach where individual students and the social environment in which they exist are modified to achieve knowledge, attitude and behaviour change[40,41].

The Child Pedestrian Injury Prevention Project (CPIPP) used a combination of school-based, community and environmental interventions to reduce pedestrian injuries in five to nine year old children[18]. The school-based component comprised classroom curriculum and 'home' activities in an attempt to increase students' and their parents' pedestrian-related knowledge, attitudes, skills and behaviour[18]. Community/environmental components aimed to reduce the speed and volume of vehicular traffic, thereby reducing children's exposure to the risk of injury[18]. These strategies included establishing a community advisory committee, 40km/h school zone trial, community education campaign (e.g. newspaper features, editorials and advertisements in local community newspapers) and implementation of safe routes to school programs[18]. This intervention research demonstrates good practice in involving the whole-school community in education and environmental interventions to reduce road injuries among young children.

Principle 12

Review and update where necessary, in partnership with external authorities, the school road environment to encourage and support parents and carers to practise safer road safety skills.

Supporting evidence

Recent debate in the scientific road safety literature has considered the role of education versus environmental modifications. While few pedestrian and

Scientific		Practical	✔
OR		OR	
Theoretical	✔	Real World	✔

other road safety classroom interventions have demonstrated significant changes in children's behaviours, it would be inappropriate to suggest there is no place for education. Similarly, environmental change alone is also inadequate in reducing road user injury. Therefore, the combination of road safety education and appropriate environmental modification is recommended[42-45]. Further, evidence from Australia[45] and other countries indicate improvements in road design, speed limits and the separation of pedestrians and vehicles around schools can greatly reduce pedestrian injuries[44,46].

This is supported by health promotion professionals who have long argued for the consideration of the environment in implementing programs to improve health through the *Health Promoting Schools Framework*[3] and the Precede/Proceed Model of health promotion planning[47]. Many health behaviour theorists also propose the important role of the environment on changing health behaviours such as Bronfenbrenner's Social Ecological Model[40].

The additional benefit of improving the road environment to enhance the safety of children and their families before and after school is the opportunity for parents to model appropriate road user behaviour using these facilities. Parents who walk their children to and from school have an opportunity to discuss, practise and model safer pedestrian behaviours and choosing safer routes to school. Further, parents who drive their children to school can demonstrate safe driver skills and discuss road rules unique to school environments.
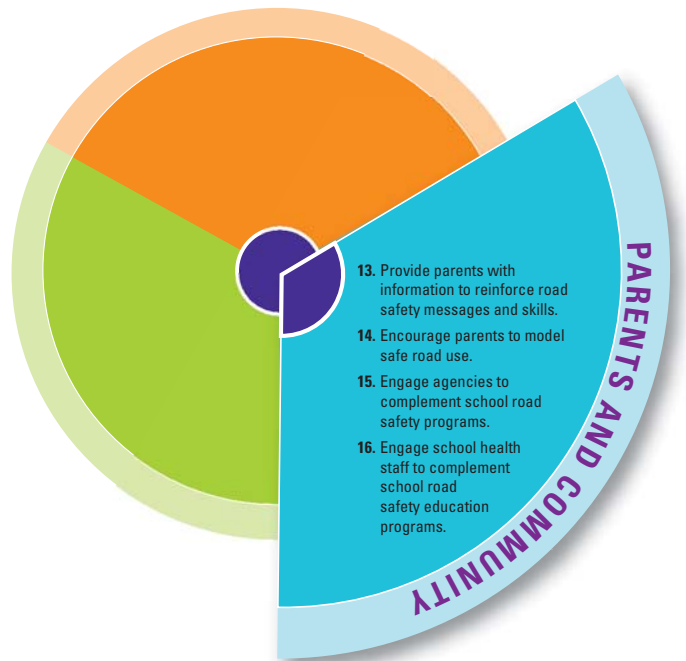
The Social Learning Theory identifies that children learn as a result of observing others undertake specific behaviours[8]. The Safe Routes to School intervention is a community-based multi-action program involving primary and secondary students to reduce the incidence and severity of road crashes[48]. An evaluation of this program in Victoria suggests that the program is most effective when used in combination with environmental strategies to modify the physical road environment and community strategies to engage parents to address road safety issues with their children[48]. Di Pietro and Hughes[49] support the implementation of Safe Routes to Schools programs, complemented by classroom education relevant to road safety behaviours. In addition they suggest appropriate authorities should be approached to undertake any necessary environmental modifications along the route[49].

The Child Pedestrian Injury Prevention Project (CPIPP) used a combination of school-based, community and environmental interventions to reduce pedestrian injuries in five to nine year old children[18]. Environmental strategies used in this program included a 40km/h school zone trial, community education campaign (e.g. newspaper features, editorials and advertisements in local community newspapers) and implementation of safe routes to school programs[18]. The findings of this study indicated community/environmental initiatives, in combination with whole-school strategies contributed to a reduction in traffic volume[45]. Further, the authors recommend whole-school interventions, such as CPIPP, which use a combined approach, are likely to reduce pedestrian injury rates[45].

Parents and Community

Parents are important contributors to students' uptake and maintenance of health behaviours which are encouraged and supported by schools[3]. Students are more likely to engage in healthy road user behaviour when parents also encourage this behaviour and when they model the behaviour themselves[3].

A broad range of services, including school health services and community agencies, may contribute to the health of students and staff and may participate in the delivery of road safety education programs[3].

PARENTS AND COMMUNITY

13. Provide parents with information to reinforce road safety messages and skills.
14. Encourage parents to model safe road use.
15. Engage agencies to complement school road safety programs.
16. Engage school health staff to complement school road safety education programs.

Principle 13
Provide parents and carers with information that will assist them to reinforce appropriate road safety messages and skills (including school guidelines) at home.

Supporting evidence

Social Learning Theory suggests that individuals learn through observation of role models who perform specific behaviours[8]. Strategies such as modelling and internal reinforcement are critical to successful behaviour change[50]. Parents are ideal role models for children and adolescents as they:

Scientific		Practical	
OR		*OR*	
Theoretical	✔	Real World	✔

- care about their child and are motivated to ensure their safety
- are aware of their children's habits and respond to issues they initiate
- are most frequently with their children in the traffic environment
- often have the opportunity to teach their children road safety[25].

