2010

An Evidence Based Multi-Activity Handwashing Education Program in Children

Sandra M. Annesi
University of North Florida

AN EVIDENCE BASED MULTI-ACTIVITY HANDWASHING EDUCATION PROGRAM IN CHILDREN

by

Sandra M. Annesi RN, MSN, CNE

A project submitted to the School of Nursing
in partial fulfillment of the requirements for the degree of

Doctor of Nursing Practice

UNIVERSITY OF NORTH FLORIDA

BROOKS COLLEGE OF HEALTH

October 2010

CERTIFICATE OF APPROVAL PAGE

The Project of Sandra Annesi is approved:

Signature deleted

Elizabeth Jane McCarthy, CRNA, PhD, FAAN — 17 Sept 2010 — Date

Signature deleted

Carol Ledbetter, PhD, APRN, BC, FAAN — 17 Sept 2010 — Date

Signature deleted

John P. McDonough, CRNA, EdD, ARNP — 17 Sept 2010 — Date

Signature deleted

Maxine Lesser, ARNP, MSN — 17 Sept 2010 — Date

Accepted for the Department:

Signature deleted

Lillia Loriz, PhD, Director, School of Nursing — 3-11-10 — Date

Accepted for the College:

Signature deleted

Pamela Chally, PhD, Dean, Brooks College of Health — 11-4-10 — Date

Accepted for the University:

Signature deleted

Dean of the Graduate School — 12/10/10 — Date

Acknowledgements

I would like to thank God for giving me the motivation and drive to move forward with my advanced education. I also wish to thank Dr. Elizabeth McCarthy for her guidance and flexibility with my project. A special thanks to Dr. Carol Ledbetter, Dr. John McDonough, and Maxine Lesser ARNP MSN for their support and suggestions. A very special thank you goes to my children, who watched their mom work hard at her computer. I would like to thank my husband for his supportive words with my desire to advance my education and my parents for their support in attending my graduation. An acknowledgement and thank you is for Mrs. Tracey Mercer, the director of TLC Kids Care, for her assistance with the completion of this project. Thank you to Dr. Tony Juve, with his expertise in statistical analysis, and Dr. Loriz and Dr. Chally for their valuable feedback.

Table of Contents

List of Tables

Abstract

Proper handwashing is one of the simplest, most affordable and effective means of stopping the spread of infection. Due to the close proximity of children in schools and child care settings, there is a high risk for the spread of infectious disease. The purpose of this project was to improve handwashing behaviors of three to six year old children in a community school setting by implementing an evidence based multi-activity handwashing education program. The objective was to increase understanding of the relationship between germs and handwashing, as well as increase the frequency and correct technique procedure of handwashing behavior in children in the community.

The evidence based handwashing education program was implemented over several weeks and included multiple activities that were found in the literature to be effective. These activities included a lecture and presentation, a return demonstration, a Glo Germ™ training device, and a video and story on handwashing. The results of the statistical analysis found that the program was effective in increasing both the frequency and correct technique procedure of the children. Most parents (80%) reported that they noticed an increase in how often their child washes his/her hands. A majority of parents (83%) noticed an increase in the duration of how long their child washes his/her hands; a larger majority (90%) noticed a decrease in how often they needed to prompt their child to wash his/her hands.

Nurses working collaboratively with other disciplines in the community can implement evidence based practice handwashing education programs in a variety of

public child care settings. The effects of the handwashing programs may significantly decrease child healthcare costs associated with prescriptions, visits to the provider, hospital admissions and emergency room visits and influence positive health promotion behaviors in children. Implementing affordable and effective handwashing education programs can lead to a reduction in infectious diseases, absenteeism, antibiotic resistance and health care costs. By fostering positive health promotion practices, such as proper handwashing behaviors in children, habits may be instilled that carry into adulthood. These habits can increase the health of a child and the community.

CHAPTER ONE

Introduction

Ignaz Semmelweis, an Austrian-Hungarian physician, first demonstrated over 150 years ago that handwashing can prevent the spread of disease. Semmelweis was able to reduce the maternal death rate 90% by requiring medical students to wash their hands between anatomy classes, where they dissected cadavers and performed vaginal exams and deliveries on women. This discovery led to the prevention of numerous infectious diseases in the mid-nineteenth century (Carter, 1983). Florence Nightingale, who also believed in the practice of handwashing, stated “every nurse ought to wash their hands very carefully during the day” (Nightingale, 1859, p. 53). She is well known for her influence in implementing infection control practices in nursing.

As it is well known today, proper handwashing can break the chain of infection and help prevent the spread of disease. Hands are often the mode of transmission for a variety of infectious diseases. Bacteria and other pathogens can be found on inanimate objects and spread from person to person through indirect transmission. If the chain of infection is not broken, illness and disease may result. Both transient and resident bacteria known as normal flora are found on the skin of hands. Transient organisms are more likely to cause infection and less likely to be firmly attached to the skin; therefore, proper handwashing using soap and water can help remove the bacteria that lead to disease (Pyrek, 2002).

Performing proper handwashing at home, in schools, and at child care centers can prevent the spread of childhood disease. Handwashing education programs can be implemented by Advanced Practice Nurses working collaboratively with other disciplines in the community to help educate the public and prevent the spread of infection (American Nurses Foundation, 2006). By working collaboratively using an interdisciplinary approach, evidence based practice handwashing education programs can be implemented in a variety of public settings to promote the health of a community overall. Handwashing practices are key prevention tools in healthcare settings, work settings, public institutions, and for the safety of our health and food.

At home, handwashing can prevent infection and illness from spreading between members, and consequently throughout the community. In the home, the basic rule is to wash hands prior to preparing food and after handling uncooked meat and poultry, before eating, after changing diapers, after coughing, sneezing, or blowing one's nose into a tissue, and after using the bathroom. The emphasis on handwashing education programs in child care centers cannot be underestimated for the safety of our children. While budget costs are a concern with schools and child care centers, most handwashing education programs are affordable with the potential savings far outweighing the costs (CDC, 2009b).

The Problem with a Lack of Proper Handwashing Practices in Children

Multiple problems and public health issues arise when handwashing practices are not implemented in community settings such as schools and child care centers. Swine Flu H1N1, spread of common childhood infectious diseases, antibiotic resistance, absenteeism and increased healthcare costs are problems associated with improper

handwashing behaviors. The literature illustrates how the implementation of handwashing education programs can significantly reduce these issues, although it is unclear how much handwashing education is needed to significantly influence handwashing behaviors over time (Witt & Spencer, 2004). The importance of handwashing is often understood and well publicized, but the implementation of programs to foster healthy handwashing habits and to reinforce the behavior in children varies widely.

Many studies on handwashing education programs have been conducted to determine the most effective interventions for children. Activities that have been found to positively influence handwashing behaviors include presentations and discussions, handwashing videos and stories, Glo Germ™ simulation devices with ultraviolet light, return demonstration, agar plates, modeling, and availability of products such as soap, towels or hand sanitizer (Witt & Spencer, 2004; Tousman et al., 2007; Snow, White, & Kim, 2008). Using effective handwashing activities that target different learning styles can help children conceptualize infection control (Cottingham, 2004). The purpose of this project was to improve handwashing behaviors of three to six year old children in a community school setting by implementing an evidence based multi-activity handwashing education program.

Implementation of the Project Plan in Practice

The implementation of handwashing education programs has the potential for widespread implications in both the community and healthcare settings. A handwashing education program assists in preventing the spread of infectious diseases (respiratory and gastrointestinal infections, flu associated infections, and the common colds), decreasing

absenteeism, decreasing health care costs, decreasing the issue of antibiotic resistance, and decreasing the spread of infection to the home setting (McGuckin et al., 1999; Tousman et al., 2007; CDC, 2009b). Through the implementation of this program, collaboration between nurses and teachers encourages them to behave as role models for children learning the handwashing guidelines. By using the most effective handwashing activities for children found in the literature, handwashing education programs have the potential to influence positive health promotion behaviors in children. Studies have found that using multiple educational interventions increases the effectiveness of handwashing education programs and leads to sustained effects over time (Snow et al., 2008).

This evidenced-based handwashing education project implemented handwashing education activities for children three to six years of age in pre-Kindergarten and Kindergarten classes in Volusia County, Florida. The classrooms were assessed for availability of products including warm water, soap, towels and hand sanitizer. Current handwashing education activities and practices were discussed with the director. Classroom teachers were educated about the handwashing education project. The letters explaining the study, pre-intervention parent report surveys and consent forms were sent home to be completed by the parents of the children. Baseline handwashing behaviors of the children were assessed with the parent reporting survey and were collected identifying home handwashing behaviors. Handwashing education activities included a presentation and discussion on proper handwashing, a demonstration and return demonstration, a germ simulation experiment with Glo Germ™ liquid and an ultraviolet light, and a story and educational video on handwashing. A bar of soap, coloring sheets, stickers, and handwashing story coloring sheets were given to the children as a reward

after each activity. Post-intervention parent reporting surveys of the handwashing behaviors of the children in the home were sent home to be completed by the parents.

Hypotheses

1. Multi-activity handwashing education programs are effective in influencing the frequency of handwashing practices of three to six year old children.
2. Multi-activity handwashing education programs are effective in influencing the correct technique procedure of handwashing practices of three to six year old children.
3. Multi-activity handwashing education programs are effective in influencing the understanding of the relationship between germs, illness and handwashing of three to six year old children.

CHAPTER TWO

Literature Review

The health and safety of our children is a priority in the United States. Handwashing remains one of the simplest, most affordable and effective means of stopping the spread of infection. It is estimated that children touch their face on average 80 times in an hour (Pearson, 2009). Hands are a vehicle for transmission of germs that spread disease. The implementation of handwashing education programs has the potential to reduce the spread of a number of childhood infections including the common cold, influenza, Swine Flu H1N1, and a variety of other respiratory and gastrointestinal infections. Reducing the spread of infections will not only reduce health care costs, but also reduce absenteeism from the child from school and the parent from work.

In addition, antibiotic resistance is becoming more of a concern in health care today. Because antibiotic therapy is often prescribed to children sick with respiratory and ear infections, handwashing education programs could decrease the number of childhood infectious diseases, decreasing the number of antibiotics prescribed to children each year (Finkelstein et al., 2001). By implementing affordable and effective handwashing education programs, a reduction in infectious diseases, absenteeism, antibiotic resistance and health care costs could result.

Swine Flu H1N1 and other Infectious Diseases

The spread of infectious disease is a concern for schools and public heath as the swine flu is being reported more in the media today. The spread of 2009 H1N1 virus is thought to occur in the same way that seasonal flu spreads. Center for Disease Control

(CDC) (2009a), reports flu viruses are spread mainly from person to person through coughing or sneezing by people with influenza. Sometimes people become infected by touching something such as a surface or object with flu viruses on it and then touching their mouth or nose. Handwashing is one of the most important infection control measures to prevent the spread of a variety of infectious diseases including the Swine Flu H1N1. Most people do not wash their hands as thoroughly as needed to prevent the spread of infection (Bhide, 2009).

Antibiotic Resistance

As mentioned above, a concern with the lack of proper handwashing practices is the spread of infectious diseases in children. Infectious diseases in children are frequently treated with antibiotic prescriptions. This treatment leads to antibiotic resistance, which is the ability of bacteria or other microbes to resist the effects of an antibiotic. Antibiotic resistance occurs when bacteria mutate in some way that reduces or eliminates the effectiveness of drugs, chemicals, or other agents designed to cure or prevent infections. The bacteria survive and continue to multiply causing more harm. Antibiotic-resistant bacteria can spread to family members, schoolmates, and co-workers, threatening the health of a community. Microbes develop resistance to specific medicines. A common misconception is that a person's body becomes resistant to specific drugs. However, it is microbes within the body, not the body overall, that become resistant to the drugs (CDC, 2009b).

