



Teaching Children to Wash Their Hands – Wash Your Paws, Georgia! Handwashing Education Initiative

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ABSTRACT

Handwashing is one of the best ways to prevent infectious diseases such as flu and many foodborne illnesses. This study developed a handwashing education initiative using a university mascot-type likeness and evaluated the effectiveness of such a campaign in teaching youth the six steps of proper handwashing and when hands should be washed. *Wash Your Paws, Georgia!* included a bulldog likeness, along with handwashing guidelines promoted by the Centers for Disease Control and Prevention (CDC) and NSF International (National Sanitation Foundation). Components included posters, an instructor's guide, PowerPoint slides, suggested activities, evaluation tools, parent/guardian information letters, and magnets and stickers to supplement educational messages. All methods, evaluation instruments and letters were approved by the University of Georgia Institutional Review Board. Extension Agents were trained in the use of the educational materials and the evaluation components of the curriculum, which was implemented throughout the state. A pre-test/post-test design was used to evaluate the program's effectiveness in increasing knowledge of the six steps of proper handwashing. More than 5,462 youth were reached in this initial study. Results indicate that the materials were very effective in increasing knowledge of proper handwashing technique and suggest that this project can serve as a model program for educational institutions.

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TABLE I. Wash Your Paws, Georgia! handwashing education curriculum components

Materials for Teachers	Materials for Students
Instructor guide: <ul style="list-style-type: none"> • Instructions for timeline – <ul style="list-style-type: none"> • Prior to delivery • Conducting the class • After the class • Hard copy handouts of slides • Printed dialogue for each slide • PowerPoint® slide presentation cd-rom • Masters of parent/guardian information letters • Masters of pre-test/post-test packets • List of materials available for use in classroom delivery • Instructions for submitting test packets to project director for grading • Instructions for reporting program delivery in state Extension on-line reporting system (keywords, etc.) 	Posters 8.5 x 11 inches <ul style="list-style-type: none"> • Educational message extenders <ul style="list-style-type: none"> • Magnets • Stickers
Posters	
Packages of test packets, 30 per package	
Packages of parent/guardian information letters, 30 per package	

INTRODUCTION

In the accountability measures that are a part of the No Child Left Behind Act of 2002, Adequate Yearly Progress requirements hold elementary and middle schools accountable for student absenteeism (7). Gastrointestinal and respiratory illnesses cause many absences from school, and studies have revealed that spread of infection by hands may be a factor in up to 50% of respiratory illnesses and up to 60% of gastrointestinal illnesses (1). Noroviruses are considered to be the leading cause of gastroenteritis in both children and adults (9). The Centers for Disease Control and Prevention (CDC) estimate that over 5,000,000 cases and over 14,000 hospitalizations in the U.S. each year are caused by noroviruses (4), which have high rates of infectivity and secondary transmission (6, 18). Transmission can occur via water, food, aerosols, objects and hands (18), with hands considered one of the main vehicles for norovirus transmission (15). Likewise, many respiratory diseases can

be spread via aerosols and hands (3). The role of children in the spread of influenza in families and communities has been well documented (2, 13, 21). School environments have many students in close contact as well as many inanimate objects that can be vehicles for transmission of infectious diseases, and often lack the time and facilities necessary for proper handwashing (23). Studies indicate that environmental factors such as inappropriate placement of sinks, traffic flow problems and lack of access to hand hygiene products are frequent barriers to hand hygiene (8), although handwashing is known to be one of the best ways to prevent infectious illnesses such as H1N1 flu and some foodborne illnesses. When done properly, handwashing has been shown to reduce the risk of bacterial contamination on hands (19) and to reduce the number of certain infectious diseases in study populations, including respiratory infections such as influenza and influenza-like illnesses, diarrhea and conjunctivitis (16, 21). Recent studies

suggest that soap and water are more effective than alcohol-based sanitizers for reducing norovirus and H1N1 contamination on hands (10, 15, 22). Although CDC recommends the use of hand sanitizers in situations where access to handwashing is not readily available (3, 5), children need to understand that handwashing is an important part of their hand hygiene regimen, and they should be taught how to wash hands properly and when to wash hands.