Information provided to parents has been found to be most effective when tailored to address particular motivators and reinforces for individual parents[51-53]. Tailoring can be as simple as adding a participant name, using survey data to determine the needs and motivators of parents and involving children in the delivery of information to their parents (via homework diaries, joint assignments etc)[52,53]. Parents also typically prefer road safety information which encourages interaction between themselves and their child, is practical and offers tips for how to teach their children about safer road use[18, 28, 29]. Printed materials such as brochures, newsletter items and children's story books are most commonly used to engage parents[18, 28, 29, 54, 55] however training programs and family homework activities are also used to provide a variety of mechanisms to engage families in road safety education[18, 28, 29]. Indeed, a combination of strategies is found to be more effective in engaging parents than sending printed material alone[18, 28, 29, 54].

Cairney[48] outlines the importance of parental involvement in the Safe Routes to School Program, implemented in Victorian primary schools. Results from this study suggest that parents of students at intervention schools were more aware of road safety issues compared to parents of students at control schools, and in addition, were more likely to think both the school environment had changed as a result of program involvement and to have taken steps to improve their children's safety (e.g. changing pick-up or drop-off locations, encouraging children to follow a different route between the car and school and actively teaching safe road crossing)[48].

Simons-Morton and Ouimet[56] describe driver education as an essential part of teaching adolescents road rules and vehicle operation skills. However, driver education often involves few professional driver training sessions and many sessions rely on parents to provide driving practise for adolescents to refine their driving skills[56]. Parent supervised driving may enhance learner drivers' driving ability in a variety of conditions, develop possible automation of key skills including visual scanning, managing distraction and self-restraint, and provide opportunities for parents to impress the importance of safe driving behaviour on their children[56]. Simons-Morton and Ouimet[56] suggest that parental involvement in learning driver experiences may be improved by targeting parental expectations during adolescents' practice sessions, providing parents with driving agreements to complete with their child at the time of licensing and targeting maintenance of parent enforced restrictions after licensing.

Principle 14

Provide parents and carers with practical, opportunistic and planned, on-road training for and modeling of appropriate behaviours to their children.

Supporting evidence

Gibson's Developmental Theory identifies a natural progression from action to concept, specifying the developmental task as one characterised by attunement and

Scientific	✔	Practical	
OR		**OR**	
Theoretical	✔	**Real World**	✔

refinement of the visual system to temporal information, leading to undertaking the desired action[10]. This implies perceptual judgements and motor responses can only be learned in the context in which they occur[10]. Thomson[10] suggests practical road safety training is thus effective as it provides the opportunity for this process to take place.

In their list of effective injury prevention program components Dragutinovic and Twisk[6] identify modelling and practice as a key factor. Several studies have demonstrated the effectiveness of practical road-side training on improving children's road safety knowledge and skills. This is supported by Adams[25] who suggests children's perceptual-motor skills are best developed in the situation in which they are being used, that is at the roadside or in the car. Zines and Miller[57] identify supervised driving practice as the single most important protective factor for reducing the likelihood of crash involvement amongst young drivers.

Hotz[16] utilised practical training as part of the Walksafe intervention and was successful in improving children's pedestrian safety knowledge. In this study one hour of the 2.5 hour intervention was devoted to outside simulation activities[16]. Observational data also demonstrated an improvement in crossing behaviours from pre-test to post-test. Whilst the study did not evaluate which program components were most effective in achieving knowledge and behaviour changes, these results, combined with the above evidence, suggests practical training is an essential component of road safety education programs.

Many recent road safety researchers call for parent involvement in the practical, on-road training of young children[10, 23-28]. In particular, providing parents with information then encouraging parents to practise and model these behaviours with their children is recommended[18, 29]. Further, modelling is best conducted when parents verbalise the correct behaviours, practise the behaviour with their child, use praise, allow the child to demonstrate the behaviour (with adult supervision) then provide feedback to the child[58]. Parents are best placed to provide opportunistic teaching and continual modelling of safe road user behaviours which are acknowledged as important indicators of children's road safety behaviours[26, 59].

Principle 15

Establish and maintain links and involve community agencies and local government in the delivery of road safety messages that complement and support existing school road safety programs.

Supporting evidence:

The Health Promoting Schools Framework[3] encourages the use of outside community and health promotion professionals in the development, implementation and evaluation of programs to improve health. Further, in a review of road safety education activities in the ACT, Di Pietro and Hughes[42] recommend road safety educators and stakeholders collaborate to develop new road safety initiatives in schools to combine their expertise in education, enforcement and the environment.

Scientific OR Theoretical	✔	Practical OR Real World	✔

Principle 16

Engage, train and resource school health service staff to complement and support road safety education programs and other initiatives in schools.

Supporting evidence:

The *National Injury Prevention and Safety Promotion Plan: 2004-2014* identified priority action areas for children and young people[60]. Collaborative planning for safety promotion was encouraged between parents and carers, child care services, the education sector, sport and recreational organisation, all levels of government and the private sector[60]. In a review of road safety education for the ACT, Di Pietro and Hughes[49] also recommend road safety stakeholders collaborate in the development of education materials for schools.

Scientific OR Theoretical	✔	Practical OR Real World	✔

Deal and colleagues[46] also suggest safety issues should be addressed by pediatricians and other health care providers during routine health visits. While one-off visits from outside road safety lecturers may have little impact, when included as part of a total education program, these visits can add value and reinforce classroom-based education as long as lead-in and follow-up lessons support their implementation[4].

The Rotary Youth Driver Awareness Program is an example of a community-led strategy where Rotarians deliver practical road safety and other information relevant to the overall responsible approach to the driving experience to Year 11 students[61]. The purpose of this program is to establish positive attitudes toward responsible motoring amongst Year 11 students, create awareness of the causes of motor vehicle accidents and supply practical strategies to avoid these situations, and create an understanding in the school and wider community that road safety requires a comprehensive, combined approach[61]. An evaluation of the program found positive changes in knowledge and attitudes immediately after the program conclusion, however many gains were diminished at three month follow-up[61].

