The WalkSafe Program: Developing and Evaluating the Educational Component

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Background: **Miami-Dade County, FL, has one of the highest numbers of pediatric pedestrian injuries in the country. To respond to this problem, WalkSafe an elementary school-based pedestrian injury prevention program was created. The purpose of this study was to evaluate the effectiveness of the 3-day WalkSafe educational curriculum in a high-risk district.**

Methods: **Sixteen elementary schools were identified and enrolled in the study. Children (n = 10,621) in grades K-5 participated in the WalkSafe program in October 2006. Four of the 16 schools were randomly selected to receive pre-, post-, and 3-month posteducational testing of pedestrian safety knowledge. Teachers (n = 462) were asked to complete teacher surveys to gain feedback about the program.**

Results: **A total of 2,987 tests were collected during the three different testing times. Grades were combined to form groups (K-1), (2–3), and (4–5). Significant differences were observed (p value <0.05) between pre- and posttesting for grades K-1 and 2–3. No significant differences were found between pre- and posttesting for (4–5) and between post- and 3-month testing across all grades (p value >0.05). There were 154 (30%) of the teacher surveys returned.**

Conclusion: **The 3-day WalkSafe educational curriculum implemented in a high-risk district was shown to increase the pedestrian safety knowledge of elementary school age children. From recommendations made by teachers and multiple agencies, the modified 3-day program was approved to implement on a yearly basis in all public elementary schools in Miami-Dade County. Further studies will investigate the transfer of knowledge gain to behavioral change among elementary school-aged children.**

Key Words: **Injury prevention, Children, Pedestrian, Knowledge, Behavior, Education.**

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In the United States, approximately one pedestrian is killed every 100 minutes.[1] A pedestrian injury is inadvertent and preventable; therefore, it can be classified as an unintentional injury. Within this category motor vehicle-related trauma is the most common[2] and remains the leading cause of death for children 1 year to 19 years old.[3] In 2001, an epidemic of pediatric pedestrian traffic injuries affecting children was identified in Miami-Dade County, FL.[4]

Improvements in prehospital and emergency medical care or a decline in walking as a mode of transportation are most commonly cited as reasons for the steady decline in overall national pediatric pedestrian injury rates.[5] Factors that increase a child's risk of being struck by a motor vehicle include small size, inadequate perception of danger, inability to judge distances and vehicular speed, and lack of understanding of traffic signals.[6] Walking is important for the health and well-being of children, however, their safety as pedestrians is of great concern particularly in urban areas. During the past few decades, the number of children walking to and from school has decreased significantly, and is thought to be contributing to the increase in childhood obesity in the United States.[7]

High-traffic volume and inadequate facilities such as sidewalks produce dangerous walking environments where children are often hit by cars. These areas are referred to as "high risk" and are associated with socioeconomic deprivation, high-population density, fast moving traffic, lower income levels, female-headed households, higher household crowding, lower levels of parental education, and lower employment status.[5,8–12] Studies have shown that communities that share these characteristics have four to five times the risk of involvement in a traffic pedestrian incident.[13,14] Demographics and individual differences are also among the underlying risk factors for pedestrian injury and fatality.[9] Hispanics and African Americans have a disproportionately higher rate of hospitalizations and fatalities as a result of pedestrian injuries when compared with Non-Hispanic Whites.[12] Disparities are also found within fatal pediatric pedestrian injuries for Hispanic, Blacks, and Whites with respective rates of 0.75, 1.24, and 0.45 per 100,000 people/population.[15] A pedestrian safety index takes into consideration the rate of pedestrian fatalities compared with the amount of people walking. Miami, FL, ranked fifth of the top 10 most dangerous metropolitan areas for walking in the United States, accompanied by another four cities in Florida.[8]

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Within Miami-Dade County, high-risk districts were identified using the yearly statewide traffic crash report database from the Department of Highway Safety and Motor Vehicles, Tallahassee, FL. All incidents of a pedestrian hit by a car between the ages of 5 to 13 are identified yearly and the incident location address is geocoded and mapped using ArcView GIS software to create point-level data. Countywide pedestrian hit by a car incidents are then classified as being low risk, low-moderate risk, moderate risk, moderate-high risk, or high risk based on the amount of data points. In this study, multiple sources of crash data were used to identify high-risk districts. The county traffic crash data[16] and zip code data[17] identified Little Havana and Overtown as a high-risk district. This district shares the following characteristics with our previous targeted high-risk district of Liberty City: above average rates of pedestrian injuries in 2000 to 2004, similar low socioeconomic status, and both having a significant amount of children that walked to and from school. The elementary schools selected for this project were all in close proximity to one another. On average, the distances between one school and the nearest neighboring schools were less than a mile. The three zip codes 33142, 33127, and 33150 are all found in both of these high-risk districts and this data helps to further identify the areas where pediatric pedestrian injury rates are above the county's average. High-risk districts are reflected in Figure 1,[18] comparing other high-risk districts to those included in this study.

