

**EVALUATION OF THE
WALKSMART / BIKESMART VERMONT!
CURRICULUM IMPLEMENTATION
IN VERMONT
2007-2009
September 2009**

Produced by the Center for Health & Learning under funding from the
Safe Routes to School Program
of the Vermont Agency of Transportation



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Evaluation of WALKSMART/BIKESMART VERMONT!

Curriculum Implementation in Vermont SRTS Classrooms 2007-2009

September 2009

Introduction

The *WalkSmart / BikeSmart Vermont!* curriculum is a pedestrian and bicycle safety education program that teaches walking and bicycling safety to children in grades K-6. The goal is to provide pedestrian safety education each fall and bicycle safety education each spring to children in Vermont schools. The aim of the program is to give children the knowledge and skills to walk and bike safely in traffic.

The curriculum was developed by the Center for Health and Learning under a contract from the Vermont Department of Transportation Safe Routes to School program during 2007-2009. Key safety-related concepts and skills include the following:

WalkSmart Vermont!

- Walking Safely in Traffic
- Crossing Roads Safely
- Getting Out of a Car Safely
- Getting Off a Bus Safely

BikeSmart Vermont!

- Helmet Safety
- Dressing for Safety
- Rules of the Road
- Bike Quick Check

An evaluative component for the classroom instruction was designed at the start of the program to collect data on implementation and to assess student attitudes toward, and knowledge about, pedestrian and bicycle safety before and after the program.

In 2007-2008, 10 schools receiving Safe Routes to School (SRTS) funding reported teaching the *WalkSmart* curriculum to 1010 children in kindergarten through second grade, and the *BikeSmart* curriculum to 1,229 children in second through sixth grade. School-based instructors at seven schools volunteered to administer the pre- and post-testing to a smaller sample of students and adhere to an evaluation administration protocol.

First-year results (see report in Appendix 2) indicated that, while students' knowledge regarding pedestrian and bike safety was impressively high to begin with, classroom instruction significantly improved students' information base in important safety areas such as riding safely, knowing one's bike and the rules of the road. Evaluation results were also used to clarify and revise some components in the curriculum.

In 2008-2009, twenty-five schools participating in the SRTS program reported implementing the *WalkSmart* curriculum to 3045 children and the *BikeSmart* curriculum to 3708 elementary school children in Vermont. Once again, pre- and post-testing was administered to a sampling of students, with two significant changes to the process: 1) A shorter five-question *WalkSmart* pre-post test was administered to children in kindergarten this year; and 2) Children in Grades 2-6 received the same *BikeSmart* pre- and post-tests in contrast to 2007-2008, when separate tests were given to children in Grades 2-3 and Grades 4-6.

Second-year results are detailed below. Wherever appropriate, these results are also analyzed within the context of the first-year figures to provide a more thorough indication of the effectiveness of the curriculum.

In summary, there is substantial similarity between results from Year 1 and Year 2, in terms of the pre- and post-test questions which indicate the largest gains of knowledge across the student samplings, and the generally high percentage of questions which are statistically significant. This would seem to indicate that the curricula is not only effective in imparting pedestrian and bike safety-related knowledge and skills to students, but that the *WalkSmart* and *BikeSmart* lessons are being delivered with a fair degree of fidelity as intended.

Methodology

In both the *WalkSmart* and *BikeSmart* programs, students were administered a series of questions before and after they received instruction in a pre-post design. Teachers of the students were provided a protocol in advance, detailing administration procedures of the instruments. The *WalkSmart* instrument, which consisted of eleven questions, was given to first and second grade students and a shorter version of the test consisting of five questions was given to kindergarten students. The *BikeSmart* instrument was given to students in grades 2-6. For all instruments, students selected an answer from a multiple-choice format.

In Tables 1-3 following, counts and percentages are presented for each of the questions for both the pre-test and post-test. Students that did not take both the pre-and post-test were not included in the analysis. The correct responses and the associated counts and percentages have been bolded. For more information on the statistical methods see *Appendix 1: Methodology*.

Summary of Results

***WalkSmart* - Kindergarten**

The following represents a summary of the *WalkSmart* survey results administered to 60 kindergarten students as shown in Figure 1 and Table 1:

- In the four of the five questions, the proportion of correct responses on the post-test was higher than the pre-test. Two of these instances were statistically significant (including “Walk facing traffic” and “Look Left-Right-Left when crossing”).
- The largest gain in the proportion of correct responses was on question #2 (“Walk Facing Traffic”).
- On question #4, the proportion of correct responses slightly *declined* from 86.7% to 83.3% on the pre-test and post-test respectively (“Cross on a Straight Line”).

