

**Assessment of the Student Awareness of Fire Education
(S.A.F.E.) Program**

**Results of child fire and life safety education in
Massachusetts**



A project of the:

Fire Data and Public Education Unit
Massachusetts Department of Fire Services

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SUMMARY: A 2007 survey conducted by Johns Hopkins Bloomberg School of Public Health found that 86% of fire departments in the US conduct fire and life safety education (FLSE). Seventy-percent of these focus on fire prevention, escape planning and smoke alarms, and many fire departments consider FLSE as key to fire prevention and reducing fire injuries and deaths. However, few fire departments conduct any systematic assessment of effectiveness. Slightly more than half evaluate their programs, but nearly 80% of these do so through informal feedback. Fewer than 1 in 4 conduct format assessments of effectiveness. In Massachusetts, in 2008, fire and burn injuries were the fourth leading cause of unintentional injury deaths among children up to 14 years old. Nearly half of all burn victims are not burned by flame, indicating importance of a comprehensive FLSE program, which addresses fire prevention and escape and includes other safety areas, such as scald burn injuries and first aid.

The Massachusetts Department of Fire Services implemented such a comprehensive program in 1996, using grants to community fire departments for community education. The elementary and secondary school program is linked to MA education curriculum standards, and utilizes standard curriculum guides for FLSE educations. Firefighters receive training and are offered opportunities for national certification. Since inception, child fire deaths in Massachusetts have decreased from an average of 18.5 per year to an average of 4.6 per year. Nearly 300,000 children in more than two hundred communities have participated in classroom and community education.

In 2009, a formal evaluation component was implemented, using a 30-item multiple choice test for 3rd grade students. The component also includes an Excel workbook for data entry; the workbook contains embedded formulae for analysis of data. A user guide and firefighter/educator training supports implementation. Findings from first two years of the evaluation reveal the following: statewide students have good understanding of elements of escape plans. Students understanding of smoke alarms, meaning of alarm sounds and maintenance of alarms is uneven. While students understand the instructions to 'stop, drop, cover and roll', many are unable to identify the correct posture for this maneuver. Students incorrectly identify proper actions to avoid scald burns (a leading cause of burn injury). Firefighter educators report that findings from the assessment have revealed strengths and weaknesses in their instructional approaches, and they have modified these approaches accordingly. Presentation will discuss: For 3rd grade test: development and review of key concepts; expert review of draft test items; field testing and revision; final 30-item test and administration procedure; design and application of Excel workbooks; and challenges to implementation. Presentation will similarly describe test for 6th grade classrooms and current implementation status, as well as process as of presentation date of test for 10th graders. Links to the test, user guides and Excel workbooks will be provided. If presentation is at 'round table' copies of tests, user guides will be provided and links provided for Excel workbooks.

Related Web Page: www.mass.gov/eopss/agencies/dfs/dfs2/osfm/pubed/web-pages/safe-news.html

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Massachusetts Student Awareness of Fire Education (S.A.F.E.) Program

- Program of the Massachusetts Department of Fire Services (DFS), in collaboration with
- Massachusetts Public Fire and Life Safety Education Task Force

CONTEXT

- Fire and burn injuries are a major cause of unintentional injury death among children:
 - In 2009, CDC reported: Third leading cause of unintentional injury death
 - In 2008, Massachusetts reported: Fourth leading cause of unintentional injury death.
 - Nearly half of burn injuries are NOT from flame

CONTEXT

- Fire and Life Safety Education is widely supported approach to injury prevention:
 - National Fire Prevention Association cites Fire and Life Safety Education (FLSE) as ‘catalyst’ for reducing unsafe behavior and environments.
 - Johns Hopkins Bloomberg School of Public Health found nearly 90% of fire departments in the US conduct FLSE as key prevention strategy.