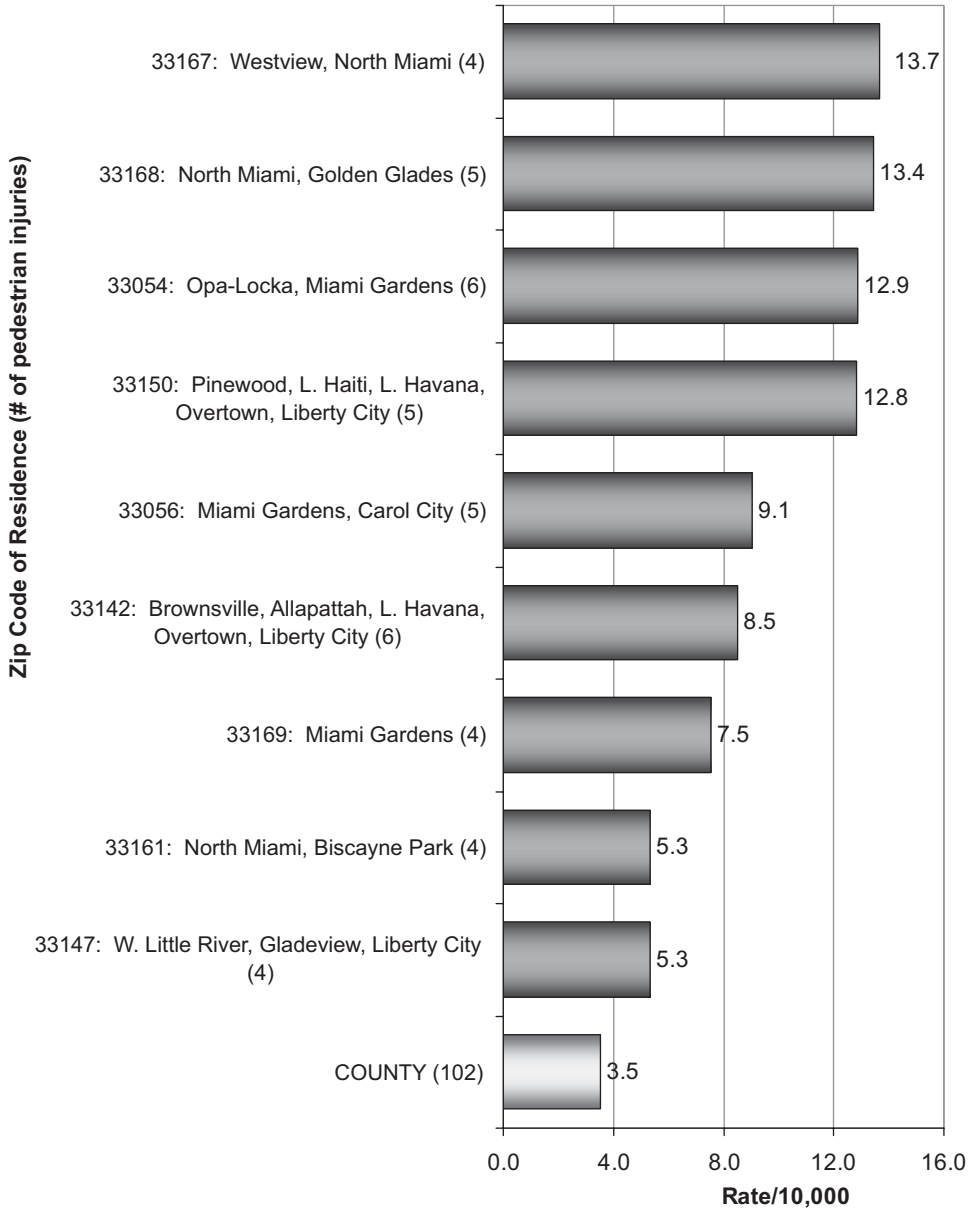

Fig. 1. *2006 deaths, hospitalizations, and emergency department visits for traffic-related pedestrian injuries, children aged 5–13 years injury rate/10,000 residents by zip code.*[17]