Figure 1
Comparison of WalkSmart Pre- and Post-test Scores
Kindergarten

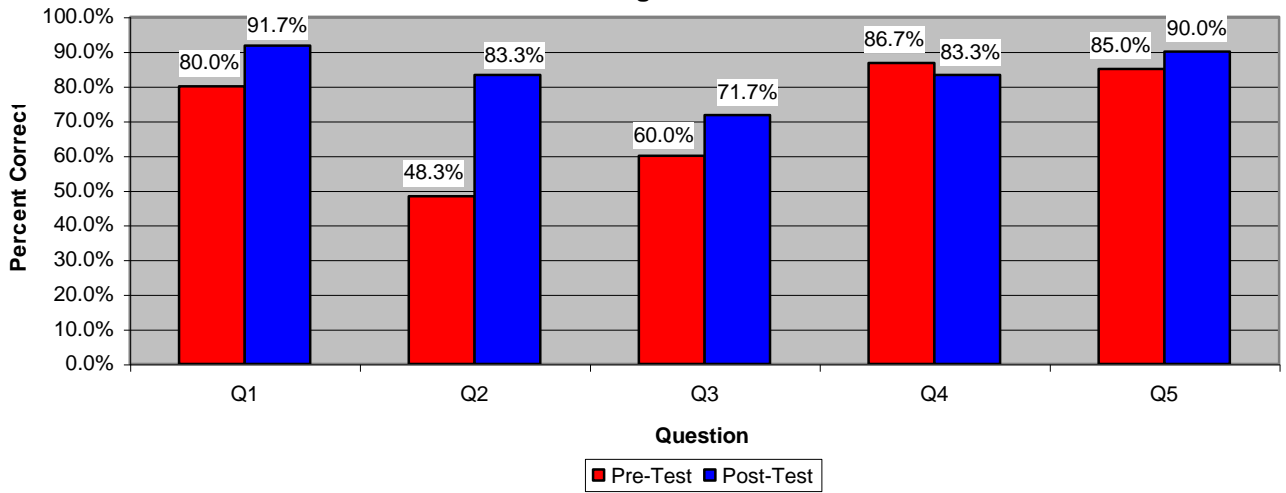


Table 1
WalkSmart Results – Kindergarten

Question	Response Choices	Pre - Test		Post-Test		z stat.	p-value
		n	%	n	%		
Q1. When you are walking down a road and there is a sidewalk should you walk on the sidewalk or in the road?	Sidewalk	48	80.0	55	91.7	1.548	0.061
	Along the road	12	20.0	5	8.3		
Q2. When you are walking in a road without sidewalks should you walk facing the cars or with the cars coming from behind you?	Facing the cars	29	48.3	50	83.3	4.024	0.000**
	With the cars behind you	31	51.7	10	16.7		
Q3. When you are crossing a road should you look Left-Right-Left or Right-Left-Right?	Left-Right-Left	36	60.0	43	71.7	1.865	0.031*
	Right-Left-Right	24	40.0	17	28.3		
Q4. When crossing a road do you cross in a straight line or at an angle?	Straight line	52	86.7	50	83.3	-0.4478	0.6729
	At an angle	8	13.3	10	16.7		
Q5. When you get off a school bus and you need to cross the road do you cross in front of the bus or behind the bus?	In front of the bus	51	85.0	54	90.0	0.5941	0.2763
	Behind the bus	9	15.0	6	10.0		

Note: * $p \leq 0.05$, ** $p \leq 0.01$

WalkSmart - Grades 1-2

The following represents a summary of the *WalkSmart* survey results administered to 146 students in grades 1-2 as shown in Figure 2 and Table 2:

- In all ten questions, the proportion of correct responses on the post-test was higher than the pre-test. Nine of the ten questions were statistically significant.
- The largest gains in the proportion of correct responses were on question #2: Walk Facing Traffic (+19%), question #3: Look Left-Right-Left when crossing, (+22.6%), question #4: Continue to look Left-Right-Left (+31.8%), and question #10: Good reasons to walk (+30%).
- Note that the largest gains in 2007-2008 were on the same questions as follows: question #2: Walk Facing Traffic (+21.9%), question #3: Look Left-Right-Left when crossing, (+23.6%), question #4: Continue to look Left-Right-Left (+20%), and question #10: Good reasons to walk (+20%).