For these reasons, antibiotic resistance is among the CDC's primary concerns. Proper handwashing practices can decrease the spread of infectious diseases and decrease the need for antibiotic therapy. Antibiotic resistance has been called one of the world's

most pressing public health problems (CDC, 2009b). Without proper handwashing practices in children, the spread of infectious disease are likely to occur, and bacteria causing infections may potentially become less responsive to antibiotic treatment. Antibiotic resistance causes increased morbidity and mortality in children and adults who have common infections that were once easily treatable with antibiotics. Proper handwashing procedures can prevent the spread of infection, cutting down on the need for antibiotic therapy resulting in less antibiotic resistance (Deasy, 2009).

Absenteeism

Absenteeism, due to a variety of illnesses, is a concern and problem in many schools and child care settings across the country. According to the CDC, 160 million school days are lost each year due to infectious illness (CDC, 2009b). One study found that a multi-activity handwashing program using agar plates, presentations and discussions, GlitterBug® return demonstration, handouts and stickers was effective in decreasing absenteeism by 34% in children after three-four weeks of program implementation (Tousman et al., 2007). Another study found a 50.6% reduction in absenteeism three months after a handwashing program was put in place (Guinan, McGuckin & Ali, 2002). When a large number of children are absent, it can disrupt the progression of the curriculum causing educational delays. The spread of infection can occur quickly in school and child care settings. These children can spread the infection to family members in the home settings, which consequently can lead to a confounding problem of absenteeism from work. These data are compelling arguments of the importance of all school and child care centers to implement an effective handwashing program.

Lack of Handwashing Leads to an Increase in Healthcare Costs

As children in schools and child care settings are in close proximity with each other, there is a high risk of the spread of infections. It is estimated that the lack of proper handwashing measures leads to over 80 million cases of food poisoning in the United States each year, resulting in increased health care costs, loss of job productivity and as many as 10,000 deaths per year. About 20,000 people die each year from acquired infections within health care facilities, primarily due to the lack of handwashing and infection control programs. Five hundred million dollars would be saved if 17% of health care facility acquired infections were prevented (Case, 2009). The effects of handwashing programs can significantly decrease child healthcare costs associated with physician visits, prescriptions, hospital admissions and emergency room visits.

Effective Interventions for Handwashing Programs in Children

Many studies have been conducted to determine the most effective interventions for children. Interventions that have been found to positively influence handwashing behaviors include presentations and discussions, handwashing videos and stories, Glo Germ™ simulation devices with ultraviolet light, return demonstration, agar microorganism cultures, storytelling, modeling and handwashing demonstration with the availability of products such as warm water, soap, towels or hand sanitizer.

Handwashing Education Presentation and Discussion. A majority of handwashing education programs begin with explaining how, why and when to wash hands. The CDC (2009b) recommends washing hands by rubbing together for at least 10-15 seconds using warm water and soap. All surfaces of the hands, wrists, palms, back of hands, fingers and under fingernails should be washed. After washing, a hand lotion is

recommended to prevent dry skin. Studies have utilized presentations and discussions as part of a multi-activity handwashing program that results in positively influence handwashing behaviors in children (Day, Arnaud, & Monsma, 1993; Early et al., 1998; Snow et al., 2008; Trousman et al., 2007; Witt & Spencer, 2004).

To influence participation in positive handwashing behaviors, it is important for children to first gain knowledge about germs, how they cause infection, and why handwashing is important in preventing the spread of infection. It has also been found that while presentations and discussion can lead to immediate positive influence on handwashing behaviors. This intervention alone is not enough to influence positive handwashing behaviors over time. Using handwashing presentations and discussions in combination with other activities that have been found to be effective are more likely to lead to successful outcomes over time (Early et al., 1998).

Glo Germ™ Liquid and Ultra-violet Light. Training devices like GlitterBug® and Glo Germ™ can make handwashing education programs fun and interactive, capturing the attention of children. These are training devices that are useful in demonstrating handwashing effectiveness. The training devices contain a bottle of liquid, gel, or powder and a ultra-violet light. The liquid or powder contains the plastic simulated germs and the ultraviolet light illuminates them to test the effectiveness of your handwashing practices. This tool is used in many nursing schools to help teach nursing students the importance of handwashing. The tool is also useful for teaching children about how germs exist on your hands even if you cannot see them.

Witt and Spencer (2004) used Glo Germ™ as part of a five activity handwashing education program that also included a presentation and discussion, return demonstration,

a story and a video. The results showed that at the child care center, 78% of children were observed washing their hands without prompting after the program. A majority of parents (77%) reported an increase in the frequency of handwashing in the home. Tousman et al. (2007) found a 34% decrease in child absenteeism due to infections after implementing a three activity handwashing education program. The program included a presentation and discussion, a GlitterBug® training device with return demonstration, handouts, and coloring sheets. In addition to the decrease in absenteeism at school, 64% of the parents of the children reported an increase in the frequency of their child's handwashing behavior, while 50% noticed an increase in the duration of handwashing.

Handwashing Stories, Posters, Handouts, and Videos. Several studies have found that a handwashing story or poster board can be an effective visual tool in helping influence positive handwashing behaviors in children. Guinan et al. (2002) used this intervention as part of a four activity handwashing program and found a decrease in absenteeism from infectious diseases in children. The program included a presentation and discussion combined with an educational video, a handout for students to color, and ensuring that resources such as soap, towels and hand sanitizer were readily available for students to wash their hands. Both Early et al. (1998) and Witt and Spencer (2004) used handwashing story books or story boards along with pamphlets and videos to help reinforce the importance of handwashing in conjunction with a presentation and discussion. Early et al. (1998) found a significant increase in the proportion of handwashing frequency from 45% pre-handwashing program interventions to 67% post handwashing program interventions ($p = 0.03$).

Return Demonstration. Educational programs can be successful when they meet the needs of a variety of learners by including visual, auditory and tactile interventions. Hands on activities can provide a way of reinforcing what the learner has seen or heard. By allowing children to perform a handwashing return demonstration, teachers are able to observe techniques and help children correct incorrect handwashing behaviors. This tactile form of leaning captures the child's attention in a fun and interactive way.

A return demonstration handwashing activity has been used in several studies where positive handwashing outcomes were achieved. Snow et al. (2008) implemented a handwashing education program using modeling and return demonstration as an activity. Three months post-intervention, 78% of children were still washing their hands before lining up for lunch. Modeling and return demonstration can be an effective strategy with children learning appropriate behaviors. Witt and Spencer (2004) used several handwashing activities on return demonstration. One activity included students putting petroleum jelly and nutmeg on their hands to simulate germs and then attempting to wash hands correctly after watching a demonstration of correct handwashing technique. Another return demonstration intervention included students using the Glo Germ™ training device to wash the Glo Germ™ liquid off of their hands. These forms of handwashing activities help to capture the tactile learners by providing hands-on learning.

Agar Plates for Microorganism Cultures. To assist children in understanding that germs exist on their hands even if they cannot see them, Day et al. (1993) used agar microorganism culture plates as part of a presentation and discussion on germs and handwashing. The agar plates provide an optimal environment and medium for bacterial growth. Each child placed their hand on an agar plate before washing their hands and

after washing their hands. The agar plates were incubated for 48 hours to allow the microorganisms to grow and be visible. Children were excited about their intervention and could not wait to see the results of their experiment. Results showed a 27.7% improvement in the handwashing technique of the children and a further improvement of 6% after one month. The results were still sustained at three months post intervention.

Tousman et al. (2007) also used agar plates to demonstrate the growth of microorganisms in conjunction with presentations and discussions, GlitterBug® return demonstration, handouts and stickers. The results of the agar plate experiments were shown to the children and staff to help them determine if the agar plate after handwashing had fewer germs, more germs or the same germs compared to the agar plates which had been exposed to hands before handwashing to determine the child's handwashing effectiveness. Results showed that a statistically significant number of plates (58%) were cleaner after handwashing ($p = < 0.001$).

Visibility and availability of warm water, soap, towels, and hand sanitizer. When implementing handwashing interventions, it is important for programs to have resources readily available for students to perform their hand hygiene including warm water, soap, towels and/ or the addition of hand sanitizer. Without the availability of resources, children will not be able to perform recommended handwashing procedures correctly and routinely. The success of a handwashing program is partly dependent on the availability and type of supplies. Guianan, et al. (2002) consistently provided warm water, soap, towels and hand sanitizer to students to encourage hand hygiene practices. The availability of the hand hygiene products were part of a four activity handwashing program and found 50.6% reduction in absenteeism from infectious diseases in children.

Another student noted that a handwashing program reduced absenteeism due to respiratory and gastrointestinal infections by 25% (Dyer, Shinder, & Shinder, 2000).

A meta-analysis was performed to quantify the effects of a variety of hand-hygiene interventions on rates of respiratory and gastrointestinal infections. Four electronic databases for hand hygiene trails were published January 1960-May 2007. When handwashing programs were implemented, a 21% reduction in respiratory infections and a 31% reduction in gastrointestinal infections were noted. The most beneficial handwashing intervention was handwashing education with a non-antibacterial soap (Aiello, Coulborn, Perez, & Larson, 2008).

Literature Review Summary

The literature shows interventions using a variety of activities that positively influence handwashing behaviors in children including presentations and discussions, handwashing videos and stories, Glo Germ™ simulation devices with ultraviolet light, return demonstration, agar plates, modeling and availability of products such as warm water, soap, towels or hand sanitizer. Implementing a multi-activity handwashing education program is more likely to influence positive behaviors and have successful results over time than single activity handwashing education programs. Using activities that include a variety of teaching modalities, including visual, auditory and tactile, the handwashing program positively influences handwashing behaviors in child learners.

Chapter Three

Methodology

An evidence based multi-activity handwashing education program was implemented in children three to six years of age. The purpose of these activities was to improve the handwashing behavior in children in a community school setting. The objective of the program was to decrease the spread of infection, decrease absenteeism, and decrease antibiotic use.

Research Design

The project used a pre- and post-test design to measure the effectiveness of a multi-activity handwashing education program in the children. A descriptive analysis of the participants was computed. Differences in the pre- and post scores on a Parent Report Survey were analyzed.

Sample and Setting

Data were collected from the eligible parents of 47 children in pre-kindergarten and kindergarten classrooms at TLC Kids Care, a private school/child care center in Volusia County, Florida. The parents completed a Parent Report Survey before and after the children participated in a multi-activity handwashing education program. Thirty participants completed the program and returned the post-intervention survey.

Protection of Human Subjects

Approval for the project was granted by the Institutional Review Board of the University of North Florida (Appendix A). The director of TLC Kids Care gave consent for the school to participate in the project and classroom teachers were educated about the project (Appendix B). Informed consent was obtained from the participating parent or guardian of each of the children. Letters explaining the study (Appendix C) and consent forms (Appendix D) were sent home to be completed by the parents of the children and returned to the school. The pre-intervention parent report surveys were sent home approximately one week prior to the beginning of the project. The activities of the handwashing program are listed below and took place over a four week period.

Evidence Based Intervention Plan

A multi-activity handwashing education plan was implemented in a private child care setting called TLC Kids Care and included a presentation and discussion, a handwashing demonstration, a return demonstration by the children, the use of a Glo Germ™ training device, and a handwashing educational video. A bar of soap, coloring sheets, stickers, and coloring story sheets were given to the children as a reward after each activity.