According to our earlier Pediatric Pedestrian Trauma Study, 53% of children were hit in the vicinity of their school.[4] From 2003 to 2005, a third of the pediatric pedestrian incidents occurring in Miami-Dade County occurred during the hours when children would theoretically be walking to and from school.[17]

Pedestrian injury prevention educational programs have been shown to improve children's knowledge on pedestrian safety.[19,20] During time, these programs are thought to not only reduce childhood injury but also impact the incidence of pediatric traffic-related crashes and fatalities.[21] Because of the high number of elementary school age children injured yearly in Miami, WalkSafe, a pedestrian injury prevention program was developed (Appendix 1). The original WalkSafe educational curriculum developed in January 2003 was 5 days (2.5 contact hours) of classroom education, the findings revealed that there was a significant increase in pedestrian traffic skill knowledge and it was maintained for a 3-month period of time.[22] From teachers surveys and focus groups recommendations were made to shorten the program. The purpose of this study was to evaluate whether the shortened 3-day (1.5 contact hours) WalkSafe program implemented October 2006 had as significant an effect on knowledge gain as previously reported with the 5-day program in this high risk culturally diverse area.

METHODS

Participants

The WalkSafe program targets children from 5 years to 11 years old, grades K-5 who attend public elementary schools in high-risk districts in Miami-Dade County. The program was implemented in 16 elementary schools located in a high-risk district of Little Havana and Overtown (voting districts 2, 3, 5, and 6). At the selected elementary schools, all children enrolled in classrooms K-5 present on October 4th to 6th 2006 participated in the program (n = 10,621). A month before the implementation, teachers from the 16 schools received pedestrian safety and WalkSafe program training (1 hour). A letter with information about the WalkSafe program and pedestrian safety brochures were sent out to all of the students' parents/caregivers. Four schools of the 16 were randomly selected to participate in the pre-, post-, and 3-month posteducational testing. Consent forms were also sent out and collected from the participants' parents at these four study-site schools. The protocol and forms distributed throughout the study were submitted and approved by the Western Institutional Review Board.

Intervention

The WalkSafe kick off event was held on the first Wednesday in October to coincide with the International Walk to School Day, and the program was completed the same week on Friday. The first day of the program videos and teacher-lead classroom discussion for 30 minutes was held to introduce the topic. On the second day, an outside simulation engaged students in a street crossing practice activity that included parked cars and traffic cones that simulated an intersection (30 minutes). On the last day of the program, the students demonstrated safety messages they had learned by participating in an individual poster contest (30 minutes). Workbooks and suggestive homework assignments were also provided to accompany the daily activities. The WalkSafe educational curriculum is age and grade level appropriate increasing in complexity as the child gets older. All materials may be found on the program's website: www.walksafe.us.

Data Collection

Four research assistants (RA) were trained by a safety specialist and each one was assigned to train and coordinate the program at a group of four schools. To assess pedestrian safety knowledge, one of the four schools in each of the RAs group was randomly selected as a testing school. At the testing school, the RA was responsible for administrating a 10-question educational pretest (1 week before the start of the program), posttest (the last day of the program), and 3-month posttest (3 months from the day of the intervention) in two to three classes (about 70 students) per grade level. Aside from collecting the parent consent forms from the study sites the RA also collected teacher surveys and registration forms at all four schools in their group. Pre-, post-, and 3-month data were collected and identified by school number and grade. Original teacher surveys were revised from the original six question Yes/No answer form to the eight question four-point Likert scale (1-not useful, 2-somewhat useful, 3-useful, 4-very useful) to reflect their feedback about the program.

Research Design

The study used a two-stage stratified cluster sample design. The first stage represented the random selection of four testing schools and the second stage represented the random selection of two classrooms per grade level at each of the four selected schools. The classroom was the unit of analysis for the measure of knowledge with students clustered within a classroom.

Statistical Analysis

Analysis of data were conducted using Statistical Analysis System at a $p < 0.05$ significance level (SAS Institute, Release 8.02. Cary, NC). Data were used to compare performance by school, grade level, and time using the repeated-measures analysis of variance. An assessment of differences among schools, among grades, and whether grade differences across schools existed was conducted. Analysis was also conducted to report if posttest scores were different from the pretest scores and report any change at 3 months follow-up.