Figure 2
Comparison of WalkSmart Pre- and Post-test Scores
Grades 1-2

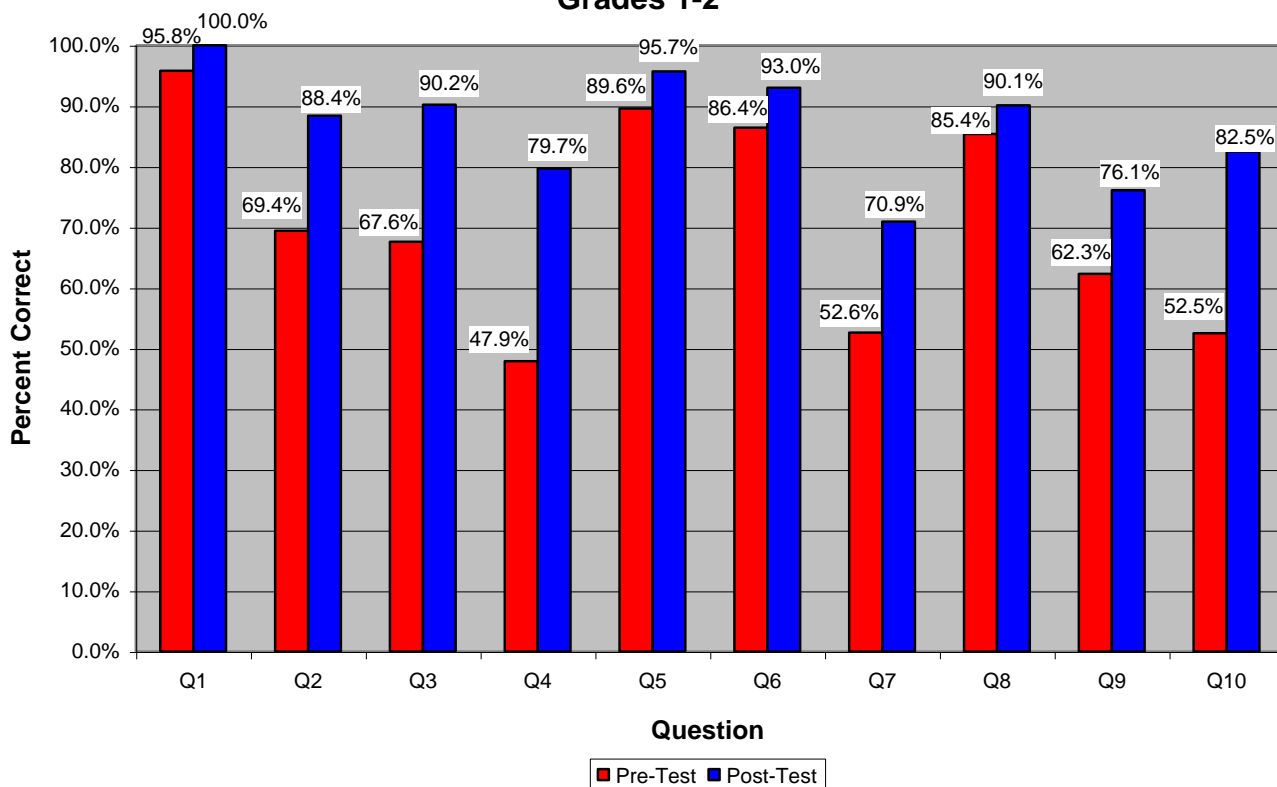


Table 2
WalkSmart Results – Grades 1-2

Question	Response Choices	Pre - Test		Post-Test		z stat.	p-value
		n	%	n	%		
Q1. When you are walking down a road and there is a sidewalk should you walk on the sidewalk or in the road?	Sidewalk	138	95.8	146	100.0	2.513	0.006**
	Along the road	6	4.2	0	0.0		
Q2. When you are walking in a road without sidewalks should you walk facing the cars or with the cars coming from behind you?	Facing the cars	100	69.4	129	88.4	4.948	0.000**
	With the cars behind you	44	30.6	17	11.6		
Q3. When you are crossing a road should you look Left-Right-Left or Right-Left-Right?	Left-Right-Left	94	67.6	129	90.2	5.693	0.000**
	Right-Left-Right	45	32.4	14	9.8		
Q4. When you are crossing the road should you continue to look Left-Right-Left or straight toward where you are going?	Look Left-Right-Left	68	47.9	114	79.7	7.586	0.000**
	Look straight ahead	74	52.1	29	20.3		
Q5. What is the edge of a road?	The side of the road	129	89.6	135	95.7	2.398	0.008**
	The middle of the road	15	10.4	6	4.3		
Q6. When crossing a road do you cross in a straight line or at an angle?	Straight line	121	86.4	132	93.0	2.278	0.011*
	At an angle	19	13.6	10	7.0		
Q7. When crossing a road and there are cars parked along the edge, where do you start crossing from?	Between the cars	65	47.4	41	29.1	4.290	0.000**
	The edge of the car	72	52.6	100	70.9		
Q8. When you get out of a parked car do you get out into the road, or toward the curb?	Into the road	20	14.6	14	9.9	1.558	0.060
	Toward the curb	117	85.4	127	90.1		
Q9. When you get off a school bus and you need to cross the road do you cross in front of the bus or behind the bus?	In front of the bus	86	62.3	105	76.1	3.345	0.000**
	Behind the bus	52	37.7	33	23.9		
Q10. What is a good reason to walk?	It is good exercise and fun	57	41.3	20	14.0	7.057	0.000**
	It cuts down on pollution	9	6.5	5	3.5		
	both a and b	72	52.2	118	82.5		

Note: * $p \leq 0.05$, ** $p \leq 0.01$

BikeSmart - Grades 2-6

The following represents a summary of the *BikeSmart* survey results administered to 245 students in grades 2-6 as shown in Figure 3 and Table 3:

- In all eleven questions, the proportion of correct responses on the post-test was higher than the pre-test. Seven of the eleven questions were statistically significant.
- On questions #1: When to wear a bicycle helmet, #6: Signal when turning, and #7: yield means slowdown, the proportion of correct responses on the pre- and post-tests exceeded 95.0%. Since nearly all the children got the questions correct initially, it was difficult to observe statistical significance. Question #3: When to replace a helmet, was also not statistically significant, as approximately 20% of the children answered correctly in both the pre-and post-tests.
- The largest gains in the proportion of correct responses were on question #2: Proper helmet fit (+22.7%), question #4: Dressing safely (+38.1%), question #5: Ride with cars coming from behind you (+29.9%), and question #10: Road riding (+26.4%).
- While the test was administered separately to Grades 2-3 and Grades 4-6 in 2007-2008, the questioning and results for the older age group last year were similar to this year, as two of the three largest gains in the proportion of correct responses in 2007-2008 were on question #4: Dress light and tight (+16.5%) and question #5: Ride with cars coming from behind you (+24.7%).
- Note that the pre-post test for Grades 2-3 last year was significantly different from that which was administered to Grades 2-6 this year.