Activity I: Handwashing education. A discussion on the basic concept of handwashing was presented to the children. The focus was on teaching correct handwashing behaviors and targeted visual and auditory learners. A presentation on the concept of handwashing and a discussion on how, why and when children should wash their hands was completed (Appendix E). The following five steps of handwashing were presented:

1. Rinsing hands with warm water
2. Placing the soap on the hands
3. Rubbing the hands together on all surfaces including nails
4. Rinsing the hands with warm water
5. Drying with a towel

Children watched a demonstration on proper handwashing and received a small bar of soap after the presentation as their reward.

Activity II: Handwashing Return Demonstration Practice. The children first participated in a review of the handwashing presentation and discussion from activity one. When, why, and how handwashing should be completed was reviewed. Activity two targeted tactile and visual learners and included a return demonstration by the children on proper handwashing (Appendix F). The steps of activity two are listed below.

1. Children were encouraged to wash all parts of their hands using soap and warm water for at least ten seconds.
2. Children were asked to sing the alphabet song while washing their hands to encourage the correct time allotment of at least ten seconds for proper handwashing to be met.
3. The children received a handwashing coloring sheet after the return demonstration as a reward (Appendix G).

Activity III: Handwashing and Glo Germ™ Liquid. Children first participated in a review of activities one and two. Activity three was ideal for tactile and visual learners and meant to reinforce the concept that even though children can't see germs, they are still there. A Glo Germ™ training device advertised as the number one

product for teaching handwashing and general handwashing education was used. The Glo Germ™ Liquid training device consisted of a liquid and an ultraviolet light. The liquid consisted of 85% USP Mineral oil and 15% synthetic organic colorant and was safe for use on children. (Appendix H). The process for activity three is described below.

1. A Glo Germ™ liquid was placed on the child's hands.
2. Children demonstrated proper handwashing and then an ultraviolet light was shown on their hands to show where the child did not wash off all of the "germs". Children were instructed to not look at the ultra-violet light.
3. After the children were able to see their hands under the ultra-violet light showing the areas that were missed with handwashing, a discussion of what they had learned was completed.
4. The children were given stickers after the activity as a reward.

Activity IV: Handwashing video. This activity utilized videos and stories to help reinforce handwashing practices and meet the needs of auditory and visual learners (Appendix I). The steps for activity four are described below.

1. Children watched a five minute video while listening to a story on the computer from the "Hooray for Handwashing" website. This was a program designed for preschool children in learning about handwashing. The video was called "Soap and Sudsy."
2. After the video, a discussion on what was learned was reviewed. Children demonstrated how to properly wash their hands again.
3. A summary of the handwashing program including when, why, and how to wash hands was completed.

4. A coloring sheet book summarizing the “Hooray for Handwashing” story in the form of coloring sheets was given to all children as a reward (Appendix J).

Instrumentation

The outcome of interest was measured using a Parent Report Survey. The survey was sent home to the parents to be completed before the handwashing education program and eight weeks after the completion of the handwashing education program. A pre-intervention Parent Report Survey included ten questions regarding demographic information and current handwashing behaviors of the child in the home (Appendix K). The post-intervention Parent Report Survey consisted of ten questions addressing the handwashing behavioral change of the child (Appendix L). Six questions were the same in both the pre-intervention survey and post-intervention survey. Of these six questions, four of the questions were measured on 4-point Likert scale (always, most of the time, some of the time, never) and two of the questions were yes/no responses. Differences in pre- and post- results were analyzed. The Parent Report Survey measured the parent’s report of handwashing behaviors of the child in the home setting after participating in the handwashing education program in the child care center.

Each survey (pre-intervention and post intervention) took the parent less than five minutes to complete. The survey questions were representative of questions commonly used to assess handwashing behaviors in children. The instrument questions had been adopted from ‘The Handwashing Habits of Pre-School Children’ survey tool used previously to measure the effectiveness of a multi-activity handwashing education program. Permission to use the questions was granted by the author, Holly S. Kihm, PhD, CCLS, CFLE (Appendix M). The Parent Report Survey questions were also reviewed by

a Behavioral Change expert, Stuart Tousman PhD, who has conducted research on handwashing education programs and found the questions to be valid and appropriate for measuring handwashing behaviors (Appendix N).

Details of the project and Parent Report Survey were described in the letters sent home to the parents with the parent consent form. The activities of the handwashing education program took place over a four week period. A time table describing the activities can be found in Appendix O.

Feasibility

The Handwashing Education program was timely and affordable. It can be easily replicated in other schools or child care centers. Resources needed to implement the project include soap, running warm water, towels, Glo Germ™ Liquid Training Kit ($71.50 for 200-300 applications), rewards for children participation (soap, coloring sheets, stickers, and coloring story sheets), and computer access with internet. A template of the project can easily be sent via email with directions to other schools and child care centers interested in implementing the project.

Statistical Analysis

Descriptive methods (frequencies and percentages) were used to describe the demographic data including gender, age and ethnicity. Data collected from the Parent Report Survey was analyzed for pre- and post- differences across the groups and tabulated using means and standard deviations for the Likert data with percentages for each of the responses. Differences in pre- and post- scores on questions four, five, six and seven on the pre-intervention survey and identical questions one, two, three and four on the post-intervention survey were analyzed using the paired t-test.

Frequency, correct technique procedure, and understanding of the relationship between germs, illness and handwashing were measured using parametric statistics. To measure frequency of handwashing, a paired-t test was performed on Post-Parent Report Survey Question three and four versus Pre-Parent Report survey question six and seven. For correct technique procedure of handwashing, a paired-t test was performed on Post-Parent Report Survey Question one and two versus Pre-Parent Report survey question four and five. Understanding of the relationship between germs, illness and handwashing was measured using mean percentages and standard deviations comparing the differences in question eight and nine on the pre-intervention survey and identical questions five and six on the post-intervention survey. The mean percent improved and confidence intervals were reported.

An overall handwashing behavior score was created by averaging Pre-Parent Report survey questions four, five, six and seven and averaging corresponding Post-Parent Report survey one, two, three and four. The overall Pre-Parent report score for handwashing behavior was compared with the overall Post-Parent report score using a paired-t-test. Differences between groups were measured. The results of the statistical analysis are discussed in chapter four.

Chapter Four

Results

This chapter presents the results of the statistical analysis of the data collected from the Multi-Activity Handwashing Education Program. A descriptive analysis of the children who participated in the program is presented below followed by the results of the differences in the pre- and post-intervention data collected from the parents of the participating children.

Description of the Participants

Forty-seven children were eligible to participate in the project. Thirty participants completed the project and returned the post intervention data. Of the thirty participants that completed the project 17 (57%) were male and 13 (43%) were female. While the children's ethnic decent ranged from African American, Asian, American Indian, and Mexican, the majority of the participants were Caucasian (87%). The age of the children ranged from three to six years with the mean age being 4.7. Only one three year old child participated. Table 4.1 describes a summary of the children's characteristics.

Table 4.1
Subject Characteristics

Variable	n	(%)
Gender		
Male	17	(57)
Female	13	(43)
Ethnicity		
Caucasian	26	(87)
Other (Asian, African American, American Indian)	4	(13)
Age		
3 years old	1	(3.3)
4 years old	10	(33)
5 years old	14	(47)
6 years old	5	(17)

Pre-Intervention Parent Report Survey Data

Handwashing behaviors were reported by the parents on the pre-intervention Parent Report Survey. Only 50% of the parents reported that their children always used soap when washing their hands. Parents also reported that a majority of the children (83%) did not consistently rub their hands together for at least 10 seconds when washing. Most of the children (83%) required prompting to wash their hands before eating at least some of the time. Only 27% of parents reported that their child washed his/her hands consistently without prompting after using the restroom.

Parents also answered questions on their child's knowledge regarding germs, handwashing and illness. A majority of the parents (93%) reported that their child understood that germs can make you sick, and most (87%) reported their child understood that handwashing can get rid of "germs."

Pre-Intervention Parent Report Survey in Relation to Age and Gender. The pre-intervention parent report data of frequency found that female children (*M* = 2.31) scored higher initially than male children (*M* = 1.94) on washing hands before eating. Female children also scored higher (*M* = 3.0) than male children (*M* = 2.76) on washing their hands after using the restroom. Four year old children scored higher (*M* = 2.5) than five (*M* = 1.93) and six (*M* = 1.8) year old children on washing hand before dinner. Four year old children (*M* = 3.2) also scored higher than five (*M* = 2.71) and six (*M* = 2.6) year old children on washing their hands after using the restroom. All children were more likely to wash hands after using the restroom (*M* = 2.87) than before eating (*M* = 2.1).

With regard to correct technique procedure on rubbing hands together for at least 10 seconds, there were no significant differences reported between groups (age and gender). All children were more likely to use soap (*M* = 3.33) than to rub hands together for 10 seconds (*M* =2.7). With regard to age, four year old children (*M* =3.6) were more likely than five (*M* = 3.21) and six (*M* = 3.0) year old children to use soap when washing their hands. Since 87% of the children were Caucasian, differences between ethnic groups were not measured.

Post-Intervention Parent Report Survey Data

Table 4.2 summarizes a comparison of the data collected from parents pre-intervention and eights week post intervention. Parents reported that eight weeks post-intervention, most of the children (73%) used soap consistently when washing hands, and that 60% reported that their child consistently rubbed his/her hands together for at least ten seconds. All of the parents reported that their child washed their hands without

prompting at least some of the time; most children (57%) washed their hands after using the restroom at home without prompting from an adult.

Table 4.2
Comparison of Pre-Post Intervention Parent Reports of Handwashing Behaviors

	Pre-Intervention				Post-Intervention			
Variable	n	(%)	M	SD	n	(%)	M	SD
Correct Technique Procedure								
Use of Soap			3.3	0.76			3.7	0.54
Sometimes	5	(17)			1	(3)		
Most of the time	10	(33)			7	(23)		
Always	15	(50)			22	(73)		
Rubbing hands for at least 10 seconds			2.7	0.79			3.6	0.5
Never	1	(3)						
Sometimes	12	(40)						
Most of the time	12	(40)			12	(40)		
Always	5	(17)			18	(60)		
Handwashing Frequency								
Washes hands before eating without prompt			2.1	0.66			2.9	0.71
Never	5	(17)						
Sometimes	17	(57)			9	(30)		
Most of the time	8	(27)			15	(50)		
Always					6	(20)		
Washes hands after restroom without prompt			2.87	0.90			3.5	0.57
Never	2	(7)						
Sometimes	8	(27)			1	(3)		
Most of the time	12	(40)			12	(40)		
Always	8	(27)			17	(57)		

Table 4.2 (continued)
Comparison of Pre-Post Intervention Parent Reports of Handwashing Behaviors

	Pre-Intervention				Post-Intervention			
Variable	n	(%)	M	SD	n	(%)	M	SD
Child understands germs can make them sick			1.07	0.25			1.0	0.00
Yes	28	(93)			30	(100)		
No	2	(7)			1	(3)		
Child understands that handwashing can remove germs			1.13	0.35			1.0	0.18
Yes	26	(87)			29	(97)		
No	4	(13)			1	(3)		

Table 4.3 shows the differences in the parent's report of the frequency, duration, and need for prompting of their child's handwashing behavior. Most parents (80%) reported that they noticed an increase in how often their child washes his/her hands. Most parents (83%) noticed an increase in the duration of how long their child washes his/her hands, and a majority (90%) noticed a decrease in how often they needed to prompt their child to wash his/her hands.