Priority groups

Children and adolescents differ greatly in their abilities associated with safe road use, as do the expectations of what they should and should not be able to do. As children develop at different rates, programs and teaching materials should be adapted to suit developmental capabilities. Much of the road safety literature and current practice encourage the use of targeted strategies and content for children and young people of different ages and learning abilities[1].

The following pages define priority and high-risk groups for road safety education, describe their specific developmental and educational needs, and provide strategies to address road safety education in these groups. Age appropriate road safety content is summarised in Appendix item 3 (page 43).

The five priority groups proposed are:

1. Early Childhood

**Kindergarten to Year 3
(4-8 years)**

2. Middle Childhood

**Year 3 to Year 7
(8-12 years)**

3. Early Adolescence

**Year 7 to Year 10
(12-15 years)**

**4. Late Adolescence/
Early Adulthood**

**Year 10 to Year 12
(15-17 years)**

5. Vulnerable Groups

What was used to define priority groups?

Two recent policy documents have informed the definition of priority groups for the *Principles for School Road Safety Education.* These include the *National Injury Prevention and Safety Promotion Plan: 2004-2014* and the *Curriculum Framework for Kindergarten to Year 12 Education in Western Australia.*

These documents help categorise children's learning styles, developmental abilities and priority health areas and provide justification for the groupings used in this section[1].

The National Injury Prevention and Safety Promotion Plan: 2004-2014

This document recognises special population groups requiring priority action for injury prevention and safety promotion[60]. These are:

• children aged 0-14 years

• youth and young adults aged 15-24 years

• Aboriginal and Torres Strait Islander peoples

• rural and remote populations.

In addition the Plan recognises the importance of targeting culturally and linguistically diverse (CALD) communities, males and lower socio-economic groups as specific at-risk populations[60].

Curriculum Framework for Kindergarten to Year 12 Education in Western Australia

The *WA Curriculum Framework* outlines what all students should know, understand, value and be able to do as a result of the programs they undertake in schools in Western Australia from Kindergarten through to Year 12[20].

The *WA Curriculum Framework* describes children's development in four phases:

1. Early Childhood (Kindergarten to Year 3)

2. Middle Childhood (Year 3 to Year 7)

3. Early Adolescence (Year 7 to Year 10)

4. Late Adolescence (Year 10 to Year 12).

The *WA Curriculum Framework* identifies Health and Physical Education (HPE) as one of the eight Learning Areas[20]. The HPE Learning Area recognises the importance of physical, mental, emotional, social and spiritual dimensions of the health of the individual[20]. Four of the five Learning Outcome areas within the HPE Learning Area are relevant for road safety education:

• Knowledge and Understandings

• Self-management Skills

• Interpersonal Skills

• Attitudes and Values.

Early Childhood
Kindergarten to Year 3

Health and Physical Education Learning Area Outcomes	Relevance to road safety education
Knowledge and Understandings	Young children need to learn how to keep themselves safe and to reduce risks to their health; therefore the curricula should encompass a variety of health topics, including road safety[20].
Self-management Skills	Situations which encourage observation, development and exploration of self-management skills in different sized groups and as individuals are important in this phase. Young children can learn the basic steps in decision-making with adult assistance, including considering various options and positive and negative consequences associated with decision-making. Play and interaction with peers, siblings and school community members should include practising decision-making, goal setting and planning skills. Young children should be provided with opportunities for maintaining their own personal safety and to explain to friends, teachers or a family member the basic strategies used to cope with unsafe situations[20].
Interpersonal Skills	Children are encouraged to explore health issues; express their feelings openly and honestly; describe situations without undue exaggeration; and recall key information. Children also learn to follow the rules of an activity[20].
Attitudes and Values	Children identify attitudes and values for a healthy, active lifestyle and demonstrate values consistent with safe road use[20].

Whilst some researchers suggest children of preschool age do not have the cognitive ability and attention needed to understand and incorporate road safety strategies into their skill set, others suggest this early intervention may provide a foundation for later skill development and application of early learning[9]. Further, the human brain appears to be most sensitive to learning in the years prior to school entry (up to age 5 years)[8]. Thomson and colleagues[10], Elliott[4], Coutts and Styles[8], and Waksman and Pirito[11] also provide support for early intervention, commenting that children aged six years or even younger can be taught to be safer pedestrians. This age group would best learn from roadside learning than classroom-based road safety education[10, 12, 13]. However, whilst research shows a high knowledge increase in the early years few studies have tracked this rise in knowledge to behaviour changes in child pedestrians[44, 62].

Children, particularly young children, are often underdeveloped in many of the skills necessary for safe road use, making them particularly vulnerable to road injury. Several psychological skills essential for safe road crossing behaviour, such as detecting the presence of traffic, visual timing and coordinating information, are underdeveloped in this age group. These skills are best developed in the road environment where children can be supervised and assisted by adults[25].

Whilst there are some conflicting arguments regarding the appropriate age to begin road safety education, the majority of researchers recommend involving parents and teachers in the education process, with a particular focus on vulnerable groups who may be at greater risk of injury. Considerations regarding parent involvement are detailed on pages 27 to 30.

Teaching and learning styles

The *WA Curriculum Framework* identifies several key points about young children's learning styles.

- Young children have a natural curiosity about and a desire to understand and communicate in their world.

- Young children learn through interaction with others, direct and vicarious experiences and use of their own senses.

- It is important that learning experiences build upon children's understandings, skills, values and experiences.

- Activities should encourage children's autonomy, intellectual risk taking, responsibility and control of learning using a variety of strategies such as explicit approaches with the whole class, small group and individual encounters.

- Learning occurs best when children are provided with learning experiences that allow play and experimentation, observation, manipulation and exploration of objects, materials and technologies and physical movement.

- Young children need to discuss, describe, label, classify, communicate and represent their observations and experiences in ways which are meaningful to them.

- Learning and teaching programs should be built around knowledge about children's development in relation to their linguistic, social, emotional, aesthetic, spiritual, creative, physical and cognitive ways of learning[20].

Moreover, although not specifically a thorough review on children's education, Elliott[4] highlights a series of principles relating to how preschoolers and young children learn.