In the early 1980s, researchers determined that the probability of a health threat and the effectiveness of a coping response had positive effects on intentions to adopt a recommended preventive health behavior (17). Others have suggested that the effectiveness of messages designed to improve hand hygiene may be enhanced by emphasizing the prevention of getting an infection rather than of cross-infection (14). Recent concern over H1N1 and a possible flu pandemic has prompted school officials to seek measures to decrease

TABLE 2. Concepts presented in the *Wash Your Paws, Georgia!* handwashing education curriculum

1. Germs can be on your hands and can make you sick.
2. Germs can be there even though you cannot see them.
3. Germs are too small to be seen just with your eyes.
4. You need a microscope to see germs.
5. Germs can be spread from one person to another.
6. Germs can get into food and can make us sick.
7. Washing your hands is a way to keep germs from spreading.
8. There are six steps you follow when you wash your hands.
 - Wet hands with warm, running water.
 - Apply soap.
 - Rub hands together and clean all over for at least 20 seconds.
 - Don't forget to clean your nails.
 - Rinse germs down the drain.
 - Dry your hands on a paper towel or clean cloth towel.
9. You should wash your hands:
 - Wash your hands a lot.
 - After you cough or sneeze.
 - After going to the bathroom.
 - Before you touch food.
10. Other ways to avoid getting sick or spreading germs to others.
 - Cough or sneeze into your elbow.
 - Cough or sneeze into a tissue, then throw it away and wash your hands.
 - Keep hands away from your mouth, nose and face.
 - Don't put objects like pencils into your mouth.
 - Don't eat food that has touched someone else's mouth.
 - Don't drink from the same cup that someone else is drinking from.
 - Stay home if you are sick.
 - Get immunized.

the risk of disease transmission in order to minimize absenteeism. In response to requests for handwashing education in schools, the University of Georgia Cooperative Extension has taken advantage of this perceived health threat to develop and implement a handwashing education initiative that targets youth through Family and Consumer Sciences and 4-H programs in schools. Although posters have been used with some success in handwashing education in several studies in health care settings (14), this campaign builds on artwork that originated as part of the award-winning *Smart Kids Fight BAC!*[®] Food Safety Education Curriculum (11) and the *He's BAC!* book (12) developed in U.S. Department of Agriculture funded projects at the University of Georgia and includes a likeness of a popular university mascot. The campaign focuses on the six steps of proper hand-

washing promoted by many agencies and organizations, including CDC and NSF International, and messages about when hands should be washed and prevention of self-infection as well as prevention of spread of disease.

The objective of this study was to develop, implement and test the effectiveness of a curriculum that includes posters as well as other educational tools and reminders for use by Extension Specialists and County Extension Agents to:

- increase awareness of the importance of handwashing in the prevention of infectious diseases and foodborne illness.
- increase knowledge of when hands should be washed as designated by the CDC (5), and
- increase knowledge of the six steps of proper handwashing

promoted by CDC (5), and NSF International as a part of the ScrubClub Campaign (20).

METHODS

Approval was obtained from the Office of Trademarks, Contracts and Fund Agreements in the Financial Services Division of the University of Georgia Division of External Affairs to use a character similar to the official Georgia bulldog mascot in a handwashing education initiative targeting youth audiences entitled *Wash Your Paws, Georgia!*. A poster designed to be the centerpiece of the campaign (Fig. 1) was created to teach the six steps of proper handwashing promoted by agencies and organizations including CDC (5) and NSF International (20) and when to wash hands as directed by the CDC (5). Curriculum components

TABLE 3. Distribution of post-test scores by pre-test scores of students in grades 4–9 for the Wash Your Paws, Georgia! handwashing education initiative

Pre-test Score Frequency ¹	Post-test Score Frequency ¹						Total
	1	2	3	4	5	6	
0	0	1	0	0	0	0	1
1	3	0	4	3	2	1	13
2	0	8	8	17	18	4	55
3	0	2	21	61	78	49	211
4	0	2	12	138	274	245	671
5	1	2	5	51	449	642	1150
6	0	0	1	3	71	808	883
Total	4	15	51	273	892	1749	2984

¹Score frequencies represent the number of questions answered correctly.

FIGURE 1. Poster created for the Wash Your Paws, Georgia! handwashing education campaign



are presented in Table 1. Concepts presented in the *Wash Your Paws, Georgia!* materials are presented in Table 2.