CONTEXT

- Nevertheless, we lack systematic assessments of effectiveness of fire and life safety education:
 - Of the fire departments responding to the Johns Hopkins survey, half assess FLSE.
 - Of that half, fewer than 1 in 4 use formal evaluations

Massachusetts Student Awareness of Fire Education (S.A.F.E.) Program

- Statewide Program begun in 1995:
 - Grants to communities to plan and maintain FLSE
 - Committed to local organization and design:
 - Partnerships between fire departments and schools and communities
 - No required curriculum: communities design their own using guides provided

Massachusetts Student Awareness of Fire Education (S.A.F.E.) Program

- MA DFS provides training and technical assistance
 - *Massachusetts Fire and Safety Education Curriculum Planning Guidebook*:
 - Essential fire and life safety behaviors to be taught
 - Teaching approaches for different ages
 - Linked to Department of Elementary and Secondary Education *Comprehensive Health Curriculum Frameworks*
 - Requires five days of training for firefighter educators
 - Frequent in-service workshops and training

Massachusetts S.A.F.E. Program

- DFS requires evaluation and annual reports, but form of evaluation is locally determined.
- In state fiscal year 2010, 201 communities received S.A.F.E. grants.
- More than 60% of efforts focused on pre-K - 4th grade.

Massachusetts S.A.F.E. Program

How do we know it is working?

- Reduction in Child Fire Deaths
- Young Heroes Program

Massachusetts S.A.F.E. Program

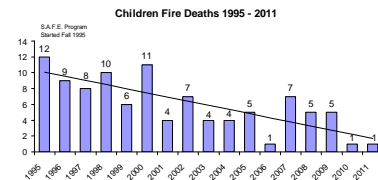
How do we know it is working?

- Reduction in Child Fire Deaths:
 - Prior to 1995, average of 18.5 child fire deaths per year
 - From 1996 to 2011, average dropped to 5.5 per year = 70% drop

Massachusetts S.A.F.E. Program

Reduction in Child Fire Deaths:

- In 1995 12 children died in fires
- In both 2010 and 2011, one child died in a fire; in 2011 no child died in a building fire



Massachusetts S.A.F.E. Program

- Young Heroes Program:
 - Nearly 300 children received ‘Young Heroes’ awards for using what they have learned:
 - A 7-year old saves grandmother by helping her to ‘stop-drop-cover- and-roll’
 - An 8-year old makes family develop and practice an escape plan as part of S.A.F.E. homework. The family uses the plan to get out alive a few weeks later.

Massachusetts S.A.F.E. Program

- Child fire fatality data and ‘Young Hero’ program provide support for S.A.F.E. Program, but DFS sought more formal assessment with clearer links to learning.
- In 2009, DFS committed to develop a formal method of documenting effectiveness.

Massachusetts S.A.F.E. Program

- DFS and Task Force undertook design of an evaluation system:
 - Using standard test formats
 - Targeting grades 3 (ages 8 - 10), 6 (ages 10 - 12) and 10 (ages 14 - 16)
 - Grades preceded by repeat exposure to concepts so there has been reinforcement of learning
 - Points of transition to new concepts

Massachusetts S.A.F.E. Program

- Began with 3rd Grade Test.
 - Massachusetts Comprehensive Assessment starts at 3rd grade.
 - 60% of S.A.F.E. FLSE targets pre-K to 4th grade

Massachusetts S.A.F.E. Program

- Assessment System Development Process
 1. Define concepts to be tested: literature, incident reports; existing curricula
 2. Draft questions
 3. Obtain expert review
 4. Pilot test in classrooms
 5. Develop companion user-friendly database
 6. Training & TA to support implementation

Massachusetts S.A.F.E. Program

- Ten 3rd Grade Concepts: Understand
 1. Dangers of tobacco and smoking products
 2. Match and lighter safety
 3. Smoke alarms
 4. Escape plans
 5. Crawl-low-under-smoke

Massachusetts S.A.F.E. Program

- 3rd Grade Concepts:
 5. Stop-drop-cover-and-roll
 6. Firefighters are helpers who save lives
 8. Reporting fire and other emergencies
 9. Hot things and first aid for burns
 10. Exit signs and knowing two ways out

Massachusetts S.A.F.E. Program

- Overall test design:
 - Goal: Assess ability to apply knowledge
 - Combine concepts and use illustrations and stories about on three children, Robert, Marcus and Claudia
 - Multiple choice questions



Massachusetts S.A.F.E. Program

- Example: Robert is sleeping when the smoke alarm goes off. Illustration shows Robert in bed; smoke is coming over the bedroom door.