- Young children learn best in a social context, when they are interacting in meaningful ways with their peers or with adults.

- Children learn best through their earnest exploration of the world about them, actively constructing their own understanding of it.

- Children learn best through their own self-initiated play.

- Children learn holistically and do not divide their thinking up into subjects.

- Children's language development facilitates their learning at all levels.

- Central to learning is the notion of reflective self-awareness.

Parental involvement

Due to their developmental ability, children in this age group are not capable of understanding and adopting all road safety behaviours alone[6]. Schools should therefore aim to enhance and encourage strong relationships with families and communities and draw upon these relationships to provide culturally appropriate programs[20]. That parents/carers of preschool-age children should be involved in the road safety education of their children is well supported and documented[8, 25, 42].

Parents/carers:

- care about their child and are motivated to ensure their safety
- accept and are aware of their children's habits and respond to issues they initiate
- model road safety behaviour (knowingly or not) for their children; are most frequently with their children in the traffic environment
- own behaviour may improve as a result of taking responsibility for their children's road safety education
- often have the opportunity (including impromptu occasions) to teach their children road safety whilst schools and early childhood centres have limited capacity to do so[25].

Waksman and Pirito[11] suggest educational programs which include parents are often more successful than those that do not. Programs that involve parents appear to be successful as they result in improved supervision and positive role modelling[11]. Furthermore, use of parents in the implementation of school-based road safety education can reduce costs and enhance the sustainability of such programs[62].

While parents are well placed to deliver road safety information to their children, many parents overestimate their child's ability to recognise dangerous situations[63]. Further, an increase in young children's knowledge may be necessary but not sufficient in helping them become safer in the road environment[63]. Parents should teach their children about potential dangers in the road environment and support this learning by demonstrating practical strategies for dealing with these dangers[63, 64]. Secondary to parental role modelling and teaching of road safety behaviours is the delivery of information by other agencies or settings where young children learn. Studies have shown that the combination of parental training supported and reinforced by children learning in other settings can produce the greatest positive change in road safety behaviours of young children[24, 25].

Parents become better road safety educators when they hold favourable attitudes towards their involvement in the road safety education of their child[65] and understand that child road injuries are not a result of fate or an accident. In addition, parents need to be aware of their child's risk and prevention of risk[66, 53]. Many factors, such as parents' beliefs about road safety education, their confidence and understanding of their role as educators and their perceived level of their child's risk in the road environment combine to make involving parents in the road safety education of their children challenging[53, 54, 65, 66]. Many parents believe they do not have the skills to be an effective teacher of road safety information and skills for their children, or they become intimidated by the road safety knowledge of professionals[23, 67, 68].

In a recent American study, parents were asked why they do not participate in road safety education programs. Parents reported they did not become involved in such programs because they could not see immediate or lasting results; they did not know where to start with the information provided; they were fearful; lacked time; had a low sense of self-efficacy and awareness of the issues; did not have access to babysitters; did not see the program as relevant; and thought the responsibility for road safety lay with other people or agencies[69]. Factors such as lifestyle, transport, family structure and employment all influence parents' desire and ability to participate in road safety interventions or training[70, 71]. To overcome this, programs should provide practical learning opportunities for parents in a familiar, non-threatening environment, which is easily accessible[72]. Varying class times between the day and early evening and rotating venues for classes are desirable for parents[73].

Road safety education materials should be designed such that they are accessible to parents of varying socio-economic status, literacy skills and cultural diversity[8]. In order to address the different messages appropriate to children of varying developmental age, road safety education materials should be delivered in instalments (i.e. spread out over time) relevant to the child's developmental stage[8].

Strategies to consolidate parents' role in their children's road safety education include:

- providing print materials such as brochures and newsletter items for parents

- linking activities to children's homework

- organising talks and displays in schools to raise parents' awareness and understanding of road safety education

- placing road safety education materials in areas (other than schools) that are frequented by families, such as kindergartens, child care centres and Government shop fronts[74].

Providing a role for parents in road safety education will assist children in internalising key road safety messages and behaviours[42]. However, children should also be educated about road safety directly as use of safety devices (such as seatbelts) or adoption of safety messages may be inhibited if resisted by children[50]. For example, children who resist wearing a seatbelt inhibit injury prevention and safety promotion, and this behaviour is reinforced if 'weary' parents succumb to this resistance[50]. Education provided to school children, for example, by teachers, may also "filter up" to parents and further increase the use of safe road using behaviours[50].

Once parents are involved in a program it is vital to keep them interested and engaged. Many barriers exist in maintaining parental involvement including the program's parent-teacher interaction, language used, topic/information relevance and the extent to which parents have to become involved or committed to the program[51, 70]. Incentives such as vouchers and certificates have been extensively used in road safety programs[73, 75, 76].

Perhaps the most important strategy for keeping parents involved in a program is the use of tailored interventions[51]. Tailored information is more likely to be read than general information because the information is personalised to target relevant motivators and reinforcers of individual participants[51, 52, 53]. Adding participant names or other personal characteristics can also help to improve the relevance of information provided to parents[52]. One method of tailoring information is to utilise survey data from parents to determine the most relevant information for each program participant[52]. An example of a tailored intervention is that described by Nansel and colleagues[53]. Individually tailored injury prevention handouts were designed according to each child's injury risk areas to increase parents' perceived relevance of the message, increase the motivational quality of the message and eliminate the provision of non-relevant information for parents[53].

Once a strategy for delivering a program has been selected, it is important to consider the most effective methods of delivering road safety information to parents. Typically, most literature describes the use of printed materials for providing road safety information to parents[18, 29, 54, 55, 77]. Booklets, pamphlets, handouts and children's storybooks are the most commonly used, however the most effective of these materials has been found when used in conjunction with other strategies[18, 29, 54, 77].

Training programs where parents are provided with information about road safety and then given the time to practise strategies for use with their children are also recommended[18, 29]. Similarly, activities designed for parent-child interaction, including tips for parents, are well documented[77]. Perry et al.[77] found parents preferred homework from school that encouraged interaction between themselves and their child, compared with attending parent education evenings.

Many authors discuss the use of a video for parents as a method of providing information about and teaching road safety to their children[18, 29, 78]. However, using videos with young children has found to be ineffective and as such is not recommended without the support of or practising behaviours[10].