Pre-tests and post-tests were developed with knowledge questions that specifically addressed the six steps of handwashing as presented in the materials. The formats selected for the test questions are formats commonly used in elementary schools. Five questions were in the multiple-choice format, and one question required students to order the six steps in proper handwashing. Tests were examined by Extension food safety educators as well as a child development specialist to assess content validity, readability and appropriateness for age group and grade level. To comply with the University of Georgia Institutional Review Board's requirement that no children's names be collected, test packets were prepared by printing the pre-test on yellow paper, and the post-test on green paper and then stapling the two tests together to ensure that the pre-test and post-test for each student remained paired. Packets were distributed prior to delivery of the educational concepts for testing at the two time intervals, much like the standardized testing to which students are accustomed. Students were instructed to complete the yellow sheet at the start of the class and then put the packet away. At the end of class, students were instructed to take out the packet and to complete the green sheet.

TABLE 4. Frequency of students (grades 4–9) whose test scores for the *Wash Your Paws, Georgia!* handwashing education initiative improved, stayed the same and regressed

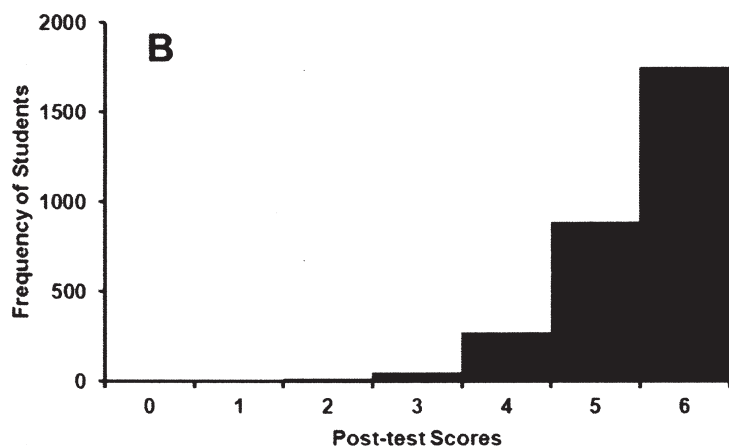
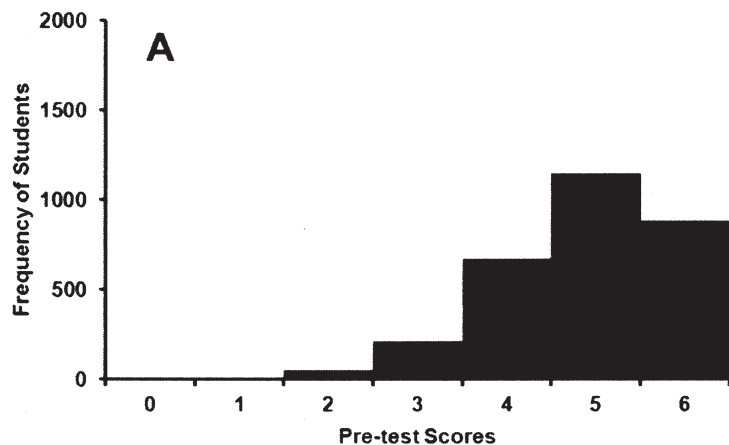
Index	Frequency	Percent	Cumulative Frequency	Cumulative Percent
-1 ¹	150	5.03	150	5.03
0 ²	1427	47.82	1577	52.85
1 ³	1407	47.15	2984	100.00

¹-1 = Regress

²0 = Same

³1 = Improve

FIGURE 2. Distribution of test scores representing the number of questions answered correctly by students in grades 4–9 prior to (pre-test) and following (post-test) instruction with the *Wash Your Paws, Georgia!* handwashing education curriculum



Agents in 4-H and Family and Consumer Sciences were trained by the project director on the content of the curriculum and procedures for delivery, evaluation and reporting of the program. All procedures were approved by the University of Georgia Institutional Review Board, Office of Human Subjects. The curriculum was implemented during the 2009–2010 school year in schools throughout Georgia, with 5,462 students participating in this initial pilot program. Pre-tests and post-tests were completed by a convenience sample of 2,984 youth in 4th through 9th grade to measure program impact. Data were analyzed by the University of Georgia Statistical Consulting Center. A paired *t*-test was used to test the null hypothesis that the mean difference, post-test – pre-test scores, was zero. Cumulative logistic regression was used to determine if scores generally increased from pre-test to post-test, and Bowker’s Test of Symmetry was used to assess the likelihood that the change in scores could be due to random test-retest variability.