Table 4.3

Parent Noticed Differences in their Child's Handwashing Behavior

Variable	n	(%)	M	SD
Parent noticed increase in how often child washes hands			1.2	0.41
True	24	(80)		
False	6	(20)		
Parent noticed increase in duration of time child washes hands			1.17	0.38
True	25	(83)		
False	5	(17)		
Parent noticed a decrease in need to prompt child to wash hands			1.10	0.31
True	27	(90)		
False	3	(10)		

Effectiveness of the Program on Increasing the Frequency of Handwashing

Handwashing frequency was measured using parametric statistics. A paired-t test was performed on Post-Parent Report Survey questions three and four versus Pre-Parent Report Survey questions six and seven. The multi-activity handwashing education program effectively increased both the frequency of the children washing their hands before eating and after using the restroom at home without prompting from an adult. Parent ratings of the frequency of their child washing their hands before eating (M = 2.90, SD = .712) t (29) = -4.56, p = .000, and after using the restroom (M = 3.53, SD = .571) t (29) = -4.55, p = .000 at home without prompting from an adult increased significantly after the handwashing educational program. The effect size, estimated with Cohen's *d*, was 1.69 indicating a large effect size. Table 4.4 summarizes the effectiveness of the program in relation to the frequency of handwashing.

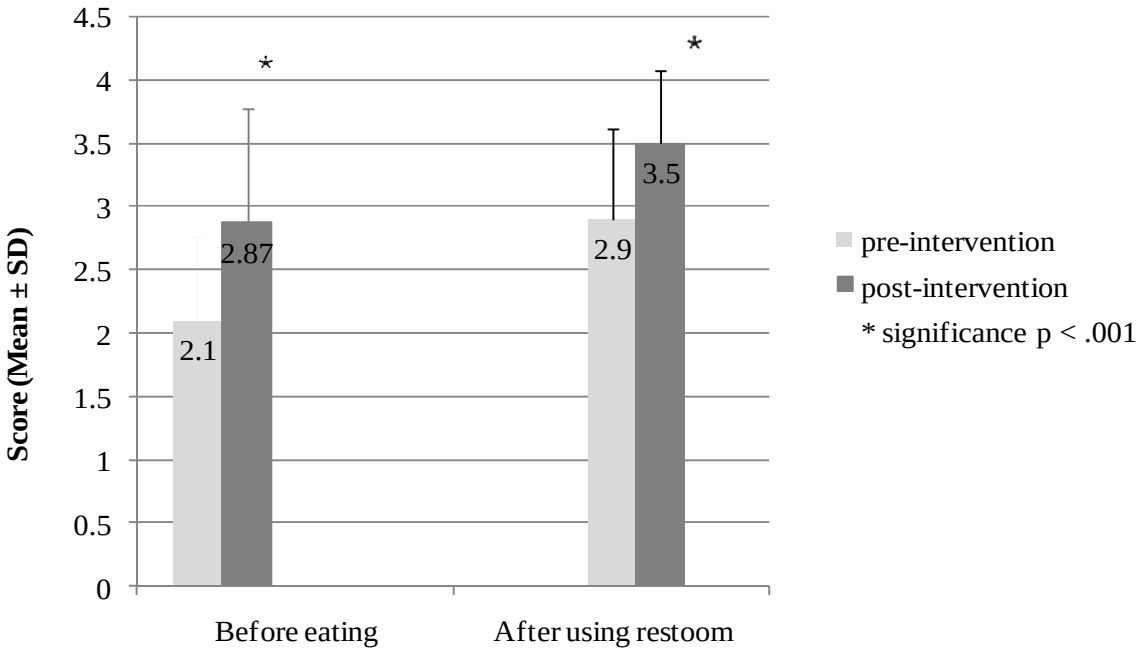


Figure 4.4. **Frequency of Handwashing** The post intervention frequency mean for before eating (*M* = 2.9, *SD* = 0.71) and after using the restroom (*M* = 3.5, *SD* = 0.57) was statistically significantly greater than the pre-intervention before eating (*M* = 2.1, *SD* = 0.66) and after using the restroom (*M* = 2.87, *SD* = 0.90).

Effect of the program on gender and frequency. The multi-activity handwashing education program most effectively increased the frequency of the male children when washing their hands before eating and after using the restroom at home without prompting from an adult. Parent ratings of the frequency of their male children washing their hands before eating at home (*M* = 2.88, *SD* = .697) *t* (16) = -5.19, *p* = .000, and after using the restroom (*M* = 3.53, *SD* = .514) *t* (16) = -4.75, *p* = .000 at home without prompting from an adult significantly increased after the handwashing educational program. The effect size, estimated with Cohen's *d*, was 2.60 and 2.37 respectively, indicating a large effect size.

Effect of the program on age and frequency of handwashing behavior. The multi-activity handwashing education program most effectively increased the frequency of the five year old children washing their hands before eating at home without prompting from an adult. Parent ratings of the frequency of their five year old children washing their hands before eating at home without prompting from an adult (M = 2.93, SD = .616) significantly increased, t (13) = -6.75, p = .000, after the handwashing educational program. The effect size, estimated with Cohen's d, was 3.74 indicating a large effect size.

The multi-activity handwashing education program effectively increased the frequency of five and six year old children washing their hands after using the restroom at home without prompting from an adult. Parent ratings of the frequency of their five year-old children (M = 3.50, SD = .519) t (13) = -4.20, p = .001, and 6 year old children (M = 3.40, SD = .548) t (4) = -4.00, p = .016, significantly increased for washing their hands after using the restroom at home without prompting from an adult after the handwashing educational program. The effect size, estimated with Cohen's d, was 2.33 and 4.0 respectively indicating a large effect size. Table 4.5 summarizes the handwashing education programs effect on frequency and age, and gender.

Table 4.5
Handwashing Education Program's Effect on Frequency and Age and Gender

		Pre-Intervention		Post-Intervention	
Variable	n	M	SD	M	SD
Gender					
Males washing hands					
Before eating without prompt	17	1.94	0.56	2.88	0.7
After restroom without prompt	17	2.76	0.90	3.53	0.51
Females washing hands					
Before eating without prompt	13	2.31	0.75	2.92	0.76
After restroom without prompt	13	3	0.91	3.54	0.66
Age					
4 year olds washing hands					
Before eating without prompt	10	2.5	0.71	3.0	0.82
After restroom without prompt	10	3.2	0.92	3.8	0.42
5 year olds washing hands					
Before eating without prompt	14	1.93	0.62	2.93	0.62
After restroom without prompt	14	2.71	0.99	3.5	0.52
6 year olds washing hands					
Before eating without prompt	5	1.8	0.45	2.8	0.84
After restroom without prompt	5	2.6	0.55	3.4	0.55

Effectiveness of the Program on Improving Correct Technique Procedure of Handwashing

Correct technique procedure of handwashing was measured using parametric statistics. A paired-t test was performed on Post-Parent Report Survey questions one and two versus Pre-Parent Report Survey questions four and five. The multi-activity handwashing education program effectively increased the children's use of soap and

rubbing their hands together for at least 10 seconds when washing their hands. Parent ratings of the frequency of their child's use of soap when washing hands (M = 3.70, SD = .535) t (29) = -2.26, p = .032 and rubbing their hands together for at least 10 seconds (M = 3.60, SD = .498) t (29) = -4.51, *p* = .000 significantly increased after the handwashing educational program. The effect size, estimated with Cohen's *d*, was 0.84 and 1.67 respectively indicating a large effect size. Table 4.6 summarizes the effectiveness of the program in relation to the children's correct technique procedure of handwashing.

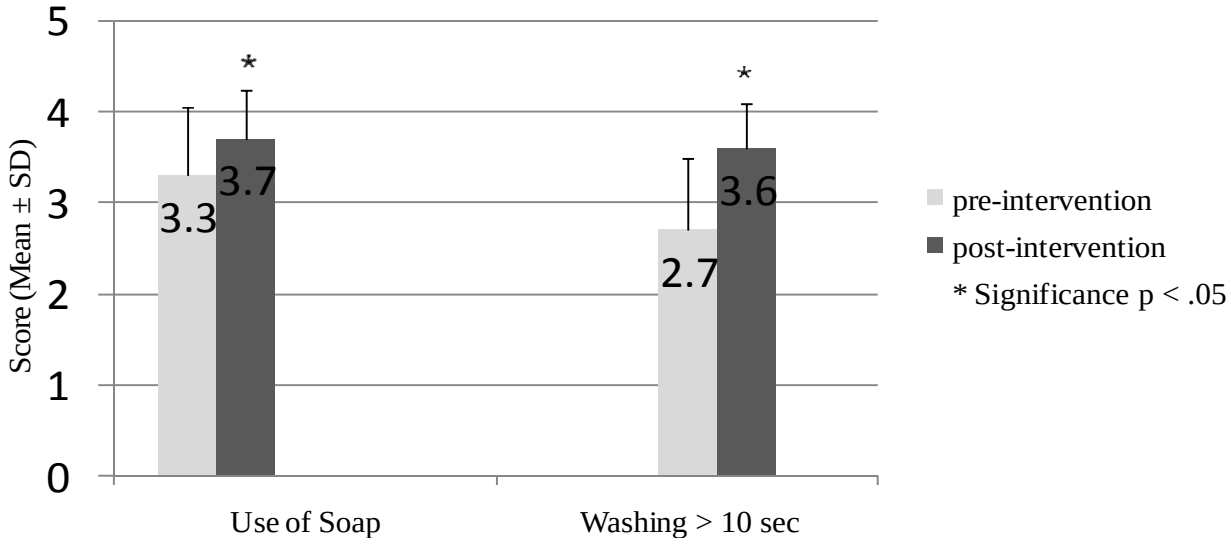


Figure 4.6. **Correct Handwashing Technique** The post intervention correct handwashing mean for use of soap (*M* = 3.7, *SD* = 0.54) and washing for > 10 seconds (*M* = 3.6, *SD* = 0.5) was statistically significantly greater than the pre-intervention use of soap (*M* = 3.3, *SD* = 0.76) and washing for > 10 seconds (*M* = 2.7, *SD* = 0.79).

Effect of program on gender and correct technique procedure. The multi-activity handwashing education program effectively increased the frequency of both the male and female children in rubbing their hands together for at least 10 seconds when washing their hands. Parent ratings of the frequency of their male children (*M* = 3.65, *SD*

= .493) *t* (16) = -3.92, *p* = .001 and female children (*M* = 3.54, *SD* = .519) *t* (12) = -2.52, *p* = .027 rubbing their hands together for at least 10 seconds when washing their hands significantly increased after the handwashing educational program. The effect size, estimated with Cohen's *d*, was 1.96 and 1.46 respectively indicating a large effect size. With regard to gender, no significant differences post intervention was noted with the use of soap.

Effect of the program on age and correct technique procedure. The multi-activity handwashing education program was effective in increasing the frequency of the five year-old children's use of soap when washing their hands. Parent ratings of the frequency of their five-year-old child's use of soap when washing hands (M = 3.79, SD = .426) significantly increased, t (13) = -2.28, p = .040, after the handwashing educational program. The effect size, estimated with Cohen's *d*, was 1.26 indicating a large effect size.

The multi-activity handwashing education program was effective in increasing the frequency of both four and five year-old children rubbing their hands together for at least 10 seconds when washing hands. Parent ratings of the frequency of their 4-year-old children (*M* = 3.70, *SD* = .483) *t* (9) = -2.37, *p* = .042 and five year-old children (*M* = 3.64, *SD* = .497) *t* (13) = -3.242, *p* = .006 significantly increased after the handwashing educational program for rubbing their hands together for at least 10 seconds when washing their hands. The effect size, estimated with Cohen's *d*, was 1.58 and 1.80 respectively indicating a large effect size. Table 4.7 summarizes the effect of the handwashing education program on correct technique procedure on age and gender.