An important component of parent-led interventions to improve young children's road safety behaviours are the methods by which parents deliver information to their children. By far, the most supported and highly recommended strategy for parents to deliver information to their children is by modelling and teaching correct road safety behaviours in a real road environment[10, 23-26, 77, 79]. This must be supported by appropriate training and resourcing of parents to ensure the correct road safety behaviours are being modelled and taught. Parental modelling is extremely effective with young children as children imitate those they hold in high regard[59]. Therefore parental modelling is vital in the establishment of safer road safety behaviours in very young children[26].

Modelling is best conducted when parents:

- verbalise the correct behaviours

- practise the behaviour with their child

- use praise

- allow the child to demonstrate the behaviour (with adult supervision), then

- provide feedback to the child[58].

Family discussions and family completed activities are another effective tool for parents to deliver road safety information to their children[77, 80].

Appropriate road safety content applicable to parents is summarised in Appendix item 3 (page 43).

Middle Childhood
Year 3 to Year 7

Health and Physical Education Learning Area Outcomes	Relevance to road safety education
Knowledge and Understandings	At this developmental phase, it is important to provide students with accurate information and to support the value of prevention of ill-health and the acceptance of personal responsibility[21]. Students should learn about risk taking and explore strategies for avoiding or reducing associated harm. They can practise skills for keeping themselves safe and protective behaviours that avoid or reduce risk, including in relation to road safety[20].
Self-management Skills	In this phase, children extend their decision-making skills through practise and predict and meet personal skills, while seeking help from others when needed[21]. Students expand their ability to recognise positive and negative consequences of their decisions and should be provided with opportunities to justify their choices, contribute to group decision-making and to set realistic and measurable short-term goals[20].
Interpersonal Skills	Children can learn and practise communication and cooperation skills through situations such as group discussions and role-play scenarios on relevant health issues (e.g. injury prevention)[20].
Attitudes and Values	Children identify attitudes and values for a healthy, active lifestyle and demonstrate values consistent with safe road use[20].

Whilst much of early road safety education may be delivered through parents, schools are an important setting in which to continue road safety education as they serve to reiterate and confirm earlier learning's, offer a range of perspectives from peer-led or student centred programs and promote the development of physical and psychological skills and their application to various traffic contexts[42]. As children approach the end of this developmental phase, their ability as pedestrians approaches a level similar to that of adults[6].

Teaching and learning styles

The *WA Curriculum Framework*[20] identifies several key points about children's learning styles.

- Children begin to develop an appreciation and understanding toward different points of view, abstract thinking and can participate in activities for longer periods of time.

- Students' ability to work collaboratively should be encouraged and group planning and decision making activities and intra- and inter- class interaction assists greatly in this skill development.

- Responsibility for managing and organising activities should be increased for both individuals and groups of varying size.

- Students draw from a broadening group of sources and information to enhance their learning experiences and lead to an understanding of commonality and diversity in human experiences and concerns.

- Technological experience and understanding increases with stronger written communication skills in a range of settings.

Early Adolescence
Year 7 to Year 10

Health and Physical Education Learning Area Outcomes	Relevance to road safety education
Knowledge and Understandings	In this developmental phase, students need to develop strategies for reducing risks associated with certain behaviours (e.g. road use). Young adolescents should be made aware of the benefits of moderate physical activity, sound diet, engaging in safe behaviours and the dangers associated with taking risks such as driving under the influence of alcohol[20].
Self-management Skills	Students should apply decision making skills in a variety of familiar and unfamiliar situations. This process should involve being able to analyse the processes and outcomes of decision-making, taking into account their values and those of others[20].
Interpersonal Skills	Students should be encouraged to use their interpersonal skills to assertively communicate their personal health and physical activity decisions, particularly when exposed to unwanted peer influence or other pressure[20].
Attitudes and Values	Students identify attitudes and values for a healthy, active lifestyle and demonstrate values consistent with safe road use[20].

As children move into early adolescence, responsibility for their own road safety behaviour increases rapidly and may be impacted on by what adolescents perceive the attitudes and values of their peers to be[7]. Children approach adult level of pedestrian crossing behaviour around age 11 or 12 years[6]. However, although adult level skills have been reached, pedestrian, cyclist and motor vehicle injury statistics do not decline from this age[6]. Arnett and colleagues[81] suggests the emotional and moral development of adolescents may play a role in this anomaly and thus could be used in planning road safety education for adolescents. Arnett's[81] findings include:

- adolescents are strongly influenced by what they think their peers and friends will think of them

- in groups, when together, adolescent friends often generate a state of elation

- adolescents try to escape from the control of parents and other adults and often experiment with what is prohibited by parents and other authorities

- adolescents underestimate the likelihood of negative events such as getting involved in a crash

- adolescents overestimate their own skills and competencies

- adolescents have strong mood swings

- male adolescents have a tendency to aggressiveness and sensation seeking, which is partly due to rising levels of testosterone in puberty.

Other researchers confirm the role these factors play in adolescent road safety behaviour. Peer pressure plays an important role in promoting or inhibiting the adoption of safety behaviours among young people[50]. Risk taking behaviour, that is, behaviour that places a person at injury risk when there are alternatives that do not do so, increases in this age group[8]. Risk taking behaviour is more prevalent amongst males compared to females[6, 8], and there is research to show that these, or unsafe

behaviours, are evident in children as young as three years[8]. Based on OECD findings on brain development, the early years are when a person develops the behaviours that predispose them to risk taking or protective behaviours[8]. Implications thus exist for road safety, with statistics reflecting higher male involvement in traffic crashes, primarily due to increased participation in risk taking behaviours[8].

Di Pietro[7] suggests gender differences amongst adolescents is particularly important, but acknowledges that to date, road safety education has not yet responded to these differences. Research has shown that boys tend to have higher crash rates, are more impulsive and are quicker to make judgements about when it is safe to cross the road compared to girls[7]. Much road safety education targeted at adolescents is an outcome of advertisements by the motor industry and through film and television which should be viewed cautiously as this material may convey unsafe road using behaviour and attitudes[7].