RESULTS AND DISCUSSION

Distributions of post-test scores by pre-test scores for youth in grades 4–9 are presented in Table 3. Of the 2,984 students, 47% showed improvement in knowledge scores at the time of the post-test (Table 4). Although an additional 47% scored the same on both the pre-test and the post-test (Table 4), data indicate that 29.6% of the students could not improve because they already knew correct

TABLE 5. Mean handwashing knowledge scores for youth in grades 4–9 and percent scoring perfect scores

	Pre-test	Post-test	Diff = (Post–Pre)
N ¹	2984	2984	–
Mean ²	4.86	5.44	+0.58
Mean % ³	80.92	90.67	+9.75
% 6/6 ⁴	29.59	58.61	+29.02

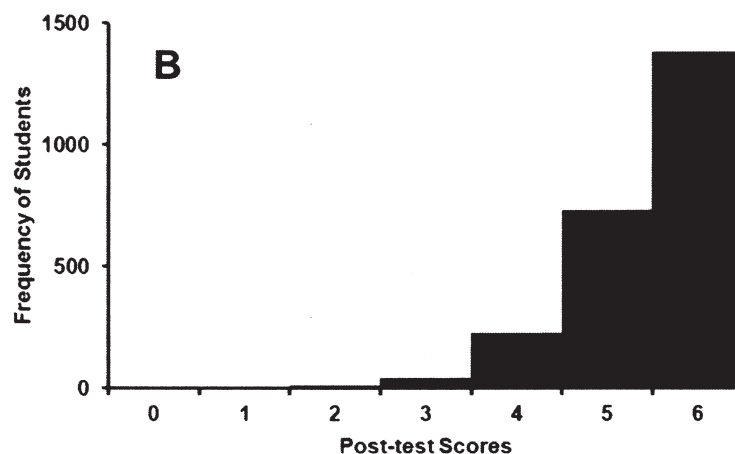
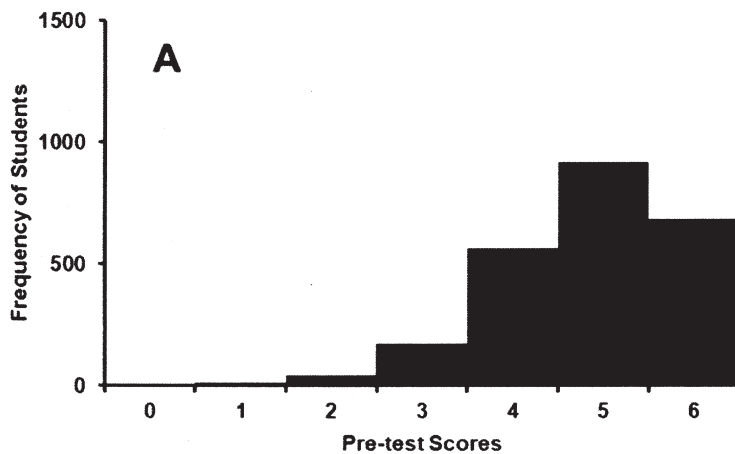
¹N = Number of students in convenience sample completing tests

²Mean = Mean of knowledge scores, with six being the highest possible score

³Mean % = Mean score as a percent of the highest possible score

⁴%6/6 = Percent answering 6 out of 6 questions correctly

FIGURE 3. Distribution of test scores representing the number of questions answered correctly by students in 4th and 5th grades prior to (pre-test) and following (post-test) instruction with the *Wash Your Paws, Georgia!* handwashing education curriculum