Massachusetts S.A.F.E. Program

- **What does it mean when the smoke alarm goes off?**



- A. The batteries should be changed
- B. You should call 911
- C. Stop what you are doing and follow the escape plan
- D. The smoke alarm is broken

Massachusetts S.A.F.E. Program

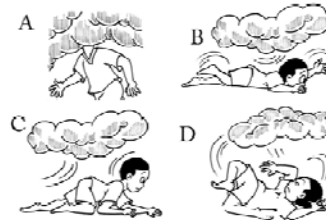
- **What should Robert do?**



- A. Hide in his closet
- B. Crawl low under the smoke to get away from the smoke
- C. Run to get his sister
- D. Go tell his mother

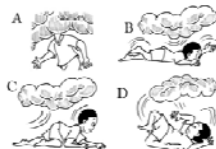
Massachusetts S.A.F.E. Program

- **Which of these pictures shows the correct way to crawl low under smoke?**



Massachusetts S.A.F.E. Program

- A** Robert walking upright in the smoke.
- B** Robert crawling with his belly and head at ground level - likely area of toxic gases
- C** Correct crawl-low posture: between 1 and 2 feet from the ground.
- D** Robert rolling.



Massachusetts S.A.F.E. Program

- Expert Review of Questions:
 - A panel of elementary grade educators, literacy expert and firefighter educators reviewed draft instrument.
 - On two dimensions, panel assigned a score on a scale of 1 to 10:
 - Relevance of the story, illustration and questions to the concept tested.
 - Degree to which the story, illustration and questions could be understood by third grade students.

Massachusetts S.A.F.E. Program

- Pilot Test:
 - Four phases: each phase in two 3rd grade classrooms of 20 – 25 students.
 - Students completed the test.
 - Time from start to completion recorded for all students.
 - Reviewed the instrument with students.
 - Some revisions after each phase.

Massachusetts S.A.F.E. Program

- Outcome:
 - Test booklet with 30 multiple choice questions
 - Most students can complete the test in 15 minutes or less

Massachusetts S.A.F.E. Program

- Companion database: Excel file with three worksheets:
 - Entry of letter student has circled -- the only data processing task.
 - Embedded formulas automatically count number of correct answers and percentage answering correctly.

Massachusetts S.A.F.E. Program

S.A.F.E. 3rd Grade Test Scores & Analysis		Overall Average Percent Correct	75.8%			
Cells shaded in orange and yellow contain formulas. Do not alter these formulas.						
Number of Tests	39	69%	64%	56%	82%	
	Number of correct answers	27	25	22	32	
ENTER SCHOOL NAME HERE	The row to the right contains the question number	1	2	3	4	
ENTER DATE OF TEST HERE	The row to the right contains the question topic	Where she should smoke	What cigarettes are made of	How smoking can be dangerous	What should smokers do to stay healthy	
Correct Question Answers are listed in this row		C	D	D	C	
Enter test booklet number in column at left (Column C)		1	C	D	A	C
		2	C	D	D	C
		3	C	D	D	C

Massachusetts S.A.F.E. Program

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Enter test booklet number in column at left (Column C)		1	C	D	A	C
		2	C	D	D	C
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Firefighter educators enters letter student has circled.

Massachusetts S.A.F.E. Program

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		2	C	D	D	C
		3	C	D	D	C

Yellow cells on Row 3 calculate percent of correct answers for each question.