These adolescent developmental characteristics suggest that road safety education for this age group should target attitudes such as avoidance of risk taking, resistance to peer group pressure and appropriate estimation of one's own skill set[6].

Teaching and learning styles

The importance of interactive strategies is influenced by both Piagetian and Vygotsky developmental theories[6]. Interactive techniques such as adult-led and peer collaboration are particularly useful in the road safety education context[6]. Students of this age group develop interest in particular subject areas and have increasing interest in the natural, social and technological world beyond that of their own communities[20]. Independence and peer group orientation is built upon by providing decision-making and interaction opportunities within the classroom[20]. These activities allow students to assume responsibilities, develop decision-making skills, explore values and further refine their social and collaborative work skills[20].

Students develop an understanding that particular ways of working and thinking have evolved over time but may be subject to change, debate and revision[20]. Links between learning and the interconnectedness of various fields is explored and activities or programs that allow achievement of outcomes in a number of learning areas at one time should be encouraged[20]. Increasingly diverse and complex sources of information facilitate enhancement of learning through comparison, contrast, synthesis, questioning and critiquing of information[20]. Students should be encouraged to form open and questioning views as recipients of social, intellectual, linguistic and technological heritages, and teaching and learning programs, and should be encouraged to actively participate in their own continuing development as well as that of their society and the world[20].

Late Adolescence
Year 10 to Year 12

Health and Physical Education Learning Area Outcomes	Relevance to road safety education
Knowledge and Understandings	Through learning and teaching programs, young adults are able to consider laws and policies and develop strategies to effect change where necessary[20].
Self-management Skills	Young adults may be involved in planning health promotion programs that address areas such as drug education and road trauma, and consider the values of different groups[20].
Interpersonal Skills	Young adults continue to develop sound interpersonal skills which enable them to contribute to group activities and resolve conflict. They are able to take social action, either individually or as members of a group (e.g. for advocacy of road safety strategies)[20].
Attitudes and Values	Young adults identify attitudes and values for a healthy, active lifestyle and demonstrate values consistent with safe road use[20].

Youth and young adults, defined as 15 to 24 years in the *National Injury Prevention and Safety Promotion Plan: 2004-2014* report, are another identified area for priority action[60]. Road safety education in schools would capture students in this group aged between 15 and 18 years. In terms of addressing injury prevention for this age group, several priority actions are outlined, including:

- increased collaboration and coordination across sectors to reduce the impact of alcohol on injury occurrence

- provide information about injury prevention and safety promotion among young people to government sectors responsible for the safety and welfare of young people, such as police, education, community services and occupational health and safety

- advocate for investment in longitudinal, in-depth, multi-disciplinary research that examines the interplay of risk factors that place young people, particularly males at elevated risk of serious injury

- promote collaborative planning with all levels of government, private sector and communities to provide safer environments and encourage safer behaviour by young people at work, on the roads, participating in sport and recreational activities, and while celebrating

- ensure that interventions aimed at intentional and unintentional injuries among young people consider the role of alcohol

- actively seek the advice and participation of young people in developing and conducting strategies to prevent the leading causes of death and disability in their age group[60].

The *National Injury Prevention and Safety Promotion Plan: 2004-2014*[60] estimates that from 1991 to 2001, approximately 1,100 injury deaths and 27,000 injury hospitalisations per year in Australia were attributed to alcohol, with about half of these deaths involving road crashes. Alcohol is not only associated with an increased risk of injury whilst driving a motor vehicle, but also being a pedestrian

and cycling[60]. Young people aged 15 to 24 years are estimated to account for over half of serious road crashes due to alcohol in Australia[60]. Therefore alcohol and its relationship with road safety should be included in road safety education for this age group.

Students in this phase of development are beginning to learn how to drive and, as new drivers, typically have higher crash rates than any other age group[81]. Driver training programs usually aim to encourage the development of safe driving techniques, also including road law knowledge tuition and in-car components[82]. Learning to drive safely is a new skill associated with the road environment and therefore requires practise and modelling by professionals and parents alike[25, 82, 83].

Teaching and learning styles

Students in this phase are developing a sense of self, including their own interests, strengths and goals. More formal assessment methods influence curricula and study options, with students achieving outcomes in school, vocational education and training or in the workplace. Learning programs should extend students' knowledge and skills in chosen interest areas, as well as investigate the implications for, and the applications of, knowledge and skills, focussing on ethical issues and on how changing values and society can affect their learning[20].

Students exert increasing responsibility in a range of tasks and own learning experiences and should be provided with opportunities to plan and manage complex tasks and to show initiative, creativity and problem-solving skills. Students' learning experiences should encourage attainment of a high level of competence and confidence in the use of language for a range of complex and relatively sophisticated purposes. They should be involved in tasks which require them to clarify goals and approaches in relation to the information they need, show initiative and perseverance in accessing appropriate information, compare and evaluate information and ideas from different sources and critically select and synthesise information in ways relevant to difference purposes[20].

Young adults have the ability to act independently and take increasing responsibility for their own learning, thus, learning situations should focus on reviewing and reflecting on decisions made and actions taken[20].

Vulnerable Groups

Vulnerable populations, such as people from lower socio-economic groups, culturally and linguistic diverse groups and rural and remote communities are at greater risk of traffic injury.

Reasons for this increased risk include lack of familiarity with the traffic environment, economic costs of participating in safe road user strategies (e.g. purchasing helmets) and differing traffic conditions in country of origin[6].

Rural and remote populations are a diverse group presenting with relatively high rates of serious injury and special challenges for injury prevention[60]. The *National Injury Prevention and Safety Promotion Plan: 2004-2014* indicates that 16% of injury hospitalisations among residents of rural areas and 15% of injury hospitalisations among residents of remote areas were caused by transport-related injuries[60].

Rates of serious and fatal injury are markedly higher for Aboriginal and Torres Strait Islander people than for other Australians and these populations are therefore a specific area for action discussed in the *National Injury Prevention and Safety Promotion Plan: 2004-2012*.

Intentional self-harm (suicide) and transport crashes were the most common causes of injury death for Aboriginal and Torres Strait Islander people in the period 1997-2002. The transport injury death rate was almost three-times higher than that of the rest of the population[60].