RESULTS

In this high-risk district (Little Havana and Overtown), a sample of 10,621 students from 16 elementary schools participated in the 3-day WalkSafe program. Each school had

Table 1 Demographic Characteristics of the Four Elementary Schools: In Little Havana and Overtown

Characteristics	School A	School B	School C	School D
Number of students				
Gender				
Male	521	375	179	520
Female	483	328	163	460
Total	1004	703	342	980
Ethnicity (%)				
White	1	1	1	1
Black	2	21	84	4
Hispanic	97	77	14	95
Multiracial	1	1	1	1

diverse student populations. Schools A, B, and D were found to have large Hispanic populations with 97%, 77%, and 95%, respectively (Table 1). School C enrolled a large African American population with 84% and a Hispanic population of 14%. Slight gender differences were observed within the schools, with males comprising a slightly higher percentage (52.66%) than females (47.34%). School sizes varied greatly and ranged from School C's population of 342 to School A's population of 1,004. Table 1 illustrates the characteristics of the four schools.

From the 16 schools, 4 schools were randomly chosen to be tested for the study. From those four schools, a total of 1,097 students received consent forms to be signed before the intervention to participate in the knowledge/educational testing. A total of 1,016 pretest, 1,019 posttest, and 952 3-month posttests were collected over the three testing conditions. This number collected was similar to the amount collected in the previous 2003 study, with 1,297 consent forms distributed, and 960 pretest, 969 posttest, and 952 3-month posttests collected. According to the data provided by each school, a total of 709 students from this study walked as their mode of transportation to and from school, whereas in the previous study there were 917.

Each of the two grades with the same educational tests were combined to calculate student test scores: Kindergarten and first grade (K-1), second and third grades (2–3), and fourth and fifth grades (4–5). The educational scores were based on 10 questions asked of each group (K-1, 2–3, and 4–5). The number correct of 10 for the first test represented the pretest scores, and the posttest scores were computed in the same manner. The teachers read the questions to grades K-1 and the students circled the corresponding image on their answer sheets. For grades 2–3 and 4–5, they were given the questions on paper and had to read and answer them on their own. An one-point increase in test scores indicates the student answered one more question correct on the posttest than on the pretest. Table 2 is an example of the questions given to groups 2 to 3.

When comparing the students' test scores at pretest and posttest conditions, grades 4 to 5 showed the highest mean pretest score (8.567), and K-1 had the lowest mean pretest score (5.835) (Table 3). The (K-1) mean pretest score significantly increased from 5.835 to 6.934 (p value = 0.0074). For grades (2–3), mean pretest score significantly increased from 7.099 to 8.130 (p = 0.0338). Grades (4–5) mean pretest score was 8.567 which increased slightly to 8.716. This increase was not significant with a p value of 0.3879. The highest increase (1.10) was seen in the group with the lowest mean pretest scores (K-1). Similarly, the smallest increase

Table 3 Comparison of Students' Test Scores at Pretest and Posttest Conditions

Grades	Pretest (SE)	Posttest (SE)	Means Difference	p
K-1	5.835 ± 0.264	6.934 ± 0.266	1.10	0.0074
2–3	7.099 ± 0.129	8.130 ± 0.374	1.03	0.0338
4–5	8.567 ± 0.088	8.716 ± 0.129	0.15	0.3879

Table 2 Test Questions for K-1st Grade

Kindergarten and Grade 1 test
Teachers copy
Directions:
For questions 1–5: There are five questions in this part. I will read each question three times and you must circle the right picture
1. Circle the picture that shows what are you looking for before you cross the street
2. Circle the picture that shows a person looking the way we are suppose to look first before we cross the street
3. Circle the picture that shows where you should stand before you cross the street
4. Circle the sign that means you should not cross the street
5. Circle the sign that means you can cross the street once you have checked to make sure it is safe to cross

For questions 6–10: There are five questions in this part. I will read each questions three times. If you think the answer to my question is YES then circle the word YES which is the first word. If you think the answer to my question is NO then circle the word NO which is the second word
(Make sure they understand YES and NO before moving on)
6. Does a green light always mean it is safe to cross the street?
7. When you come to a light that is already green, should you wait for a new green light?
8. If you see a car coming, should you run across the street?
9. Does a green arrow mean you can cross the street?
10. If there are cars parked on the street, should you check to see if they are empty?