Table 4.7
Handwashing Education Program's Effect on Correct Technique Procedure on Age and Gender

		Pre-Intervention		Post-Intervention	
Variable	n	M	SD	M	SD
Gender					
Males					
Use of Soap	17	3.24	0.75	3.59	0.62
Rubbing hands for at least 10 seconds	17	2.76	0.75	3.65	0.49
Females					
Use of Soap	13	3.46	0.78	3.85	0.38
Rubbing hands for at least 10 seconds	13	2.62	0.87	3.54	0.52
Age					
4 year olds					
Use of Soap	10	3.6	0.52	3.5	0.71
Rubbing hands for at least 10 seconds	10	2.7	0.95	3.7	0.48
5 year olds					
Use of Soap	14	3.21	0.89	3.79	0.43
Rubbing hands for at least 10 seconds	14	2.71	0.83	3.64	0.50
6 year olds					
Use of Soap	5	3.0	0.71	3.8	0.45
Rubbing hands for at least 10 seconds	5	2.6	0.55	3.4	0.55

Understanding of Handwashing in relation to Germs and Illness

Parents reported on their child's knowledge about understanding the relationship between germs, handwashing and illness. A large number of parents 93% reported that they perceived their child understood that germs can make them sick and a large number (87%) reported that their child understood that handwashing can get rid of germs. Post-intervention reporting demonstrated a modest increase with all of the parents reporting

(100%) that their child understood that germs can make them sick and 97% understanding that handwashing can get rid of germs.

Overall Handwashing Behavior Score

An overall handwashing behavior score was created by averaging Pre-Parent Report Survey questions four, five, six, and seven and averaging corresponding Post-Parent Report survey one, two, three and four to identify gains or losses. The overall handwashing score ranged from 4-16. Overall, the multi-activity handwashing education program was effective in increasing the children's handwashing behaviors. The parent ratings of their children's handwashing behaviors (frequency and correct techniques) from pretest (M = 11.0, SD =2.10) to posttest (M = 13.73, SD = 1.14) significantly increased, t (29) = -6.500, p = .000, after the handwashing educational program. The effect size, estimated with Cohen's d, was 2.48 indicating a large effect size. Table 4.8 provides a summary of the overall handwashing behaviors pretest to posttest.

Table 4.8
Overall Handwashing Score (range = 4-16)

	Pretest	Posttest	Gain
Overall	11.0	13.73	2.73
Males	10.71	13.65	2.94
Females	11.39	13.85	2.46
Age 4	12.00	14.00	2.00
Age 5	10.57	13.86	3.29
Age 6	10.00	13.40	3.40

Overall Handwashing Scores by Gender

The multi-activity handwashing education program was effective in increasing both the male and female children's overall handwashing skills. Overall, the parent ratings of the male children's handwashing skills (frequency and correct techniques) from pretest (M = 10.71, SD = 2.02) to posttest (M = 13.65, SD = 1.12) t (16) = -6.32, p = .000 and the female children's handwashing skills (frequency and correct techniques) from pretest (M = 11.39, SD = 2.22) to posttest (M = 13.85, SD = 1.21) t (12) = -3.18, p = .008 significantly increased after the handwashing educational program. The effect size, estimated with Cohen's d, was 3.16 and 1.84 respectively indicating a large effect size. Table 4.9 is a summary of the gender by age overall handwashing behavior scores.

Table 4.9

Overall Handwashing Scores by Gender and Age Comparisons

	Four year olds		Five year olds	
Survey Items	Male (n=5)	Female (n=5)	Male (n=9)	Female (n=5)
Pre-Intervention				
Use of Soap	3.60	3.60	3.00	3.60
Rubbing hands for at least 10 seconds	2.80	2.60	2.78	2.60
Washing before eating without prompt	2.20	2.80	1.78	2.20
Washing after using restroom without prompt	3.40	3.00	2.44	3.20
Post-Intervention				
Use of Soap	3.20	3.80	3.67	4.00
Rubbing hands for at least 10 seconds	3.80	3.60	3.67	3.60
Washing before eating without prompt	3.40	2.60	2.67	3.40
Washing after using restroom without prompt	3.80	3.80	3.44	3.60

Overall Handwashing Scores by Age

The multi-activity handwashing education program was effective in increasing the four, five, and six year old children's overall handwashing skills. Overall, the parent ratings of the four year old children's handwashing behaviors from pretest (M = 12.00, SD = 2.26) to posttest (M = 14.00, SD = 1.25) t (9) = -2.41, p = .039, five year old children's handwashing skills from pretest (M = 10.57, SD = 2.03) to posttest (M = 13.86, SD = 0.86) t (13) = -6.22, p = .000, and six year old children's handwashing skills from pretest (M = 10.0, SD = 1.58) to posttest (M = 13.40, SD = 1.14) t (4) = -3.90, p = .018 significantly increased (frequency and correct techniques) after the handwashing educational program. The effect size, estimated with Cohen's d, was 1.61, 3.45, and 3.9 respectively indicating a large effect size. In most cases (all but one) the four year-old males were rated higher by the parents than were the five year-old males. The six year old children had the largest gains of all the gender and age groups (gain 4.0).

Chapter 5

Discussion

An evidenced-based multi-activity handwashing education program was implemented in children three to six years of age. The purpose of these activities was to effect change in handwashing behavior in children in a community school setting.

Summary of Hypotheses

From the data analysis, hypothesis one, which states that multi-activity handwashing education programs effectively influence the frequency of handwashing practices of three to six year old children, was supported. The parent report of the frequency of children washing their hands before eating and after using the restroom without prompting increased. Male children showed a more significant increase in the frequency of handwashing than females. Considering that the females started at a higher mean than the male children, it is difficult to determine if the program was effective or if the parent's perception was higher that female children are more likely to wash their hands frequently. Five year old children experienced the largest increase in frequency of handwashing making this age group important in targeting future programs.

A determination was made from the data analysis that hypothesis two, which states multi-activity handwashing education programs are effective in influencing the correct technique procedure of handwashing practices of three to six year old children, was supported. Parents reported an increase in both the child's use of soap and rubbing the hands for at least ten seconds when washing hands. The program was effective in

both male and female children. Parent ratings of the five year old children showed the largest increase.

Although hypothesis three, which stated that multi-activity handwashing education programs are effective in influencing the understanding of the relationship between germs, illness and handwashing of three to six year old children, was supported, only a modest increase was noted. Parents reported about a 7% increase that their children understood that germs can make them sick and about a 10% increase understanding that washing hands can remove germs. The modest increase was due to a large number of parents reporting a high number of children at this school setting already understanding these questions.

The findings of this evidence based project were consistent with the findings that were found in the literature. Witt and Spencer (2004) found that children receiving multiple activities in a handwashing education program showed an improvement regarding handwashing habits as well as an increased knowledge of the importance of proper handwashing. Tousman et al. (2007) found that a multi-activity handwashing education program implemented over several weeks led to an improvement in hand hygiene. Snow et al. (2008) found that multiple activity handwashing education programs can be timely and inexpensive and result in a sustainable increase in the frequency of hand hygiene among elementary school children.

Additional Findings

Overall, the program was effective in increasing the handwashing behaviors of the children at the school. It was unexpected that the four year old children would start out higher than the five and six year old children. The pre-intervention findings were the

parents' perception of their children and not actually observed handwashing behaviors of the child.

When asked if there was anything else parents wanted to share about the handwashing program, they reported positive comments such as "she thought it was fun," "he really learned to wash his hands," "he tells me now to wash my hands," "very informed about her ability to keep germs from spreading," "she loved it and washes her hands longer, "and "she sings the ABC song every time she washes now." Keeping parents informed of the project can help to reinforce habits learned at school in the home setting. Parents verbally expressed their approval and satisfaction of the program and showed support for future health promotion programs at the school.

The sample size was limited in terms of ethnicity with a majority of the sample being Caucasian. There was only one three year old child in the study limiting the ability to discern the effectiveness of the program with this age group. To perform a more comprehensive statistical analysis, a larger parent reporting questionnaire with expansive questions on frequency and correct technique procedure is recommended so that subscales can be created and tested. Although effect size performed on the tests indicated a large effect size, performing the program at multiple institutions can provide comparative data between settings and a large sample size.

Future Program Recommendations

The effectiveness of the program has led to the recommendation that the program be continued and expanded. Post-intervention follow-up of the program at three and six months will help to determine how often the program should be implemented in a school year. Due to seasonal fluctuations with illness, the program may need to be reinforced

three to four times throughout the year. It is recommended that, parents, teachers, and child care workers continue to role-model and reinforce the program. A larger inclusion of three year old children is recommended.

Since the program may be easily replicated, it is recommended that other child care settings and elementary schools implement the multi-activity handwashing education program. Expansion of the program can include other evidence based health promotion programs for areas such as nutrition, exercise, and stress management. Policy recommendations and a collaborative interdisciplinary approach can lead to easy implementation of the programs. With a larger sample size more intricate statistical analyses could be performed including ANCOVA and ANOVA to identify further differences between groups. The results of this project indicate the parents' perception to their child's handwashing behaviors and may not reflect actual handwashing of the children. Further measurements, such as observations, could provide more accurate reflections.

Conclusion

Nursing has a strong presence in long-term care facilities of the elderly, but very little if any presence in early childhood care settings. While long-term care focuses on the treatment of chronic disease, there is a need for early childhood care facilities to focus on health promotion and disease prevention. The results of the study have shown that multi-activity handwashing education programs are effective in increasing the children's handwashing behaviors. The children's handwashing behaviors (frequency and correct techniques) from pretest (M = 11.0, SD =2.10) to posttest (M = 13.73, SD = 1.14)

significantly increased, t (29) = -6.500, p = .000, after the handwashing educational program.

Evidence based practice handwashing education programs in children reduce the spread of childhood infections including the common cold, influenza, Swine Flu H1N1, and other respiratory and gastrointestinal infections. The effects of the handwashing programs can significantly decrease child healthcare costs associated with physician visits, prescriptions, hospital admissions and emergency room visits and influence positive health promotion behaviors in children. The results of the project will be disseminated at conferences, to child care centers, and to legislation to help facilitate a change in practice that can lead to an improved health status of children. Implementing affordable and effective handwashing education programs can lead to a reduction in infectious diseases, absenteeism, antibiotic resistance and health care costs. Health promotion programs beginning in childhood can lead to increased habits that last into adulthood and increase community health.

References

Aiello, A., Coulborn, R., Perez, V., Larson, E. (2008). Effect of hand hygiene on Infections disease risk in the community setting: A meta-analysis. *American Journal of Public Health*, *98*(8), 1372-1381.

American Nurses Foundation. (2006). *Handbook for School Nurses: Prevention, Detection and Management of Foodborne Illness*. Retrieved from http://www.foodsafeschools.org/PDFsPPT/ANF_FoodSafeSchoolsHand7.pdf

Bhide, V. (2009). Washing hands stops the spread of influenza A and H1N1 of swine origin. *General Medicine Suite 101.com*. Retrieved from http://generalmedicine.suite101.com/article.cfm/hand_washing_prevents_swine_flu_infection

Carter, K. (1983). Semmelweis, I. Etiology, concept, and prophylaxis of childbed fever. 1st ed. Madison, WI: The University of Wisconsin Press.