Figure 3
Comparison of BikeSmart Pre- and Post-test Scores

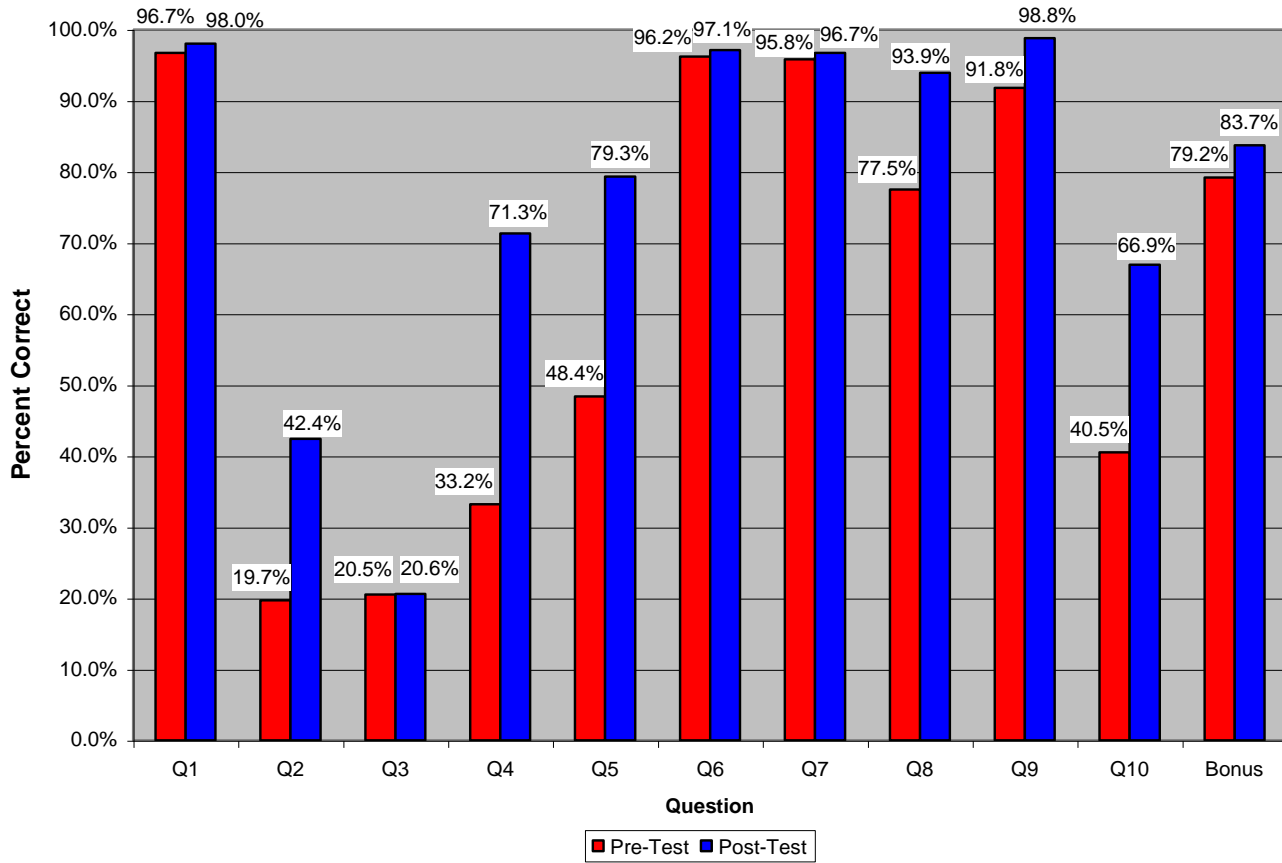


Table 3
BikeSmart Results – Grades 2-6

Question	Response Choices	Pre-Test		Post-Test		z stat.	p-value
		n	%	n	%		
Q1. When should you wear a bicycle helmet?	When riding in traffic	8	3.3	5	2.0	1.139	0.127
	Whenever you are riding	237	96.7	239	98.0		
Q2. What are the things you check for proper helmet fit?	Light and tight	196	80.3	140	57.6	8.915	0.000**
	Eyes ears and mouth	48	19.7	103	42.4		
Q3. When is it time to get a new helmet?	When it is more than five years old or has been in an accident	48	20.5	50	20.6	0.038	0.485
	Every year	186	79.5	193	79.4		
Q4. How should you dress safely when riding a bike?	Comfortable clothes	101	41.4	60	24.6	12.638	0.000**
	Light and tight	81	33.2	174	71.3		
	Doesn't Matter	62	25.4	10	4.1		
Q5. When you are riding a bicycle should you ride facing the cars or with the cars coming from behind you?	Cars coming from behind you	118	48.4	192	79.3	9.658	0.000**
	Facing the cars	126	51.6	50	20.7		
Q6. When should you signal?	When making a turn	230	96.2	237	97.1	0.728	0.233
	When going straight	9	3.8	7	2.9		
Q7. Does "yield" mean stop or slow down and look for traffic?	Slow down and look for traffic	228	95.8	236	96.7	0.692	0.244
	Stop	10	4.2	8	3.3		
Q8. When you are riding with a friend who is also riding, is it best to ride next to the friend or single file?	Next to the friend	55	22.5	15	6.1	6.135	0.000**
	Single file	189	77.5	229	93.9		
Q9. When you do the ABC-Quick Check, which should you check?	Air in the tires	13	5.3	0	0.0	3.993	0.000**
	Chain	7	2.9	3	1.2		
	Both a and b	225	91.8	242	98.8		
Q10. Does a bicyclist have a right to ride in the road when there is a sidewalk?	Yes, you have the right to ride in the road	98	40.5	164	66.9	8.366	0.000**
	No, you must ride on the sidewalk.	144	59.5	81	33.1		
Bonus. What is a good reason to ride your bike?	It is good exercise and fun	48	19.6	38	15.5	1.735	0.041*
	It cuts down on pollution	3	1.2	2	0.8		
	both a and b	194	79.2	205	83.7		

Note: * $p \leq 0.05$, ** $p \leq 0.01$

Conclusions

Over the past two years, implementation of the *WalkSmart / BikeSmart Vermont!* curriculum has had significant impact on the knowledge and attitudes of school-age children in grades K-6. When responses for both lessons and all three tests were combined in 2008-2009, the percentage of children getting correct responses improved on 25 out of 26 questions, with 18 of the questions showing statistically significant gains. Details of the three tests are as follows:

- In the four of the five questions for *WalkSmart Kindergarten*, the proportion of correct responses on the post-test was higher than the pre-test. Two of these instances were statistically significant.
- In all ten questions for *WalkSmart 1-2*, the proportion of correct responses on the post-test was higher than the pre-test. Nine of these instances were statistically significant.
- In all eleven questions for *BikeSmart 2-6*, the proportion of correct responses on the post-test was higher than the pre-test. Seven of the eleven questions were statistically significant.

Similarly, in 2007-2008, the percentage of students getting correct responses across all three tests improved in 27 out of 31 questions, with 24 of the questions showing statistically significant gains. Details of the three tests are as follows:

- In the eight of the ten questions for *WalkSmart K-2*, the proportion of correct responses on the post-test was higher than the pre-test. Six of these instances were statistically significant.
- In the eight of the ten questions for *BikeSmart 2-3*, the proportion of correct responses on the post-test was higher than the pre-test. All eight of these instances were statistically significant.
- In all eleven questions for *BikeSmart 4-6*, the proportion of correct responses on the post-test was higher than the pre-test. Ten of the eleven questions were statistically significant.

After two years of classroom instruction, our evaluations indicate that the *WalkSmart/BikeSmart Vermont! Curriculum* has improved students' information base in a number of important safety areas, including:

- The necessity to walk in a road facing traffic
- The need to look Left-Right-Left when crossing a road
- When getting off a school bus, the importance of crossing the road in front of the bus
- The necessity to ride a bicycle along the side of the road in the same direction as the traffic
- The importance of riding a bicycle in single file when accompanied by a friend
- The preference for wearing bright and tight clothing for safety while bicycling

These results indicate that the program is a reliable approach to increasing knowledge and promoting positive attitudes about pedestrian and bicycle safety.

Appendix 1: Methodology

In both the *WalkSmart* and *BikeSmart* programs, students were administered a series of questions before and after they received instruction in a pre-post design. Teachers of the students were provided a protocol in advance, detailing administration procedures of the instruments. The *WalkSmart* instrument, which consisted of eleven questions, was given to first and second grade students and a shorter version of the test consisting of five questions was given to kindergarten students. The *BikeSmart* instrument was given to students in grades 2-6. For all instruments, students selected an answer from a multiple-choice format.

To test whether there was a statistically significant difference in the proportion of correct answers from the pre-test to the post-test, the one-sample test for a binomial proportion was used. This statistical procedure compares the proportion of correct responses on the pre-test to the proportion of correct responses on the post-test for each of the questions. A z test is used to determine whether the proportions are significantly different. Since it is expected that the proportion of correct responses will increase after instruction, a one-tailed z-test will be used. P values that are less than or equal to 0.05 are statistically significant and are noted in the tables with an asterisk. The null and alternative hypotheses for the one-sample test for a binomial proportion are as follows:

- H_0 : The proportion of correct responses on the pre-test and the post-test are the same.
- H_1 : -The proportion of correct responses on the post-test are greater than the pre-test.