Addressing road safety education in vulnerable groups

A number of strategies exist to assist schools address road safety education with vulnerable groups. The strategies presented do not necessarily relate solely to schools, rather the wider community in which the school exists.

- Access to information and data that will aid the planning of injury prevention and safety promotion for rural and remote communities.

- Advocate for greater attention and greater resourcing to improve equity of access to safety in program funding for rural and remote communities, and to enhance access by rural and remote communities to safety information, skilled workforce, and safe transport options, recreational and residential facilities.

- Collaborate with key agencies and government bodies responsible for services and planning in rural and remote areas to ensure that the prevention of injuries is integral to planning and policy development.

- Advocate that government agencies with injury prevention and safety promotion responsibilities include injuries within rural and remote communities in their accountability documents and performance measures.

- Raise awareness of the challenges of program implementation and evaluation where populations are small and dispersed.

- Build collaborative relationships for promoting safety and preventing injury within and between governments at all levels, and organisations and community groups that work with Aboriginal and Torres Strait Islander people, in order to collectively address safety.

- Stimulate national discussion on improving Aboriginal and Torres Strait Islander peoples' safety by encouraging Aboriginal and Torres Strait Islander community leaders to set safety promotion and injury prevention priorities, and by strengthening leadership and commitment.

- Increase knowledge and skills in and commitment to safety promotion and injury prevention in Aboriginal and Torres Strait Islander communities, among community leaders, and within the Aboriginal and Torres Strait Islander and non-Aboriginal and Torres Strait Islander workforce.

- Support safety promotion and injury prevention policies and strategies that address a mixture of social, environmental and behavioural factors, and provide good examples of dealing with the underlying alienation and disadvantage of Aboriginal and Torres Strait Islander peoples.

- Improve surveillance systems and other sources of quantitative and qualitative data, to provide adequate information for Aboriginal and Torres Strait Islander safety promotion and injury prevention. Develop mechanisms to coordinate injury prevention research and evaluations activities.

- Create and sustain local focus on promoting safety and preventing injury.

- Provide culturally and linguistically appropriate road safety information, including the provision of materials in different languages[60].

Teaching and learning styles for Indigenous populations

While teaching and learning styles often differ between individual Aboriginal and Torres Strait Islander communities, some principles are similar across the varying cultures[84]. According to Stewart[84], an effective teaching environment is created by employing a balance of warmth and demandedness.

Perceptive communication allows the teacher to develop an understanding of the needs of individual students and their individual learning approaches and flexible combinations of teaching and learning styles allow all students to develop effective ways of attaining positive outcomes[84]. Stewart[84] summarises previous research which suggests Indigenous approaches to teaching and learning should take into account several factors, including:

- involvement in adult activities from an early ages

- emphasis on observation and imitation rather than direct instruction or question and answer

- a preference for learning by doing, not for learning how to do

- learning in a way which makes use simultaneously of several different mental processes

- the social cost of making a mistake being greater than that of admitting ignorance

- a tendency to reinforce correct behaviour rather than penalising error

- competition directly and primarily outside the kin group; within the kin group there is a strong emphasis on cooperation

- learning tending to be by person-orientation rather than information-orientation, where knowledge is valued because of who gives it

- non-verbal communication used more, and more consciously, than by non-Indigenous Australians

- exploratory behaviour, persistence and repetition being important learning strategies.

Appendix

Appendix 1: Barriers to effective interventions

Success in road safety education is difficult to measure however, measuring knowledge transfer, when children use this knowledge and become safer road users, as well as reductions in road-related mortality and morbidity can be useful indicators of success[8]. Dragutinovic and Twisk[6] list several conclusions about evaluation studies of road safety education programs: a limited number of studies have been conducted thoroughly or "by the book"; few studies use crashes as an evaluation criterion (most use intermediate variables such as knowledge, attitudes and safe behaviour); the majority of interventions target primary school aged children and focus on pedestrian's roles; and evaluations have been conducted in high income, Western countries and thus findings cannot be generalised to developing countries. Along with the lack of well-evaluated road safety education programs, many factors have been cited as barriers to implementation, participation and achieving positive outcomes.

MacKay and colleagues[85] suggest several reasons why injury prevention programs fail to implement good practice.

- *Resistance to change:* from many sectors including the government (e.g. resistance to legislatory changes), from the injury prevention community (may be comfortable with the current focus of interventions) and from program developers and managers (because the current approach may be simpler or quicker).

- *Competing priorities:* such as time, money, potential inconvenience for adults or other community members.

- *Failure to plan solutions effectively:* too little time spent planning may lead to reduced potential benefits and outcomes and loss of transfer of the good practice steps.

- *Lack of capacity or expertise:* injury practitioners need to education decision makers and advocate for commitment and resources for strategies that work.

- *Lack of time or resources:* practices not based on good practice may be appealing because they may be less time consuming or be completed quickly, however evidence-based strategies may take longer or cost more, but will produce greater results upon completion.

Howat et al.[86] cite many barriers and enablers to community participation in road safety, which may be transferable to road safety education in schools. Planning issues may pose barriers to implementing road safety programs, and could include: adherence to one approach or process, top-down or bottom-up planning leading to mismatching priorities between planners and communities, inappropriate program focus and/or evaluation, lack of funds and resources and lack of sustainability[86]. Personnel issues may prevent participation in programs and attainment of positive outcomes. Personnel issues include decreased social capital (defined as the features of an organisation such as networks, norms and social trust that facilitate cooperation for mutual benefit), lack of time, lack of leadership and lack of relevant skills and knowledge[86].

Due to a lack of distinct curriculum space for road safety education, some researchers suggest using a cross-curricular approach[5]. However, this comprises several limitations such as limited curriculum decision-making, lack of budget for professional development and purchasing of resources, and potentially loss of goals planned sequentially, learning outcomes or associated assessment tasks[5]. In addition, parents could be involved in road safety education to reduce the burden on schools and to ensure a consistent message is provided across all settings.

Many parents/carers lack the understanding that they are an influential role model for their child's own behaviour development, especially during the first three years of life. They are unsure how to train their very young children about traffic awareness (e.g. scanning traffic and judging gaps); they may be unaware that children learn best through discovery and self-reflection; that frequent, consistent and ongoing roadside education appropriate to their child's developmental readiness is important; or that roadside training should focus on visual search skills[25].