Table 4 Comparison of Students' Test Scores at Posttest and 3-Month Posttest Conditions

Grades	Posttest (SE)	3-Month Posttest (SE)	Means Difference	*p*
K-1	6.934 ± 0.266	7.244 ± 0.266	0.31	0.32
2–3	8.130 ± 0.374	8.246 ± 0.157	0.12	0.91
4–5	8.716 ± 0.129	8.855 ± 0.147	0.14	0.65

(0.15) was seen in the group with the highest mean pretest scores for grades (4–5). This data are compared in Table 3.

Comparisons were also made between mean posttest scores and 3-month mean posttest scores, and are reflected in Table 4. None of the three groups exhibited a significant increase between mean posttest scores and 3-month posttest scores.

From the 462 teachers surveyed, 154 (30%) responded. Feedback was focused on how they felt the program benefited their students (from a scale of very useful to not useful). Of those returned, 86% of teachers responded to eight of the eight questions in the survey and 98% responded to seven of the eight questions. The vast majority of the teachers (83%) found the program to be overall useful, and more than a quarter (28%) of those teachers found the program to be over all very useful (a score of 4 on each item).

DISCUSSION

In the selected high-risk districts for this study, 10,621 students from 16 elementary schools participated in the 3-day WalkSafe program. The findings revealed that the shortened program (1.5 contact hours) significantly increased knowledge gain among elementary school age children. These results were comparable with those outlined in the initial version of the program (2.5 contact hours).[19] The educational testing results from the randomly chosen four schools (1,016 pretests, 1,019 posttests, and 952 at the 3-month posttesting) were also similar to the previous studies, which demonstrated that the younger grades experienced greater increments of knowledge gain than older grades. In addition, across all grades the posttest skill level was significantly different from the pretest and unchanged at the 3-month posttesting.

The educational test only assesses the traffic safety knowledge of 10 specific components. Although there was an overall significant effect on knowledge gain increments and retention rates in a 3-month period of time, this study is limited in addressing if life long skills were attained after receiving the WalkSafe program. The combination of the various learning modalities and consistent reinforcement of safety messages during the program is in part accountable for the significant increments in the educational testing. We recommend for these concepts to be taken into account when designing, implementing, and evaluating pedestrian safety programs. It may also be important to set up an 8-month posttesting to be done in June before children have summer break to see if they retain the pedestrian safety information longer then 3 months.

The teacher surveys and the teachers focus groups from the original 5-day program in 2003 provided valuable information and suggestions that helped construct this study. Feedback was received from approximately 50% of the teachers who implemented the program. The survey consisted of six Yes/No questions that covered topics from how well the teachers felt the children were receptive to the program to whether they had received enough training. The seventh question was open-ended providing an opportunity for teachers to share their comments and suggestions about the program. A considerable number of teachers stated that the program was too long and took up too much classroom time during the 5 days. After careful consideration, classroom educational curriculum was modified and shortened from 2.5 contact hours during a 5-day period, to 1.5 contact hours in 3 days.

Teachers also made the suggestion that new videos should replace the existing ones so that the information is more relevant and interesting for the students to watch. Although others suggested making the simulation portion more realistic by having it conducted in real traffic situations in the streets surrounding the schools, however there are liability issues for taking children off school grounds for an activity. There was also discussion among the agency partners on who should teach the program. Many agreed that it should be mandated by the school board yearly, but opinions differed on whether the physical education teachers should train the other teachers or teach at least the outdoor simulation portion, or whether all teachers should receive the training and teach their own classrooms. The WalkSafe 3-day program does encourage for the classroom, physical education, and art teachers to be involved in the curriculum. Some schools have full service coordinators, and many of the teachers at these schools felt that they should be the person in charge of monitoring and training the program on a yearly basis. Only 27 of the 203 elementary schools in Miami-Dade County have this position; therefore, we recommend that the Assistant Principal be the program contact person. In determining the sustainability of the WalkSafe program, the "train by trainer" model needs to be further disseminated and implemented in other high-risk districts in Miami-Dade County as well as other counties and school systems.

Teachers also recommended that the materials be available online, a website was developed and constantly updated in order for ease of accessibility to the curriculum and workbooks (www.walksafe.us). Some teachers asked why the program is taught to all elementary grades and not just taught to those in the younger grades, K through 3rd grade. Even children in the younger grades have shown the greatest knowledge gain based on the tests given, repetition is very important to children of all ages in the learning process. We have also observed that younger children walk home with older siblings, neighbors, cousins etc. If all grades (K-5) receive the WalkSafe program then there is a greater sense of

accountability to know and practice the pedestrian safety guidelines.