Appendix 2: Evaluation of the *WALKSMART/BIKESMART VERMONT!* Curriculum Implementation in Vermont SRTS Classrooms 2008-09, September 2008 – See next page

Post-Script

Thank you to the educators who implemented the program and collected the pre-post data:

2007-08 SRTS Coordinators: Vanessa Hampton, Alice Charkes, Pam Mathews, Robin Wright, Betsy Coutmemanche, Nicki Steel, Gabriela Meyer, Lynn McDonald, Donna Ewald, Jon McDonald, Gail Gorman, Bill Merrylees, Becka Roof, Francois Daigneault, and Debra Burchard

2007-08 Safety Educators from the following schools: Fair Haven Grade School, Green Street School, Hyde Park Elementary, Jericho Elementary, Newfane Elementary, Readsboro Central, State Street School, St.Johnsbury School, Union Elementary, BFA Fairfax, and Community Connections

2008-09 SRTS Safety Educators:

Principal Investigator: JoEllen Tarallo-Falk, Ed.D., Center for Health and Learning

Statistician: Richard Grip, Ed.D., Statistical Forecasting LLC

Research Assistant: Bob Crego

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Curriculum Implementation in Vermont SRTS Classrooms 2008-09
September 2008**

**Principal Investigator: JoEllen Tarallo-Falk, Ed.D., Center for Health and Learning
Statistician: Richard Grip, Ed.D., Statistical Forecasting LLC**

Introduction

The *WalkSmart / BikeSmart Vermont!* curriculum is a pedestrian and bicycle safety education program that teaches walking and bicycling safety to children in grades K-6. The goal is to provide pedestrian safety education each fall and bicycle safety education each spring to children in Vermont schools. The aim is to give children the knowledge and skills to walk and bike safely in traffic. The curriculum was developed by the Center for Health and Learning under a contract from the Vermont Agency of Transportation during 2007-2009 to reach elementary school children with pedestrian and bicycle safety education that would enhance their walking and bicycling activities. The curriculum teaches critical content, concepts and skills for pedestrian and bicycle safety. An evaluation component for the classroom instruction was designed early to collect data on implementation and to assess student attitudes toward and knowledge about pedestrian and bicycle safety before and after the program.

Key concepts and skills include:

WalkSmart Vermont!

- Walking Safely in Traffic
- Crossing Roads Safely
- Getting Out of a Car Safely
- Getting Off a Bus Safely

BikeSmart Vermont!

- Helmet Safety
- Dressing for Safety
- Bike Quick Check
- Rules of the Road

In 2008-09 ten schools reported teaching the *WalkSmart* lesson to 1013 children in kindergarten through second grade, and the *BikeSmart* lesson to 1229 children in second through sixth grade. This represents less than half of the schools responsible for implementing the lesson. School-based instructors at seven schools volunteered to administer the pre- and post- testing to a smaller sample of students and adhere to an evaluation administration protocol.

First year results show classroom instruction significantly improved students' information base in very important safety areas, such as riding safely, knowing your bike, rules of the road. Evaluation results were also used to clarify and revise some components in the curriculum.

Methodology

In both the *WalkSmart* and *BikeSmart* programs, students were administered a series of questions before and after they received instruction in a pre-post design. Teachers of the students were provided a protocol in advance detailing administration procedures of the instruments. The *WalkSmart* instrument was given to first and second grade students while the *BikeSmart* instrument was given to students in grades 2-6. Due to the age variation, two *BikeSmart* instruments were created; the first instrument was for grades 2-3 consisting of ten questions while the second was for grades 4-6 consisting of eleven questions. There were eight common questions in the *BikeSmart* instruments. For all instruments, students selected an answer from a multiple-choice format.

In Tables 1-3 following, counts and percentages are presented for each of the questions for both the pre-test and post-test. The correct responses and the associated counts and percentages have been bolded. For more information on the statistical methods see *Appendix 1: Methodology*.

Summary of Results

WalkSmart Vermont! Grades K-2

The following represents a summary of the *WalkSmart* survey results administered to 110 students in grades 1-2 shown in Table 1 and Chart 1:

- In the eight of the ten questions, the proportion of correct responses on the post-test was higher than the pre-test. Six of these instances were statistically significant.
- On question 1, the proportion of correct responses was 99.1% on both the pre-test and post-test. Since nearly all the children got the question correct initially, it was difficult to observe statistical significance.
- On question 6, the proportion of correct responses *declined* from 93.6% to 88.2% on the pre-test and post-test respectively.

BikeSmart Vermont! Grades 2-3

The following represents a summary of the *BikeSmart* survey results administered to 107 students in grades 2-3 shown in Table 2 and Chart 2:

- In the eight of the ten questions, the proportion of correct responses on the post-test was higher than the pre-test. All eight of these instances were statistically significant.
- On question 4, the proportion of correct responses *declined* from 99.1% to 97.2% on the pre-test and post-test respectively. This represented a change in only two students. On question 1, the proportion of correct responses was 99.1% on both the pre-test and post-test. In both instances, since nearly all the children got the questions correct initially (a poor discriminator), it was difficult to observe statistical significance.

BikeSmart Vermont! Grades 4-6

The following represents a summary of the *BikeSmart* survey results administered to 170 students in grades 4-6 shown in Table 3 and Chart 3:

- In all eleven questions, the proportion of correct responses on the post-test was higher than the pre-test. Ten of the eleven questions were statistically significant.
- On question 1, the proportion of correct responses increased from 97.1% to 98.8% on the pre-test and post-test respectively but was not statistically significant. Since nearly all the children got the question correct initially, it was difficult to observe statistical significance.

Table 1
WalkSmart Results - Grades 1-2

Question	Response Choices	Pre-Test		Post-Test		z stat.	p-value
		n	%	n	%		
Q1. When you are walking down a road and there is a sidewalk should you walk on the sidewalk?	Sidewalk	109	99.1	109	99.1	0.000	0.500
	Along the road	1	0.9	1	0.9		
Q2. When you are walking in a road without sidewalks should you walk facing the cars or with the cars coming from behind you?	Facing the cars	71	64.5	95	86.4	4.800	0.000*
	With the cars behind you	39	35.5	15	13.6		
Q3. When you are crossing a road should you look Left-Right-Left or Right-Left-Right?	Left-Right-Left	74	67.3	100	90.9	5.276	0.000*
	Right-Left-Right	36	32.7	10	9.1		
Q4. When you are crossing the road should you continue to look Left-Right-Left or straight toward where you are going?	Look Left-Right-Left	62	56.4	84	76.4	4.230	0.000*
	Look straight ahead	48	43.6	26	23.6		
Q5. What is the edge of the road?	The side of the road	106	96.4	109	99.1	1.520	0.064
	The middle of the road	4	3.6	1	0.9		
Q6. When crossing a road do you cross in a straight line or at an angle?	Straight line	103	93.6	97	88.2	-2.314	0.990
	At an angle	7	6.4	13	11.8		
Q7. When crossing a road between parked cars or parking lot with parked cars where do you start crossing from?	Between the cars	49	44.5	37	33.6	2.300	0.011*
	The edge of the car	61	55.5	73	66.4		
Q8. When you get out of a parked car do you get out into the road, or toward the curb?	Into the road	12	10.9	5	4.5	2.154	0.016*
	Toward the curb	98	89.1	105	95.5		
Q9. When you get off a school bus and you need to cross the road do you cross in front of the bus or behind the bus?	In front of the bus	79	71.8	86	78.2	1.492	0.068
	Behind the bus	31	28.2	24	21.8		
Q10. What is a good reason to walk	It is good exercise and fun	43	39.1	20	18.2	4.253	0.000*
	It cuts down on pollution	3	2.7	4	3.6		
	both a and b	64	58.2	86	78.2		

