R Azeredo, S Stephens-Stidham

Design and implementation of injury prevention curricula for elementary schools: lessons learned

Objectives: Project objectives were to: (1) design and produce an easy-to-use, replicable comprehensive injury prevention curriculum for elementary schools; (2) pilot the program to determine instructors’ ease in teaching the material and its usefulness in enhancing student knowledge and behavior change; (3) present material in subject-integrated, grade-specific lessons that would meet state and national student learning objectives; and (4) submit and obtain adoption of the curriculum by the State Department of Education.

Methods: A pilot program was developed, implemented, and evaluated in six intervention and six control schools. The curriculum was revised and implemented in five other schools and finalized according to evaluation results and teachers’ and parents’ suggestions. Community resources such as police, fire, and county health departments participated in program implementation.

Results: The program showed a significant increase from 21% to 36% in seatbelt use during the school year in program schools compared with a 1% decrease in control schools. Bicycle helmet use increased from 0% to 10% in the program schools. Pre-test and post-test results showed significant differences in student knowledge, attitudes, and behaviors within the program schools, and in comparing the program and control schools. On a Likert scale of 1 (poor) to 7 (excellent), teachers rated lesson content, exercises, and the usefulness of materials and resources as 5.8, 5.5, and 5.4, respectively. Evaluations for the revised curriculum ranged from 5.7 to 6.2.

Conclusions: The favorable evaluation results resulted in the adoption of the curriculum as a state textbook, and widespread teaching of the curriculum. The product is appropriate and efficacious in these elementary schools and their communities.

Abbreviations: SCI, spinal cord injury; TBI, traumatic brain injury
The brain and spinal cord injury lesson involved learning anatomical descriptions related to risk factors, sentence completion about the brain, spine, and safety habits, doing arithmetic problems involving safe water depth, and calculating students’ use of seatbelts. Injury protection, choice, and the value of good safety habits were central themes.

Classroom supports
Photocopied sets of all lesson materials were provided for teachers and safety folders for students. Smoke alarms, safety belts, bicycle helmets, Muskogee and Oklahoma maps, and safety pamphlets were placed in classrooms, and videos and audiocassettes in school libraries.

Measuring change in knowledge, attitudes, and behavior
Observations of safety belt use were scheduled before, during, and two weeks after the program. (Although observations three months after the program were planned, principals reported that many students had emigrated or immigrated resulting in student population change, making such comparisons meaningless.) Bicycle helmet observations were conducted in program schools before and after the program. Written tests were given before and after the program to determine the utility and appropriateness of items in assessing changes in knowledge, attitudes, and behavior and self reported behavior, and to make comparisons between the two groups. The design illustrating program implementation, tests, and seatbelt observations is shown in fig 1.11 Self reported safety belt use was an additional measure.

RESULTS

Safety belt observations
A majority of students rode with parents; others walked, and about 3% rode bicycles to and from school. Five percent of children in the private and 10%–12% in public schools used busses. Belt use was counted for front seat occupants only. A majority of students rode with parents; others walked, and 3% rode bicycles to and from school. About 10%–12% used busses. Belt use was counted for front seat occupants only. At the time of implementation, airbags were not in common use and recommendations had not been made for children younger than 13 to sit in the back seat.

Seatbelt use
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Safety penpal letters
Four schools in Massachusetts and New York agreed to have students be penpals with those in program schools. Oklahoma students wrote letters about injury prevention and safety habits. Packets of sealed letters, including a postcard map of Oklahoma, were sent, and schools out-of-state sent letters back, many with small gifts.

Lessons
The 30–45 minute lessons for basic subjects included safety messages imbedded in the exercises and activities. To illustrate, fourth grade students’ social studies lessons involved learning Oklahoma’s safety belt use laws, reviewing key provisions of all states’ belt laws, writing letters to legislators, and how to have a safety belt law passed in Oklahoma.

<table>
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<th>Program schools</th>
<th>Pre-program</th>
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<td>Pre-test and posttest</td>
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<tr>
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<td>O_{1b}</td>
<td>O_{2b}</td>
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Figure 1: Two group quasiexperimental time series design of program and control schools. Design notation modified from Cook and Campbell.11 O, observation of safety belt use; X, program intervention; A and B represent different measures from a single group: S, start; F, finish. Two groups (program and control) are illustrated.

Figure 2: Observed passenger safety belt use before, during, and after intervention in program and control schools.
Program schools showed a significant increase of 21% to 35% in belt use compared with a 1% decrease in control schools (fig 2). Student reported belt use in program schools, obtained from class graphs and “SafeStat” measures, increased from 42% to 65%, indicating that self reported use was twice that of observed use. Driver belt use showed an increase of 2% in program schools compared to no increase in control schools.

Bicycle helmet observations conducted before and after in program schools showed that helmet use increased from 0% to 10%.

Pre-tests and post-tests
Approximately 6300 pre-tests and post-tests were completed by students in the 12 schools. Tests were composed of 14 item activity and simple written questions for kindergarten to 1, and 20 item true/false and multiple choice questions for grades 2–3 and 4–5. Three questions elicited information concerning type of family vehicle and where the student usually sat. Aggregate data were analyzed for grades kindergarten to 1, 2, 3–4, and 5. Data were analyzed by program versus control school status. Significant differences were found in students’ knowledge, attitudes, and behavior between the program and control schools (table 1). Comparison of students’ post-tests showed significant differences in knowledge, attitudes, and behavior between the program and control schools (table 2).