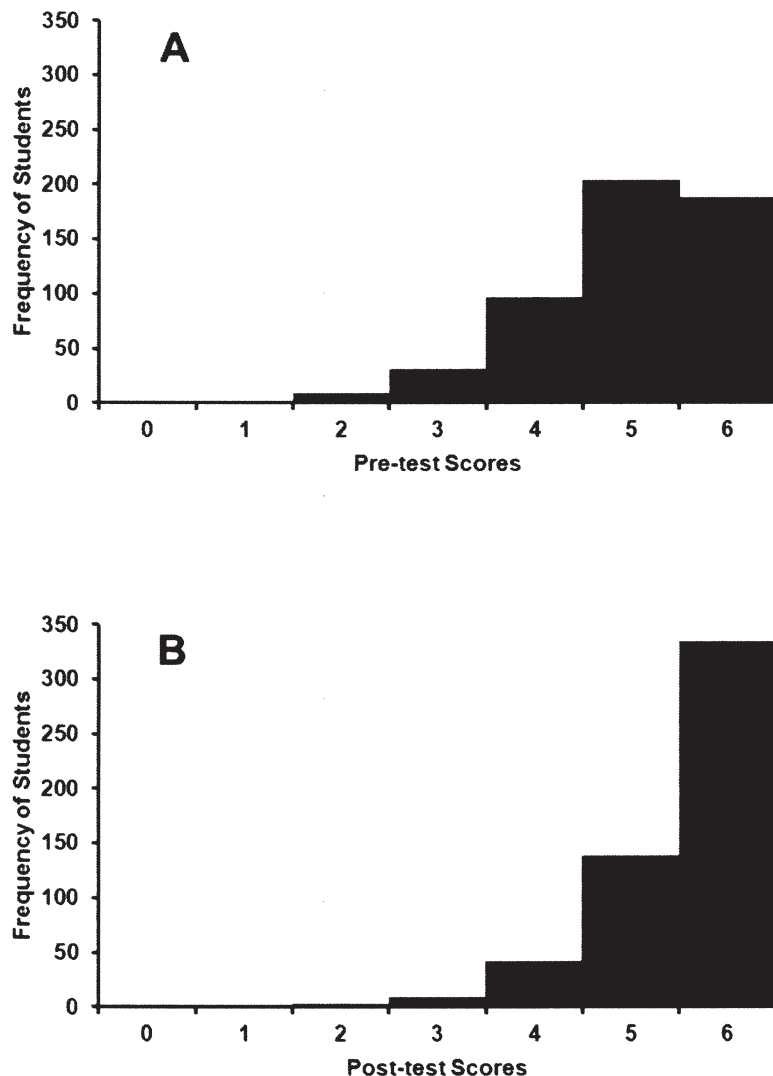


handwashing technique and scored a perfect score even on the pre-test (Table 5). Almost 60% of students scored a perfect score on the post-test, indicating a 29% increase in students who scored perfect scores (Table 5). The results of the cumulative logistic regression indicate that as an individual's score went from pre-test to post-test, the score was less likely to be in a low-score category and therefore more likely to be in a high-score category ($P < 0.0001$); in other words, scores generally increased from pre-test to post-test. The results of Bowker's Test of Symmetry indicate that for a population in which individuals would randomly increase or decrease their scores following an educational program, there is less than a 0.01% chance that the population would produce data with at least as high a percentage of increasing individuals as seen in our data through random test-retest variability ($P < 0.0001$).

The mean improvement in scores was highly significant over all age groups, with an improvement of 0.58 on a 6 point scale ($P < 0.0001$). Of 2,984 youth, 80.2% were in grades 4 and 5, 17.7% in grades 6 and 7, and only 2.1% in grades 8 and 9 and a mixed-grade group. Therefore, further analyses focused on 4th and 5th graders as one group and 6th and 7th graders as a second group, since these groups represented almost 98% of the total population.

Only 35.6% of 6th and 7th graders and 28.5% of 4th and 5th graders knew the correct handwashing technique at the time of the pre-test. Distributions of pre-test and post-test scores for all grades are presented in Fig. 2, for grades 4 and 5 are presented in Fig. 3, and for grades 6 and 7 in Fig. 4. Mean improvement for

FIGURE 4. Distribution of test scores representing the number of questions answered correctly by students in 6th and 7th grades prior to (pre-test) and following (post-test) instruction with the *Wash Your Paws, Georgia!* handwashing education curriculum



the largest group (4th and 5th graders, representing 80.2% of the study population) was 0.60 on a 6-point scale ($P < 0.0001$).

The educational intervention tested was effective in increasing student knowledge of proper handwashing technique for groups ranging in age from 9 to 15. One unexpected outcome of the project has been interest shown by various groups to use the materials with adult audiences, citing its simplicity and its use of the mascot likeness (e.g., requests for posters to display in campus busses and on bulletin boards throughout the college campus; requests for posters to

display in restrooms and elevators in hospitals and in doctors' offices and other public buildings; and requests to use the curriculum in face-to-face training programs with adult consumer groups and child care providers).

CONCLUSIONS/ RECOMMENDATIONS

Although the intervention was successful in increasing knowledge, knowledge does not always translate into behavior change and additional research is needed to determine whether the educational intervention has long-term

effects on improved handwashing behavior. It is not known if the campaign has had an impact on environmental factors in schools so as to make handwashing more accessible and effective. Research in this area is needed.

Even in upper elementary and beginning middle school grades, where one might expect that students already know proper handwashing technique, results indicate that additional education efforts and reminders are needed. Unanticipated requests for materials to use in a variety of settings with various age groups suggest that the design of the intervention using a university mascot likeness was a popular method for gaining audience attention to handwashing education messages. This program could serve as a model for other universities in handwashing education.

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