Massachusetts S.A.F.E. Program

- Second worksheet aggregates percentages by concept:
 - Example: 6 questions about smoke alarms.

Smoke Alarms					
7	15	16	17	18	30
Smoke alarm goes off?	Alarm chirps?	What should marcus do?	Smoke alarm does?	How often replace batteries?	Where put to smoke alarms
74%	67%	72%	67%	62%	59%

Massachusetts S.A.F.E. Program

- Database provides immediate feedback for firefighter-educators
- 2012 added worksheet to track wrong answers
 - Allows firefighter educators to target improvements more precisely

Massachusetts S.A.F.E. Program

- Companion user guide describes how:
 - The test was developed
 - To administer the test in the classroom
 - To enter scores in database
 - To report results
- 3-hour in-service training provided
- Implemented Spring 2010

Massachusetts S.A.F.E. Program

- **RESULTS:**
 - In Massachusetts FY 2011, 54 of 139 communities who submitted reports voluntarily used this 3rd grade system.
 - Administered more than 3,000 tests
 - One-third of those in one large city

Massachusetts S.A.F.E. Program

- **RESULTS:** Broad view of S.A.F.E. effectiveness:

Key Concept: Crawl Low Under Smoke	Statewide Average
When there is smoke, crawl low under the smoke away from the smoke and fire.	89%
Correct crawl-low-under-smoke is on hands and knees with head at 1' to 2' feet above floor.	87%

Massachusetts S.A.F.E. Program

- **RESULTS:** Statewide averages
 - Nearly 90% of students understand WHEN to 'crawl-low-under-smoke', and
 - How to correctly 'crawl-low-under-smoke'

Massachusetts S.A.F.E. Program

- **RESULTS:** Target improvements statewide

Key Concept: Smoke Alarms	
When the smoke alarm goes off you should stop what you are doing and follow the escape plan.	76%
When a smoke alarm chirps it means the batteries are wearing out and should be replaced.	73%
When a child hears the smoke alarm chirp he should ask an adult to change the batteries	75%

Massachusetts S.A.F.E. Program

- **RESULTS:** Target improvements statewide

Key Concept: Smoke Alarms	
A smoke alarms smells smoke; makes a loud noise if there is smoke; gives the alarm to escape	71%
If a smoke alarm uses regular batteries, batteries be replaced twice a year <small>(MA standard)</small>	60%
Smoke alarms should be on each floor of a house; outside each bedroom; at the top and bottom of stairs	69%

Massachusetts S.A.F.E. Program

- **RESULTS: Smoke Alarms**
 - Slightly more than three-quarters (76%) know that when the smoke alarm goes off, you should stop what you are doing and follow the escape plan.
 - No more than 75% answered the other five smoke alarm questions correctly.
 - Working smoke alarms reduce fire injury and deaths, so we want to improve these results.

Massachusetts S.A.F.E. Program

- **RESULTS:** Targeting technical assistance where it is needed:

Stop-Drop-Cover-and-Roll	Statewide	Lowest
When clothing catches fire, stop-drop-cover-and-roll	92%	62%
Correct way to stop-drop-cover-and-roll is with hands covering mouth, nose and eyes	72%	20%

Massachusetts S.A.F.E. Program

- **RESULTS:** Firefighter educators assess and improve their teaching:

Escape Plans	2010	2011
Family emergency meeting place should be outside the building	69%	88%
In drawing an escape plan for an apartment, recognize which room(s) do not have two ways out.	57%	79%

Massachusetts S.A.F.E. Program

- **NEXT:** 6th Grade System: 15% of S.A.F.E. Program classrooms are 5th and 6th Grade
- Followed the same sequence:
 1. Define concepts to be tested
 2. Draft questions
 3. Obtain expert review
 4. Pilot test in classrooms
 5. Develop companion database
 6. Training and implementation