Note: * $p \leq 0.05$

Chart 1
Comparison of Walk Smart Pre- and Post-test Scores
Grades 1-2

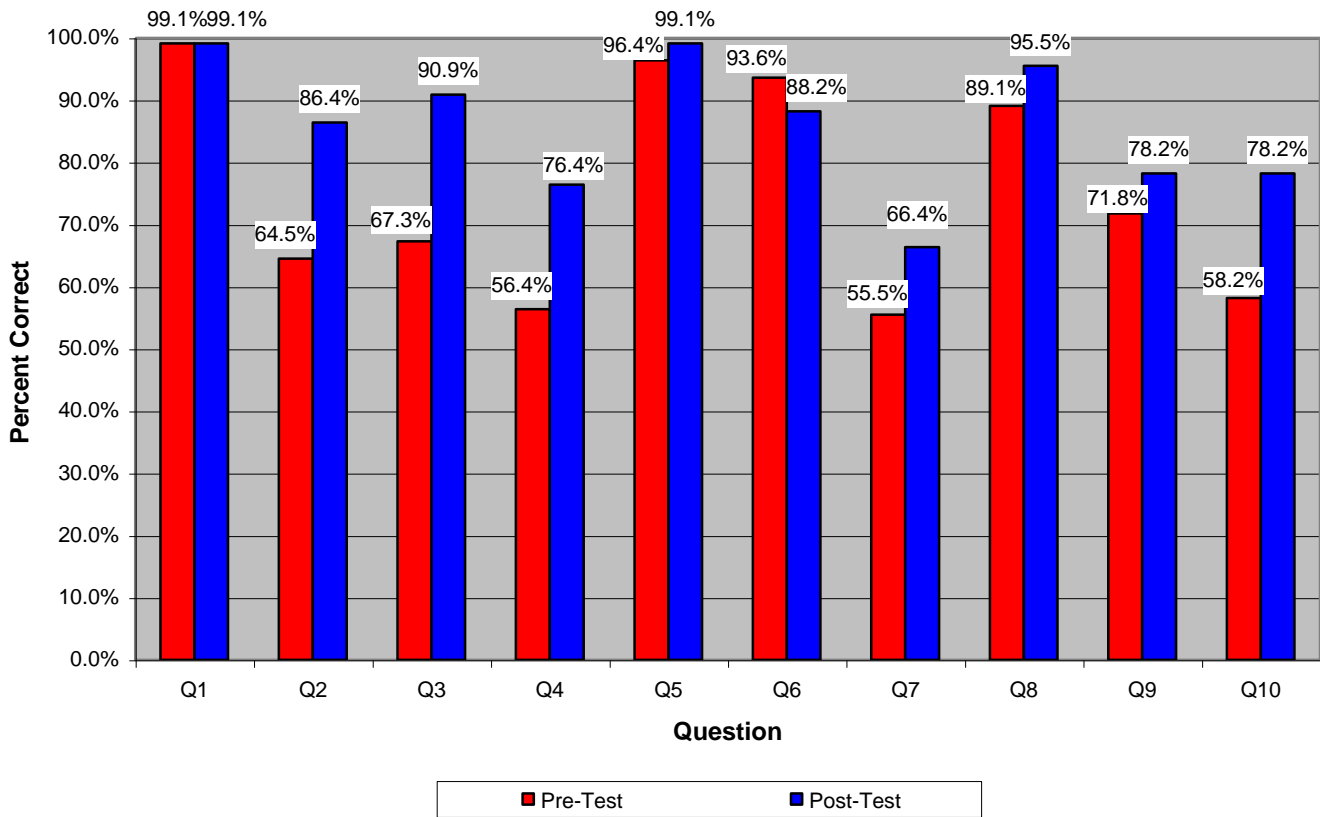


Table 2
BikeSmart Results- Grades 2-3

Question	Response Choices	Pre-Test		Post-Test		z stat.	p-value
		n	%	n	%		
Q1. When should you wear a bicycle helmet?	When riding in traffic	1	0.9	1	0.9	0.000	0.500
	Whenever you are riding	106	99.1	106	99.1		
Q2. When is it time to get a new helmet?	When it is more than five years old or has been in an accident	14	13.1	58	54.7	12.694	0.000*
	Every year	93	86.9	48	45.3		
Q3. What color clothes should you wear when riding a bike?	Light	89	83.2	100	93.5	2.850	0.002*
	Dark	9	8.4	4	3.7		
	Doesn't Matter	9	8.4	3	2.8		
Q4. How should you carry something when riding a bike?	In your left hand	1	0.9	3	2.8	-2.081	0.981
	In a backpack or on a rack	106	99.1	104	97.2		
Q5. When you are riding a bicycle should you ride facing the cars or with the cars coming from behind you?	Cars coming from behind you	35	32.7	58	54.7	4.828	0.000*
	Facing the cars	72	67.3	48	45.3		
Q6. Should you stop at stop signs?	At all times	91	85.0	101	94.4	2.723	0.003*
	When traffic is coming	16	15.0	6	5.6		
Q7. Should you give a hand signal when making a right turn?	Yes	90	84.9	104	97.2	3.553	0.000*
	No	16	15.1	3	2.8		
Q8. Should you give a hand signal when slowing down or stopping?	Yes	80	75.5	104	97.2	5.219	0.000*
	No	26	24.5	3	2.8		
Q9. When you do the ABC-Quick Check, which should you check?	Air in the tires	6	5.6	3	2.8	1.846	0.032*
	Chain	2	1.9	0	0.0		
	both a and b	99	92.5	104	97.2		
Q10. What is a good reason to ride your bike?	It is good exercise and fun	18	16.8	3	2.8	4.056	0.000*
	It cuts down on pollution	1	0.9	0	0.0		
	both a and b	88	82.2	104	97.2		