Case, C. (2009). *Handwashing. Access Excellence Collection*. Retrieved from http://www.accessexcellence.org/AE/AEC/CC/hand_background.php

Center for Disease Control. (2009a). 2009 H1N1 flu ("Swine Flu") and you. *Center for Disease Control and Prevention Website*. Retrieved from http://www.cdc.gov/H1N1flu/qa.htm

Center for Disease Control. (2009b). Get smart: Know when antibiotics work. *Center for Disease Control and Prevention Website*. Retrieved from http://www.cdc.gov/getsmart/antibiotic-use/anitbiotic-resistance-faqs.html

Cottingham, A. (2004). Now wash your hands please. Teaching concepts to very young children: knowledge of children's cognitive development and appropriate teaching strategies to deliver effective health promotion. *Paediatric Nursing, 16*(8), 33-36.

Day, R., Anaud, S., Monsma, M. (1993). Effectiveness of a handwashing education program. *Clinical Nursing Research, 2*(1), 24-40.

Deasy, J. (2009). The antibiotic challenge: changing clinical management of infections; common pathogens continue to evolve and learn in the process to evade antimicrobial intervention. Updated guidelines help to ensure successful treatment of these infections. Retrieved from http://www.allbusiness.com/medicine-health/diseases-disorders-urogenital/12797719-1.html

Dyer, D., Shinder, A., Shinder, F. (2000). Alcohol-free instant hand sanitizer reduces elementary school illness absenteeism. *Family Medicine, 32(*9), 633-38.

Early, E., Battle, K., Cantwell, E., English, J., Lavin, J., Larson, E. (1998). Effects of several interventions on the frequency of handwashing among elementary public school children. *American Journal of Infection Control*, *26*, 263-69.

Finkelstein, J, Davis, R. Dowell, S. Metlay, J., Soumerai, B., Rifas-Shiman, S.,. . . . Platt, R. (2001). Reducing antibiotic use in children: A randomized trial in 12 practices. *Pediatrics, 108*(1), 1-7.

Guinan, M., McGuckin, M., Ali. (2002). The effect of a comprehensive handwashing program on absenteeism in elementary schools. *American Journal of Infection Control*, *30,* 217-20.

McGuckin, M., Waterman, R., Porten, L., Bello, S., Caruso, M., Juzaitis, B.,. . . . Ostrawski S. (1999). Patient education model for increasing handwashing compliance. *American Journal of Infection Control, 27*, 309-314.

Nightingale, F. (1859). *Notes on nursing. What it is and what it is not*. Philadelphia, PA. JB Lippincott.

Pearson, M. (2009). Avoiding H1N1 Influenza - How to Avoid Catching the Swine Flu. Ezome Articles. Retrieved from http://ezinearticles.com/?Avoiding-H1N1-Influenza---How-to-Avoid-Catching-the-Swine-Flu&id=3078402

Pyrek, K. (2002). Breaking the chain of infection. Infection Control Today. Retrieved September 10, 2010 from http://www.infectioncontroltoday.com/articles/2002/07/breaking-the-chain-of-infection.aspx

Snow, M., White, G., Kim, H. (2008). Inexpensive and time efficient hand hygiene interventions increase elementary school children's hand hygiene rates. *The Journal of School Health*. 78, 4, 230-34.

Tousman, S., Arnold, D., Helland, W., Roth, R., Heshelman, N., Castaneda, O., . . . K., Bileto, S. (2007). Evaluation of a handwashing program for 2nd graders. The Journal of School Nursing. 23, 6, 342.

Witt, S., & Spencer, H. (2004). Using educational interventions to improve the handwashing habits of Preschool Children. Early Child Development and Care. 2004, 174, 5, 461-471.

Appendix A

Institutional Review Board Approval

UNIVERSITY of
NORTH FLORIDA.

Office of Research and Sponsored Programs
1 UNF Drive
Jacksonville, FL 32224-2665
904-620-2455 FAX 904-620-2457
Equal Opportunity/Equal Access/Affirmative Action Institution

MEMORANDUM

DATE: March 10, 2010

TO: Ms. Sandra M. Annesi

VIA: Dr. Elizabeth Jane McCarthy
Nursing

FROM: Dr. Katherine Kasten, Chairperson
UNF Institutional Review Board

RE: Review by the UNF Institutional Review Board IRB#10-015:
"An Evidenced-Based Multi-Activity Handwashing Education Program in Children"

This is to advise you that your project, "An Evidenced-Based Multi-Activity Handwashing Education Program in Children," has undergone "expedited, category #7" review on behalf of the UNF Institutional Review Board and was approved.

This approval applies to your project in the form and content as submitted to the IRB for review. Any variations or modifications to the approved protocol and/or informed consent forms as they relate to dealing with human subjects must be cleared with the IRB prior to implementing such changes. Any unanticipated problems involving risk and any occurrence of serious harm to subjects and others shall be reported promptly to the IRB.

Your study has been approved for a period of 12 months. If your project continues for more than one year, you are required to provide a Continuing Status Report to the UNF IRB prior to **02/10/2011** if your study will be continuing past 03/10/2011. *We suggest you submit your status report 11 months from the date of your approval date as noted above to allow time for review and processing.*

As you may know, **CITI Course Completion Reports are valid for 3 years**. Your completion report is valid through 09/26/2012. If your completion report expires soon please take CITI's refresher course. Once you complete all of the CITI modules a completion report will be emailed

UNF IRB Number: 10-015
Approval Date: 3-10-10
Revision Date:

to our office. For faster file updating purposes, however, please notify this office when you complete your CITI refresher course.

Should you have questions regarding your project or any other IRB issues, please contact the Office of Research and Sponsored Programs at 904.620.2455.

Thank you,

Research Integrity Staff

UNF IRB Number: 10-015
Approval Date: 3-10-10
Revision Date:

Appendix B

Participation Agreement

The Living Cornerstone

Tracey Mercer - Director
TLC Kids Care
1835 Taylor Road
Port Orange, Fl 32128

February 5, 2010

To Whom It May Concern:

I have read the project proposal, and as Director of TLC Kids Care pre-school, I agree for my facility to participate in the implementation of an Evidenced Based Multi-Activity Handwashing Education Program in Children. I understand that my facility will provide the means for the children to perform handwashing including sinks, warm water, soap and paper towels.

If you have any questions, please feel free to contact me at (386) 788-0490.

Sincerely,

Signature deleted

Tracey E. Mercer
Director of TLC Kids Care

A Christian based, high quality, age appropriate spirit of excellence.

TLC Kids Care
Tracey Mercer
Director

1835 Taylor Road
Daytona Beach, Florida 32128

A.C.S.I. Lic. #0081066
(386) 788-0489
Fax: (386) 788-2553

Senior Pastors: Ramona & Howard Chadwick
1835 Taylor Road • Daytona Beach, Florida 32128 • Phone (386) 788-4870 • Fax (386) 788-4983
TLC Kids Care (Preschool) • Phone (386) 788-0489
www.thelivingcornerstone.com

Appendix C

Parent Letter

Dear TLC Kids Care Parent or Guardian,

I am a Doctoral Nursing student at the University of North Florida in Jacksonville conducting my Doctoral Project. I am asking you to participate in the project by filling out two short, 10 question Parent Report Surveys. I will be implementing a two week fun, handwashing education project for the pre-kindergarten and Kindergarten children. The purpose of the project is to help teach children about proper handwashing to help prevent the spread of infection and to see if the handwashing education program affects how the child washes his/her hands eight weeks later.

The handwashing education program includes discussing when, why, and how to wash hands correctly, a demonstration on handwashing, a handwashing education training device to show children areas on their hands they may have missed when they washed their hands, and a five minute handwashing education video with a story. Your child will be given the opportunity to practice washing their hands at school and rewards for participating will be given to the child that include a small bar of soap, coloring sheet, stickers, and a coloring story book on handwashing.

If you agree to be part of this project, you will be asked to complete a short 10 question survey before the program and eight weeks after the program. All information obtained will be kept confidential. If this project is published, neither you nor your child will be identified in any way. There are no risks to your child for participating in the project and your child's classroom grade will not be affected in any way regardless of participation in the study. This project is voluntary, and you are free to choose not to participate in this project at any time. No monetary compensation will be awarded for participation.

The project will start off with you filling out the attached Parent Report Survey and returning it to the school. Your child will then participate in four, fun handwashing education activities that will be implemented over a two week period. The project will end with you completing the Parent Report Survey again, eight weeks later.

My Doctoral committee and the Institutional Review Board (IRB) of the University of North Florida have approved this project. If you have any questions regarding this project, please feel free to contact me at 386-767-2031 or my project chair, Dr. Elizabeth McCarthy at (301) 570-1299. You may also contact the Head of the UNF IRB, Dr. Katherine Kasten at (904) 620-2498.

Sincerely,

Sandra M. Annesi RN MSN CNE

Doctor of Nursing Practice Student, University of North Florida

Appendix D

Parent Consent Form

I _____give voluntary permission to participate in the
Print Name

Evidenced Based Multi-Activity Handwashing Education Program which will

involve my child _____.
Print Child's Name

I understand that I will fill out two, ten question Parent Report Surveys on my child's handwashing behaviors. My child's grade will not be affected in any way.

If my child is allergic to the hand soap at TLC Kids Care or to mineral oil, I have circled them below. My child will not participate in the activities that involve these products.

1. Hand soap at TLC
2. Mineral Oil

A copy of this has been given to me.

_____ _____
Parent or legal guardian signature Date

_____ _____
Principal Investigator Sandra M. Annesi RN MSN Date

Appendix E

Activity One – Presentation and Discussion

This activity includes a presentation and discussion on the basic concept of handwashing. This presentation will include when, why, and how to wash hands.

1. The doctoral student will first ask the children when, why, and how they wash their hands.
2. The doctoral student will then discuss with the children when, why, and how they should wash their hands.
3. Finally, a demonstration on proper handwashing will be performed by the doctoral student to show the children how to wash their hands.

1. When?
    a. after using the bathroom
    b. before and after eating
    c. after playing outside
    d. before cooking activities
    e. after playing with pets

2. Why?
    a. get rid of “germs” (bacteria and viruses)
    b. get rid of dirt

3. How? (Doctoral student will demonstrate while explaining the procedure)
    a. Rinse hands with warm water
    b. Put soap on hands
    c. rub hands together for 10 seconds
    d. rub hands together while singing the “Alphabet song”
    e. Rinse hands with warm water
    f. Dry hands thoroughly with a paper towel.

Child will be asked to summarize what they have learned. At the end of the presentation and discussion, each child will be given a small reward, a small bar of soap.

Appendix F

Activity Two – Return Demonstration

This activity includes a return demonstration by the child on handwashing and is used to reinforce the five steps of handwashing. The children will review when, why, and how to wash their hands.

1. Ask the children what they remember from the first discussion about handwashing. Then, review these points about handwashing
   a. When to wash hands
   b. Why to wash hands
   c. How to wash hands

2. Doctoral student will demonstrate the procedure for handwashing to review from activity one.
   a. Rinse hands with warm water
   b. Put soap on hands
   c. rub hands together for 10 seconds
   d. rub hands together while singing the “Alphabet song”
   e. Rinse hands with warm water
   f. Dry hands thoroughly with a paper towel

3. Ask each child to wash his or her hands following the steps demonstrated by doctoral student. A sink, warm water, soap and paper towels will be available for the child to perform handwashing.

4. Give each child a coloring sheet as a reward for properly washing his/her hands.

Appendix G

Coloring Sheet

COLORING SHEET

Name_____

I pledge to wash my hands

Appendix H

Activity Three - Glo Germ™ Handwashing Training Device

This activity will show the children that even though they cannot see “germs”, they are still on their hands. In this activity, Glo Germ® is used to represent “germs” on the children’s hands. The children will wash their hands be able to get a visualization of the areas that were missed with their handwashing.