Certificates of recognition were given to program schools and results presented at the annual school board/City Council meeting. Injury prevention and safety rules similar to those outlined in the program were included in requirements drafted by the School Improvement Division of the Oklahoma Department of Education.

DISCUSSION
Knowledge and experience in injury epidemiology and prevention, behavior change strategies, and educational psychology and research were used in writing this curriculum. Literature reviews of injury prevention programs, review of student textbooks for all subjects (kindergarten to grade 6), and study of testing manuals were completed to help create appropriate lesson exercises.

When the program was developed in 1992, the only safety curriculum available was one written by the Oklahoma Department of Education addressing bus and intersection safety. In 1988, apparently the first program outlining methods for teaching healthy living in an elementary school system was described. Healthy People 2010 cites the continued goal to teach health and safety behaviors in elementary schools.

Curricula and programs targeting school children proliferated during the 1990s. In 1993, Think First for Kids: The Brain and Spinal Cord Injury Prevention Curriculum for Teachers, was developed by the author of the Oklahoma injury prevention curriculum. In 1998, Risk Watch was published addressing eight risk areas for grades pre-kindergarten to kindergarten, grades 1–2, 3–4, 5–6, and 7–8.

Revision and current status of curriculum
Based upon the effectiveness of the pilot program and suggestions from teachers, principals and parents, the curriculum was rewritten to be grade-specific (kindergarten to 5) and included three additional injury topics, state laws, and resources. The additional lessons included “Creative Problem Solving”, “Safety Around Firearms”, and “Injuries to the Brain and Spinal Cord”. The revised curricula were implemented in three rural schools in 1993–94; further refined curricula were implemented in two Oklahoma City urban schools in 1994–95. The final curriculum incorporated suggestions from 154 teachers from six state and three out-of-state school districts, principals, state educators, national student testing consultants, and guidance specialists. Curriculum content and safety themes are shown in boxes 1 and 2. A descriptive brochure was developed and the curricula presented at 30 teacher meetings statewide. The process of obtaining approval and adoption as a school text in 1997 involved applying for an ISBN number and giving multiple presentations to schools, regional meetings, and the Textbook Committee. The curriculum is now being taught in more than 650 schools in Oklahoma and at 32 schools in 14 other states.

Program evaluation
Formative, process, and impact evaluation were conducted for the pilot program through continuous contact with teachers.
Formative evaluation involved the receptiveness of teacher training, negotiation in establishing protocols, and the quality of teachers’ suggestions for incorporating the curriculum within their lesson plans. Process evaluation included feedback from, and observations of individual teachers’ work at weekly meetings and with all staff where expectations and ways to ease implementation were discussed. Impact evaluation included the results of safety belt and bicycle helmet use observations, student reported belt use, comparisons of observed versus self reported belt use, comparisons of pre-tests and post-tests in program schools, comparison of belt use and pre-tests and post-tests between the two groups, review of school coordinators’ recorded notes, and teachers’ and principals’ written evaluations.

Seventy eight principals and teachers in program schools (83%) completed evaluations using a Likert scale of 1 (poor) to 7 (excellent). Main items rated were lesson content (mean 5.8), activities (mean 5.5), and the usefulness of materials and resources (mean 5.4).

Program effectiveness was also shown by the response of the community. Firefighters installed 250 alarms in students’ homes and law officers conducted seatbelt practice for all students in grades kindergarten to 3. Over 1300 bicycle helmets were distributed at helmet fairs at school assemblies. Smoke alarm and bicycle helmet giveaways invoked enthusiastic parent responses. Over 1300 bicycle helmets were distributed at helmet fairs at school assemblies. Smoke alarms and fire safety, Traffic signs and signals, Intersections and railroad crossings, Water safety.

Program success was largely determined by the lesson content and teaching methods. How long children will remember, use, and act upon whatever information was retained in their long term memory is unknown. Observed learning, through modeling can teach new behaviors and values. Teachers have the opportunity to influence children second only to parents. If injury safety lessons are taught each year, students will have continued exposure and, possibly, sustained behavior. Many variables interrelate to affect behavior such as teacher interest, parents, the home environment, and students’ ability to relate messages to their daily living.

Limitations

The main limitation of the pilot program was the scope and detail of activities external to curriculum lessons. Considerable teacher time was applied to the application process for smoke alarms and bicycle helmet giveaways, and to daily recording of student safety belt use. The plain appearance of the curricula, compared with newly available and colorful materials, was also a limitation. Also, inclusion of “Oklahoma” in the curriculum title at the request of teachers limits out-of-state marketability.

The difference in observed belt use among program schools may have been attributable to teachers’ interest, the school environment, or weather conditions; these factors were not evaluated.

IMPLICATIONS FOR PREVENTION

School-integrated injury prevention curricula/programs should remain a principal strategy for long term instruction and behavior change. The materials are usually well written and developmentally and grade appropriate, and children experience several years of exposure. Safety behavior may be sustained if ingrained as a normal part of life, such as seatbelt use in states with education, legislation, and enforcement. Costs of materials and implementation should be minimal so as to ensure availability to all populations.

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