Note: * $p \leq 0.05$

Chart 2
Comparison of Bike Smart Pre- and Post-test Scores
Grades 2-3

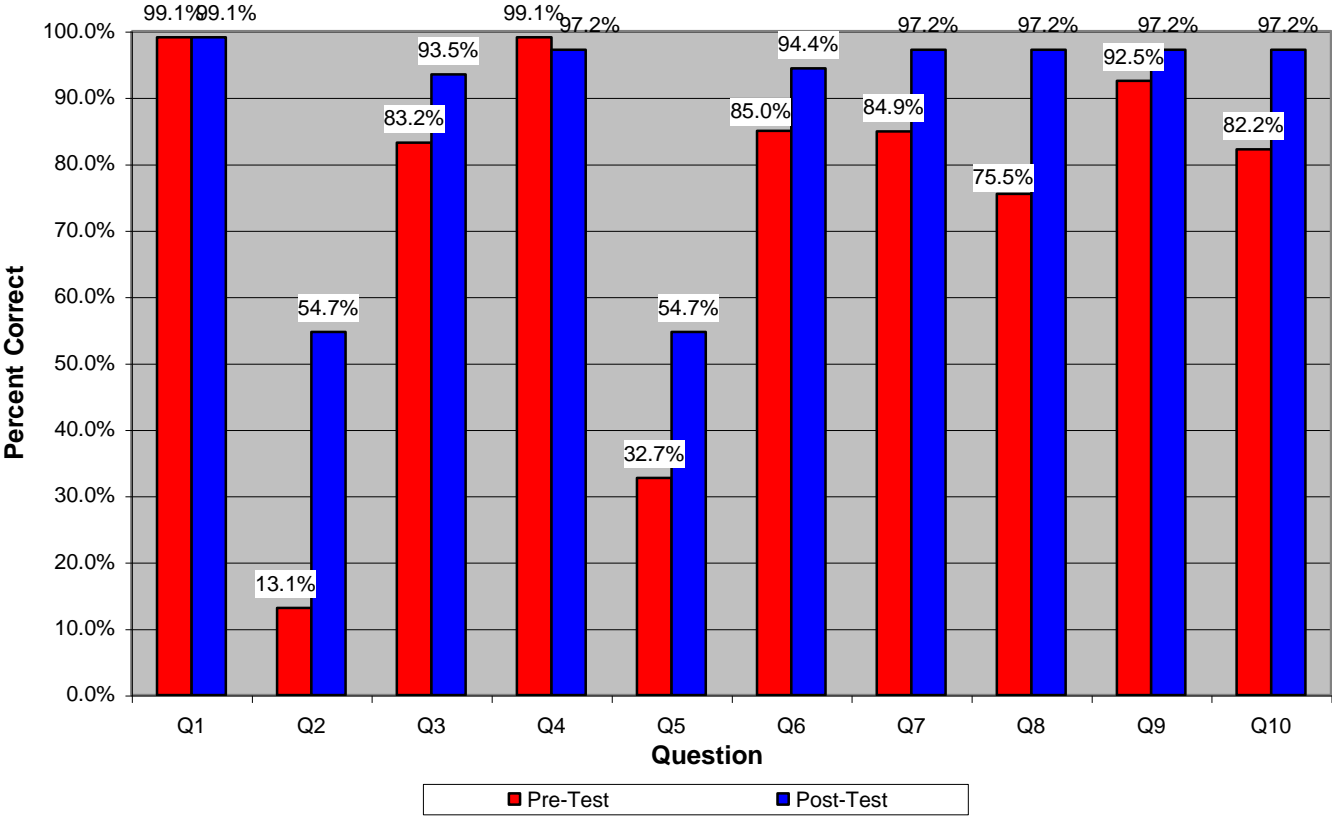
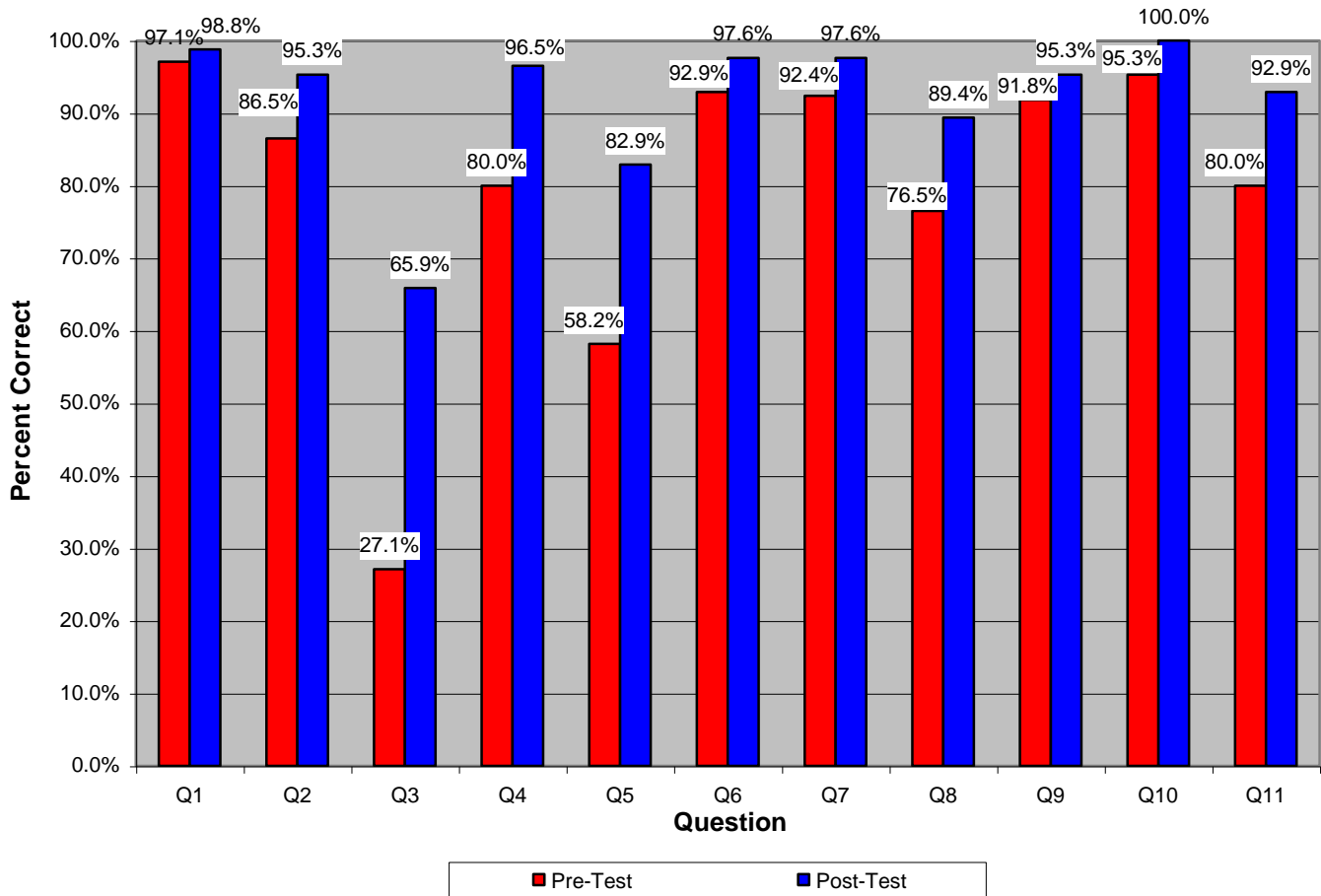