Both theories of Diffusion of Innovation[87] and Capacity Building[88] are also rarely used in the design and implementation of road safety interventions, however hold much promise in addressing the factors which may inhibit schools and their communities from being able to implement such programs. By incorporating these theories into the design and implementation of strategies to improve road safety education in schools, the opportunities for success are greatly improved.

Many of the barriers to implementing the Principles, as cited in expert consultation and validation, were consistent across the *Principles for School Road Safety Education*[1]. The most common barriers identified include:

• lack of coordination of road safety programs

• lack of funding for initiatives

• lack of support for teachers

• lack of leadership in schools for road safety

• need for a road safety 'champion' in each school

• already crowded curriculum

• teachers too busy

• availability of resources

• community/parent's perception of the priority for road safety

• accessing and involving external agencies[1].

These potential barriers are important to consider during implementation of the Principles at a national and state level[1].

Appendix 2: Case study examples

Principle 3

Creating strong partnerships with external local agencies allowed one school to have access to relevant and current road safety education resources, as well as being notified of professional learning opportunities[1].

Principle 4

Teachers reported in the early childhood area, interactive strategies that encouraged learning through play, were most beneficial for students. One school reported for Kindergarten students, creating a mock road environment using materials created by the students assisted with the learning process for pedestrian behaviours[1].

Principle 6

One school reported using a number of resources to send home to parents including pamphlets and booklets developed by external organisations and information in the school newsletter[1].

Principle 7

A buddy program already in place at one school between Year 1 and Year 7 students saw the Year 7 students introduce Year 1 students to their crossing attendant at the school[1].

Principle 8

One primary school reported their success in developing a road safety policy by creating partnerships with their local government's engineering department and road safety officer, as well as community road safety agencies. Parents were also invited to participate in developing the policy. The policy was disseminated to families through the Parent Handbook. All new families to the school also received the policy at their induction[1].

Principle 9

Schools reported providing time for teachers to plan for road safety education in the classroom as well as linking in to relevant days or special road safety events occurring in the community, such as Easter campaigns and Walk to School Days[1].

Principle 13

Many schools report sending home information through every school newsletter, sending home pamphlets and booklets supplied by external road safety agencies and discussing road safety issues at school assemblies, at least once a term[1].

Appendix 3: Developmentally appropriate road safety education content

Although there is a vast array of content applicable to road safety education, it may not be possible to include all items in the time devoted to road safety in Australian schools. As such, Elliott[4] suggests a limited curriculum be provided to teachers within the school environment, supplemented by a curriculum for parents to educate their child in areas appropriate to their developmental phase (e.g. parents could teach early childhood children where they live, who lives there, their telephone number etc., whilst teachers could teach these children the causes of road-related injury).

A combined approach is likely to achieve greater results than both groups operating in isolation as it ensures children receive consistent messages and increased practice opportunities to reinforce messages learnt.

The following table (continued on page 44) provides a summary of developmentally appropriate road safety education content.

Content area	Appropriate content	Kindy to Year 3	Year 3 to Year 7	Year 7 to Year 10	Year 10 to Year 12
Sensing Traffic	What traffic is and what vehicles are.	●			
	Searching in a systematic way for traffic.	●			
	Meaning of road signs.	●			
	Understand how and why vehicles contribute to safety or danger.	●			
Passenger Safety	Being a safe passenger (e.g. wearing seatbelts, child car restraints, using the safety door, not distracting the driver).	●	●		
	Rules that help to keep them safe.	●			
	How and why vehicles contribute to safety and danger.		●		
	How and why their own behaviour as a passenger contributes to safety and danger.		●		
	Adolescents should be made aware of the benefits of engaging in safe behaviours and the dangers associated with taking risks such as driving under the influence of alcohol or other drugs, or getting into a car with someone under the influence of alcohol or other drugs.			●	●
	Protection offered by seatbelts, air bags and other vehicle safety features.				●

Content area	Appropriate content	Kindy to Year 3	Year 3 to Year 7	Year 7 to Year 10	Year 10 to Year 12
Pedestrian Safety	Vocabulary of the road (kerb, pavement, etc).	•	•		
	Skills needed to keep them safe (e.g., holding an adult's hand when crossing the road, stopping back from the kerb).	•	•		
	Choosing the safest places to cross the road.	•	•		
	Planning a safe route.	•	•		
	Safer places to play and safe rules for play.	•	•		
	Identifying people who could assist them to use roads more safely.		•		
	Explore strategies for avoiding or reducing associated risks in the traffic environment.		•		
	Avoidance of risk taking as a pedestrian.			•	•
	Resistance to peer pressure.			•	•
	Getting home safely when under the influence of alcohol or other drugs.			•	•
Bicycle Education	Safer cycle training including on-road training element and bicycle maintenance.		•	•	
	Helmet education, traffic rules, safety guidelines, and on-bike training.	•	•	•	
	Avoidance of risk taking as a cyclist.	•	•	•	•
	Resistance to peer pressure.			•	•
	Getting home safely when under the influence of alcohol or other drugs.			•	•
Driver Education	Relationship between alcohol and other drugs and road safety.				•
	Encourage the development of safe driving techniques including knowledge of road laws and in-car components.				•
	Causes of common traffic accidents involving young drivers and how such accidents can be prevented.				•
	Laws which apply to vehicle ownership.				•
	Journey planning, including maps and timetables.				•
	Benefits of supervised driving practice.				•
Parent Involvement	Modelling and teaching correct road safety behaviours in a real traffic environment.	•	•	•	
	Raise awareness of young children's limitations in the traffic environment (e.g., crossing roads).	•	•	•	
	Parents should teach their children about potential dangers in the traffic environment and support this learning by demonstrating practical strategies for dealing with these dangers.	•	•		
	Educating parents in school pick-up and drop-off zones.	•	•	•	•
	Parents should develop a safer socialising agreement with their teenagers.			•	
	Practising and modelling good driver safety behaviours.				•
	Encouraging driving practice in a range of conditions.				•

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