Finally, the start date and length of the WalkSafe program was modified to accommodate the priorities and demands of public elementary schools. The implementation was changed from the beginning of January to the first week in October to coincide with the International Walk to School Day. This was helpful for the schools' schedule and did not interfere with Florida Comprehensive Assessment Test. After these changes were made to the WalkSafe program, it was now important to evaluate the 3-day program. Once again the teachers' surveys provided a lot of good feedback regarding the educational curriculum. The eight question survey asked teachers to evaluate the training, program materials, and curriculum using a four-point Likert scale. The last item again was open ended requesting for them to express their comments and concerns. Once again the major issue was that the videos needed to be updated. Both the quality and relevance of the videos were brought up, with many stating that they videos were too outdated and not culturally relevant for the children. We have been in contact with National Highway and Safety Administration who are currently working to update the videos. The majority of teachers were pleased with the 3-day program, that it was implemented in October to coincide with the International school day and that all materials were provided on line.

CONCLUSIONS

Reducing pedestrian deaths and injuries is part of a national objective for Healthy People 2010.[23,24] The WalkSafe Program has addressed this public health issue by developing, implementing, and evaluating an educational school-based injury prevention program. After several phases of research and development, this study demonstrates that the 3-day educational program consisting of 1.5 contact hours produced significant increments of knowledge gain and was more practical for teachers to complete than the 5-day, 2.5 contact hour educational curriculum.

The WalkSafe program works closely with educators, traffic engineers, law enforcement, parents, SAFEKIDS, Injury Free Coalition, and other representatives from multiple community agencies to implement strategies that will decrease pediatric pedestrian trauma. A multiagency collaboration is essential in disseminating a successful pedestrian injury prevention program. Future investigations will continue to study the implementation and the effect of the WalkSafe program in other high-risk districts in the county and statewide.

APPENDIX

Description and Design of the WalkSafe Program

WalkSafe is a pedestrian injury prevention program designed to educate children in kindergarten through fifth grade about safe street crossing. Since 2001, WalkSafe has undergone various phases of development, implementation, evaluation, and dissemination to address decreasing pedestrian injuries and fatalities in and around elementary schools.[1,2] This is a 5-E (education, engineering, enforcement, evaluation, and encouragement) program involving multiple agencies. The primary focuses are safety education (Miami-Dade Public Schools) provided in the classroom, engineering modifications (Department of Public Works) around the elementary schools, and enforcement (Miami-Dade County, City of Miami, and Miami-Dade County School Police Departments). The evaluation is done by the WalkSafe research team and encouragement efforts include all of the partners including parent/caregivers.

The educational curriculum is the major component of the WalkSafe program. The curriculum intends to provide an educational basis for children to learn street crossing behaviors and practice them safely when they are unsupervised. The grade-specific curricula were developed by a group of pedestrian safety specialists at University of Miami/Ryder Trauma Center based on the literature review of preexisting programs and the support of different community agencies including several elementary school teachers.[2] A consensus by elementary school teachers found the curriculums to be developmentally appropriate for students in grades K-5. The curriculum was tested by safety education tests and proven effective in increasing pedestrian safety knowledge gain in various elementary schools.[1]

The constructs that were applied to the WalkSafe educational curriculum are considered by many educators as the three main modalities for learning which include visual, auditory, and motor.[1] WalkSafe incorporates each of these learning modalities through different activities. Videos that were developed by the National Highway and Safety Administration and American Automobile Association are used and made available to the schools through teachers choice a broadcast system provided by public television for South Florida (WLRN). The videos are shown to the children on the first day of the program and complimented with teacher-lead discussions, which provide students with both visual and auditory teaching techniques. The outside simulation on the second day of the program provides modeling and training by a physical education or classroom teacher on how to address a situation when cars are parked, when they arrive at an intersection or mid street, or when they are playing near a street, enabling them to be active and learn more through hands-on experience.[3] Lastly, the final day of the program involves having each child design a poster, therefore providing an alternate way for children to demonstrate their ability to use what they have learned to depict a pedestrian safety message.[4] The use of the multimodalities permits for concepts to be repeated and reinforced in different formats enhancing the opportunity for children to learn and retain the information.[5] This classroom curriculum is also accompanied by educational materials and resources distributed to teachers and pedestrian informational brochures that are sent home to parents.

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