Table 3
BikeSmart Results - Grades 4-6

Question	Response Choices	Pre-Test		Post-Test		z stat.	p-value
		n	%	n	%		
Q1. When should you wear a bicycle helmet?	When riding in traffic	5	2.9	2	1.2	1.321	0.093
	Whenever you are riding	165	97.1	168	98.8		
Q2. Is it safe to wear an iPod when riding a bicycle?	Yes, it is safe	23	13.5	8	4.7	3.358	0.000*
	No, it is not safe	147	86.5	162	95.3		
Q3. When is it time to get a new helmet?	When it is more than five years old or has been in an accident	46	27.1	112	65.9	11.382	0.000*
	Every year	124	72.9	58	34.1		
Q4. What color clothes should you wear when riding a bike?	Light	136	80.0	164	96.5	5.378	0.000*
	Dark	8	4.7	0	0.0		
	Doesn't Matter	26	15.3	6	3.5		
Q5. When you are riding a bicycle should you ride facing the cars or with the cars coming from behind you?	Cars coming from behind you	99	58.2	141	82.9	6.529	0.000*
	Facing the cars	71	41.8	29	17.1		
Q6. Should you stop at stop signs?	At all times	158	92.9	166	97.6	2.386	0.009*
	When traffic is coming	12	7.1	4	2.4		
Q7. Should you give a hand signal when making a right turn?	Yes	157	92.4	165	97.6	2.551	0.005*
	No	13	7.6	4	2.4		
Q8. Does "yield" mean stop or slow down and look for traffic?	Slow down and look for traffic	130	76.5	152	89.4	3.967	0.000*
	Stop	40	23.5	18	10.6		
Q9. When you are riding with a friend who is also riding, is it best to ride next to the friend or single file?	Next to the friend	14	8.2	8	4.7	1.658	0.049*
	Single file	156	91.8	161	95.3		
Q10. When you do the ABC-Quick Check, which should you check?	Air in the tires	4	2.4	0	0.0	2.896	0.002*
	Chain	4	2.4	0	0.0		
	both a and b	162	95.3	170	100.0		
Q11. What is a good reason to ride your bike?	It is good exercise and fun	33	19.4	11	6.5	4.205	0.000*
	It cuts down on pollution	1	0.6	1	0.6		
	both a and b	136	80.0	158	92.9		

Note: * $p \leq 0.05$

Chart 3
Comparison of Bike Smart Pre- and Post-test Scores
Grades 4-6



Conclusions

Implementation of the *WalkSmart / BikeSmart Vermont!* curriculum had significant impact on the knowledge and attitudes of school-age children grades K-6. When responses for both lessons and all three tests were combined, the percentage of children getting correct responses improved on 27 out of 31 questions, with 24 of the questions showing statistically significant gains. This indicates that the program is a reliable approach to increasing knowledge and promoting positive attitudes about pedestrian and bicycle safety.

- In the eight of the ten questions for *WalkSmart K-2*, the proportion of correct responses on the post-test was higher than the pre-test. Six of these instances were statistically significant.
- In the eight of the ten questions for *BikeSmart 2-3*, the proportion of correct responses on the post-test was higher than the pre-test. All eight of these instances were statistically significant.
- In all eleven questions for *BikeSmart 4-6*, the proportion of correct responses on the post-test was higher than the pre-test. Ten of the eleven questions were statistically significant.

The one question which showed a slight decline in knowledge relied on a visual image in the curriculum. This information was used to change the graphic in the revision of the curriculum. The first year results show that classroom instruction significantly improved students' information base in very important safety areas including whether you should walk in a road facing the cars or with the cars coming from behind you, whether you should look Left-Right-Left or straight ahead when crossing a road, whether you should ride a bicycle facing the cars or with cars coming from behind you, whether you should give a hand signal when slowing down or stopping, what color clothes you should wear when riding a bike, and when it is time to get a new helmet.

Appendix 1: Methodology

In both the *WalkSmart* and *BikeSmart* programs, students were administered a series of questions before and after they received instruction in a pre-post design. Teachers of the students were provided a protocol in advance detailing administration procedures of the instruments. The *WalkSmart* instrument was given to first and second grade students while the *BikeSmart* instrument was given to students in grades 2-6. Due to the age variation, two *BikeSmart* instruments were created; the first instrument was for grades 2-3 consisting of ten questions while the second was for grades 4-6 consisting of eleven questions. There were eight common questions in the *BikeSmart* instruments. For all instruments, students selected an answer from a multiple-choice format.

To test whether there was a statistically significant difference in the proportion of correct answers from the pre-test to the post-test, the one-sample test for a binomial proportion was used. This statistical procedure compares the proportion of correct responses on the pre-test to the proportion of correct responses on the post-test for each of the questions. A z test is used to determine whether the proportions are significantly different. Since it is expected that the proportion of correct responses will increase after instruction, a one-tailed z-test will be used. P values that are less than or equal to 0.05 are statistically significant and are noted in the tables with an asterisk. The null and alternative hypotheses for the one-sample test for a binomial proportion are as follows:

- H_0 : The proportion of correct responses on the pre-test and the post-test are the same.
- H_1 : The proportion of correct responses on the post-test are greater than the pre-test.