1. Ask the children what they remember about handwashing.

    a. When to wash hands?
    b. Why we wash hands?
    c. How to wash hands?

2. Discuss “germs” with the child and reinforce that just because you are unable to see them, they still exist on your hands.

    a. What are “germs”?
    b. Review that “germs” can make you sick
    c. “Germs” are too small to see
    d. Handwashing can help remove germs from your hands

3. Explain to the children what they are going to be doing. Demonstrate to the children as you explain the activity.

    a. Three drops of Glo Germ® will be placed on your hands. The children will be told that they are going to make believe that this represent “pretend germs”. The children will be told to rub their hands together to make the Glo Germ® disappear.
    b. Children will be told that they are going to wash the “pretend germs” off.
    c. Children will be told that they are going to look at their hands under a special light to see if any “pretend germs” were left on their hands.
    d. The children will be told that the lights will be dimmed and a special light will be shown to see if any “pretend germs” are present.
    e. The children will be asked if they can see any “pretend germs” on their hands.
    f. Explain to the children that they are going to be doing the same thing. Remind them that they are not to look into the light or touch the light. The ultraviolet light will be held six inches above their hands at all times.

4. While the children participate in the activity:

    a. Remind them that even though they cannot see them, “germs” are still on their hands.

   b. Remind the children to sing the “alphabet song” while washing their hands
   c. The children will see what parts of their hands they did not get clean

5. After the remaining Glo Germ® has been washed off, discuss with the children what they have learned.
   a. “Germs” are on their hands even though they cannot see them.
   b. Handwashing helps to remove “germs” from their hands.

6. Children will be given stickers as a reward for participating in the activity.

Appendix I

Activity Four- Handwashing Video and Story

This activity includes an educational handwashing video and story. The cartoon video is used to stress when handwashing should be completed. The material is from the “Hooray for Handwashing” program.

1. Ask the children what they remember about handwashing

    a. When to wash hands
    b. Why we wash hands
    c. How to wash hands

2. Ask the children what they remember about “germs”

    a. What are “germs”?
    b. “Germs” can make you sick
    c. “Germs” are too small to see
    d. Handwashing can help remove germs from your hands

3. Explain to the children what they are going to do.

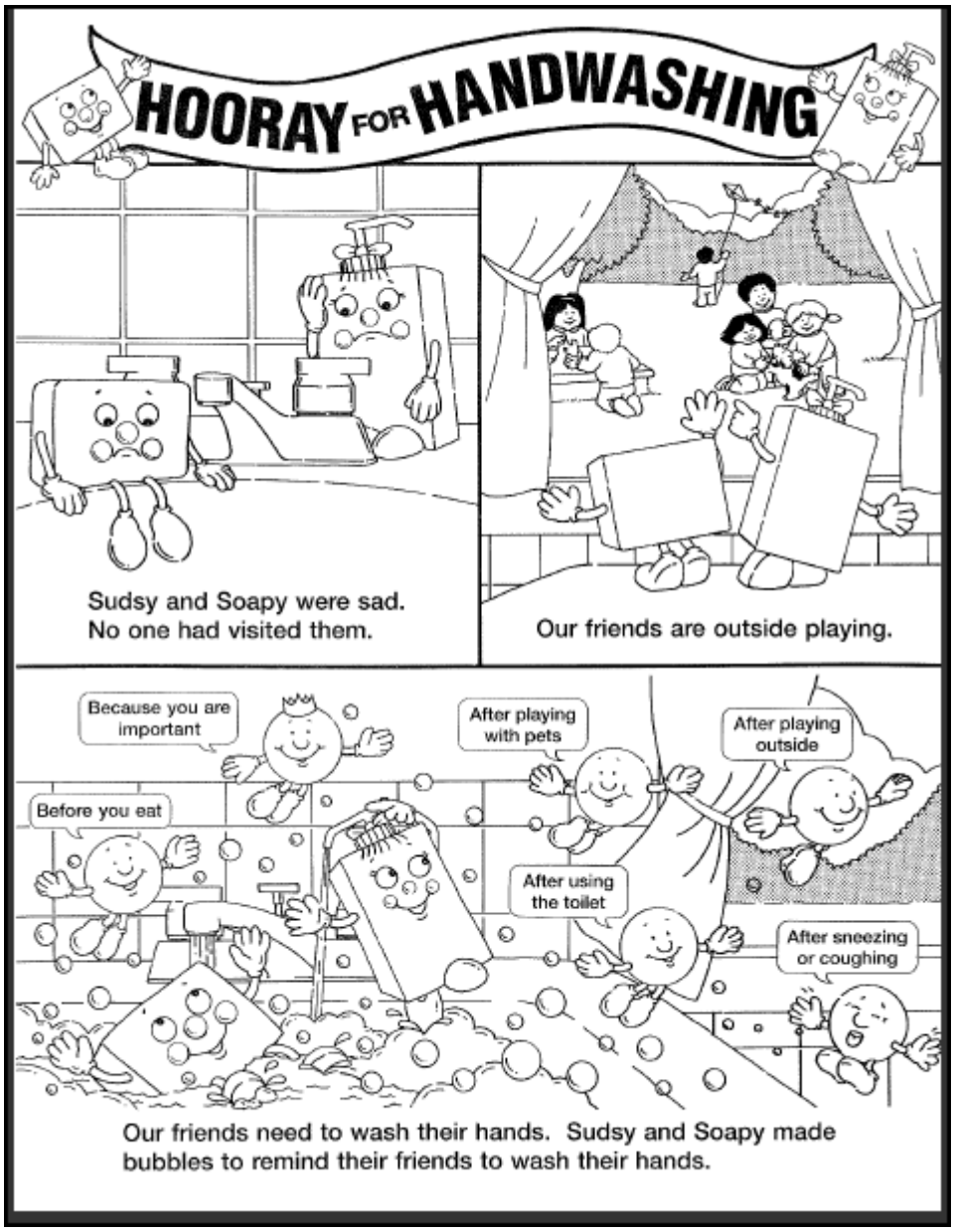
    a. The children will watch a video about “Soap and Sudsy” This story stresses the importance of handwashing.
    b. Ask the children what “Soap and Sudsy” have taught them.
    c. Discuss with the children the importance of handwashing.
    d. Discuss what the video showed as when they should wash their hands.

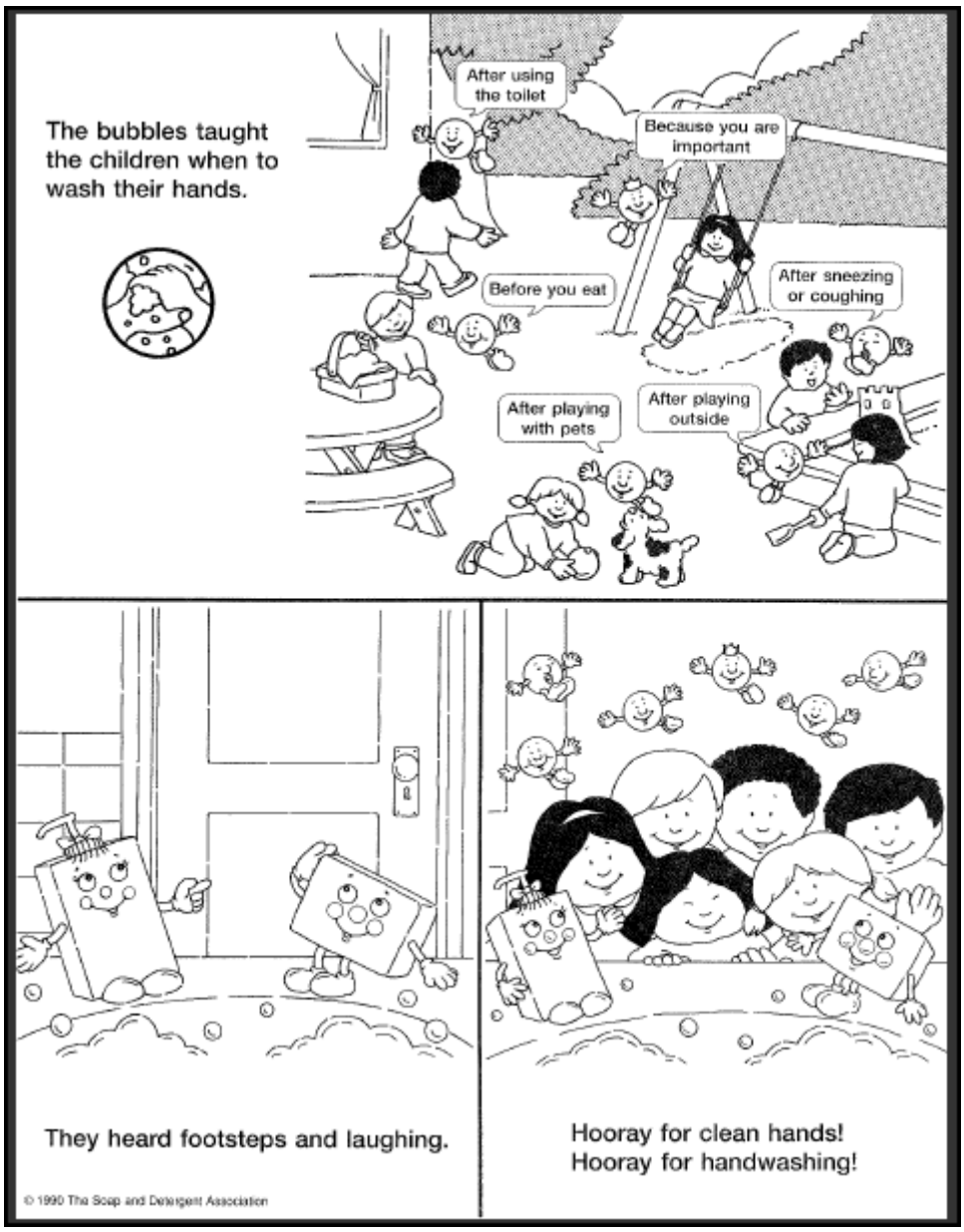
4. Have the children demonstrate proper handwashing.

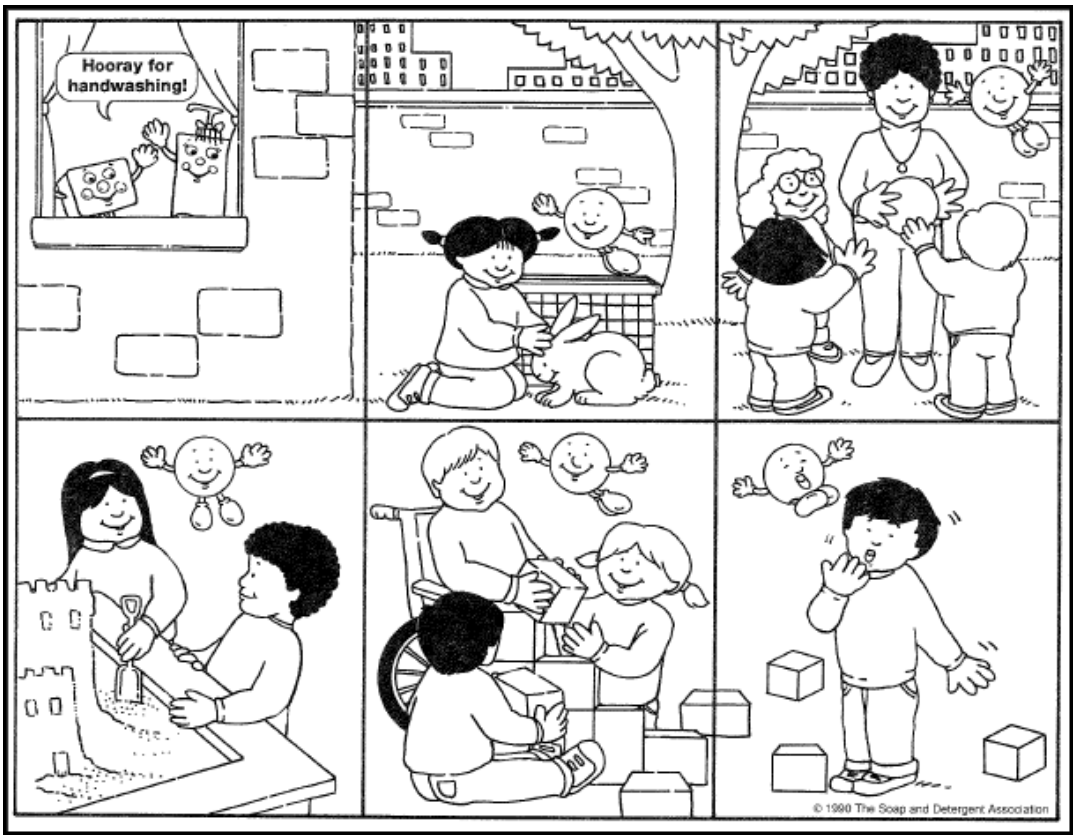
5. Give each child the “Hooray for Handwashing” story in the form of color sheets for them to color as a reward.