Massachusetts S.A.F.E. Program

- 6th Grade Concepts: 3rd Grade, PLUS: Understand
 1. Fire and fire behavior
 2. Kitchen safety
 3. Home fire hazards
 4. Electrical safety

Massachusetts S.A.F.E. Program

- 6th Grade Concepts: 3rd Grade, PLUS: Understand
 6. Flammable liquids and vapors
 7. Safety around heat sources
 8. Carbon monoxide
 9. Personal responsibility for safety

Massachusetts S.A.F.E. Program

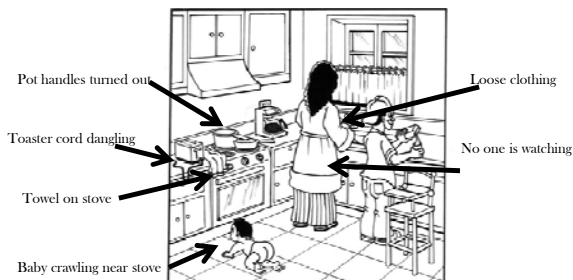
- Draft questions:
 - Used standard test formats:
 - Open response
 - Multiple choice
 - Fill-in
 - True-false
 - Matching
 - Some questions based on illustrations
- Reviewed by Expert Panel

Massachusetts S.A.F.E. Program

- Pilot tests:
 - Six Schools, 226 students
 - Focus on achieving literacy level of 4th grade
- Companion database and user guide
 - 6th Grade test requires a score sheet with answer guidance
- Implemented Spring 2012
 - 22 Questions
 - 25 minutes to complete

Massachusetts S.A.F.E. Program

6th Grade Test Example: Kitchen dangers



Massachusetts S.A.F.E. Program

Kitchen dangers

1. Circle three things that are not safe
2. Write how to make those three things safe



Massachusetts S.A.F.E. Program

- High School: Currently being pilot tested
- Additional Concepts: Understand
 1. Candle safety
 2. First aid
 3. Sports and recreation safety
 4. Fireworks safety
 5. Safe babysitting
 6. Motor vehicle safety

Massachusetts S.A.F.E. Program

- 10th Grade test questions:
 - Used standard test formats:
 - Open response
 - Multiple choice
 - Fill-in
 - True-false
 - Matching

Massachusetts S.A.F.E. Program

- 10th Grade Test Example:
Which of the items below CORRECTLY lists the three parts of the fire triangle?
 - A. Flame, fuel and heat
 - B. Heat, oxygen and fuel
 - C. Flame, oxygen and air
 - D. Heat, hydrogen and carbon

Massachusetts S.A.F.E. Program

- 10th Grade Test Example – Stove-top fire:

The correct way to put the fire out is: put a lid on it and turn off the burner

These actions would remove the oxygen and the heat from the fire triangle.



Massachusetts S.A.F.E. Program

- Outcomes of Massachusetts S.A.F.E. Program Assessment System:
 - Support for the firefighter-educator:
“When DFS first rolled out the 3rd grade evaluation tool, I thought you guys were crazy. Once I used it and saw the results, I was stunned, and I am changing my lesson plans as we speak.”

Massachusetts S.A.F.E. Program

- Outcomes of Massachusetts S.A.F.E. Program Evaluation System:
 - Link learning to outcomes related to child fire fatalities and Young Heroes
 - Community and statewide documentation, tracking and monitoring
 - Target technical assistance
 - Reporting results

Massachusetts S.A.F.E. Program

- Critical elements of Massachusetts S.A.F.E. Program:
 - State agency support, coordination, training and technical assistance
 - Local partnership design and implement
 - User friendly assessment system developed with participation of firefighter educators, other experts and students

Massachusetts S.A.F.E. Program

- All components – tests, databases, user guides – available at:

<http://www.mass.gov/copss/agencies/dfs/dfs2/osfm/pubed/web-pages/safe-news.html>

- Contact: Jennifer Mieth

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