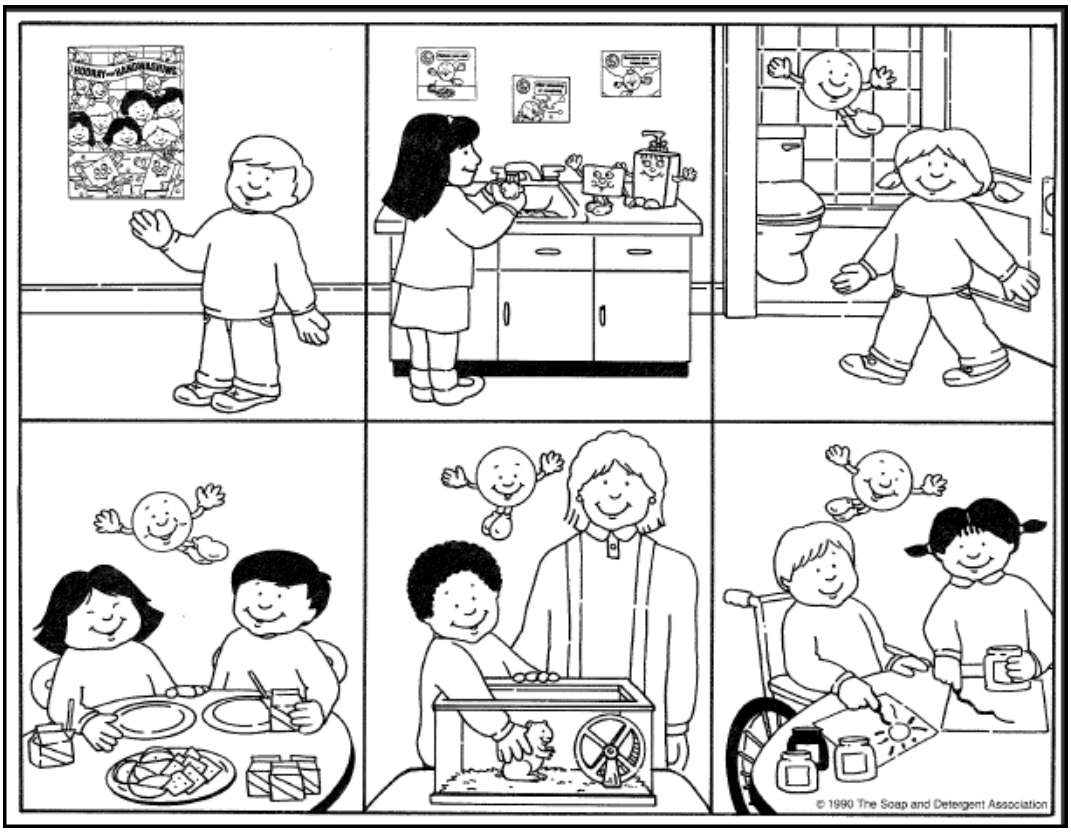
Appendix J

Handwashing Story




The bubbles taught the children when to wash their hands.
After using the toilet
Because you are important
Before you eat
After sneezing or coughing
After playing with pets
After playing outside
They heard footsteps and laughing.
Hooray for clean hands!
Hooray for handwashing!
© 1990 The Soap and Detergent Association


Hooray for handwashing!
© 1990 The Soap and Detergent Association


© 1990 The Soap and Detergent Association

Appendix K

Pre-Intervention Parent Report Survey

Your Name_____ Your child's name: _____

Please circle the best response.

1. What sex is your child?
    1. Male
    2. Female

2. What is the age of your child?
    1. 3 years old
    2. 4 years old
    3. 5 years old
    4. 6 years old

3. What is the ethnicity of your child?
    1. African American
    2. Asian
    3. Caucasian
    4. Hispanic
    5. Other _____

4. Does your child use soap when washing his/her hands?
    1. never
    2. sometimes
    3. most of the time
    4. always

5. Does your child rub his/her hands together for at least ten seconds when washing hands?
    1. never
    2. sometimes
    3. most of the time
    4. always

6. Does your child wash his/her hands before eating at home **without** prompting from an adult?
    1. never
    2. sometimes
    3. most of the time
    4. always

7. Does your child wash his/her hands after using the restroom at home **without** prompting from an adult?
    1. never
    2. sometimes
    3. most of the time
    4. always

8. Does your child understand that germs can make you sick?
    1. _____yes
    2. _____ no

9. Does your child understand handwashing can get rid of “germs”?
    1. _____ yes
    2. _____ no

10. Is there anything else you can tell me about your child’s handwashing behaviors?

    _____

    _____

Appendix L

Post-Intervention Parent Report Survey

Your Name_____ Your child's name: _____

Please circle the best response.

1. Does your child use soap when washing his/her hands?
    1. never
    2. sometimes
    3. most of the time
    4. always

2. Does your child rub his/her hands together for at least ten seconds when washing hands?
    1. never
    2. sometimes
    3. most of the time
    4. always

3. Does your child wash his/her hands before eating at home **without** prompting from an adult?
    1. never
    2. sometimes
    3. most of the time
    4. always

4. Does your child wash his/her hands after using the restroom at home **without** prompting from an adult?
    1. never
    2. sometimes
    3. most of the time
    4. always

5. Does your child understand that germs can make you sick?
    1. _____yes
    2. _____ no

6. Does your child understand handwashing can get rid of "germs"?
    1. _____ yes
    2. _____ no

7. During the past 8 weeks, I have noticed an increase in how often my child washes his/her hands?

    1. True
    2. False

8. During the past 8 weeks, I have noticed an increase in the duration of how long my child washes his/her hands?

    1. True
    2. False

9. During the past 8 weeks, I have noticed a decrease in how often I need to prompt my child to wash his/her hands?

    1. True
    2. False

10. What was your child's response to the handwashing education program at school?

_____

_____

Appendix M

Permission to Use Questions for Parent Report Survey

From: Holly Kihm [mailto:holly.kihm@selu.edu]
Sent: Wed 1/20/2010 2:47 PM
To: Annesi, Sandra
Subject: Re: Handwashing Publication

Hi Sandra,
I am so sorry I am so late in replying. I have been on maternity leave since the end of November, and I am just now getting through my emails! Please feel free to use the tool if you still need it. I realize you may have found another resource, but if you still would like to use it, you certainly have my permission. Good luck with your project!

Holly S. Kihm, PhD, CCLS, CFLE
Assistant Professor
Counseling and Human Development
223-B White Hall
985.549.3268

On Thu, Dec 3, 2009 at 1:17 PM, Annesi, Sandra <s.annesi.98503@unf.edu> wrote:
Thank you Susan,
Holly, I am a doctoral nursing student interested in implementing an evidenced based nursing project on handwashing education of children. I am requesting permission to use the parent report survey and your observational tool that you used in the study Witt, S, & Spencer, H, (2004). Using educational interventions to improve the handwashing habits of preschool children. Early Child Development and Care. 2004, 174, 5, 461-471. I have copies of the tools and am seeking your permission to use them for my doctoral project. Please let me know if this is allowed. Your help is appreciated. Thank you.

Sandra M. Annesi RN MSN CNE
Doctor of Nursing Practice Student
University of North Florida
s.annesi.98503@unf.edu

From: Witt,Susan D [mailto:susan8@uakron.edu]
Sent: Thu 12/3/2009 1:28 PM
To: Annesi, Sandra
Subject: RE: Handwashing Publication

Sandra - I think it would be best if you would contact my co-author on that article and check with her. She did the actual implementation of that and would be the best one to let you know if you'll be able to use it. I've put her contact information below. Susan Witt Holly Kihm (formerly Spencer) holly.kihm@selu.edu

Appendix N

Behavioral Change Expert Review of Parent Report Survey

From: Tousman, Stuart A. [mailto:SATousman@jchs.edu]
Sent: Thu 12/17/2009 2:08 PM
To: Annesi, Sandra
Subject: RE: Handwashing research article

Hi Sandra,
Your questions look good. Many of the parents for our 2nd graders reported that their children were telling everyone else in the house to wash and such. I think your survey allows for that in the anything else category. Keep in touch. I am happy to assist.

Dr. Stuart Tousman PhD
Associate Professor of Psychology
Health Psychology
Jefferson College of Health Science
920. South Jefferson St.
Roanoke VA 24018
SATousman@jchs.edu
540-985-8371

From: Annesi, Sandra [s.annesi.98503@unf.edu]
Sent: Thursday, December 17, 2009 1:11 PM
To: Tousman, Stuart A.
Subject: RE: Handwashing research article

Thank you for your response Dr. Tousman,
Your work on behavioral change is impressive, and I have read your article. I would like to ask your opinion as a behavioral change content expert. As I mentioned previously, I am implementing a multi-activity handwashing education program in children. The activities in the handwashing education program will include a presentation and discussion, a handwashing demonstration, a return demonstration by the children, the use of a Glo Germ(tm) training device, and a handwashing educational video.
Like the questions used to evaluate the handwashing program in your article, most of the instruments used to evaluate the effectiveness of handwashing education programs are straight forward and descriptive with little reliability and validity of the instrument reported. As an expert in behavioral change, would you please review the pre-intervention and post intervention Parent Reporting Survey Instruments below and give your expert opinion if these questions would be appropriate in evaluating the parent reporting of handwashing behaviors of children in the home setting? You will notice that questions 8-11 on the post intervention survey are directly related to behavioral change. Your help is greatly appreciated. Thank you.
Sandra M. Annesi RN MSN CNE Doctor of Nursing Practice Student University of North Florida s.annesi.98503@unf.edu

Appendix O

Timetable

Week one. Details of the project were reviewed with the director of the school and classroom teachers. Letters explaining the study, pre-intervention parent surveys, and parent consent forms were given to parents of children. Completed consent forms and pre-intervention surveys were collected at the end of the week.

Week two. A follow-up with the school on any additional consent forms and pre-intervention surveys was conducted. At the end of the week activity one was completed including presentation and discussion on when, why and how children should wash hands with a demonstration on proper handwashing.

Week three. Activity two was completed in week three. A review of the presentation and discussion from activity one was completed. Children performed a return demonstration of proper handwashing. Children were encouraged to sing the alphabet song to encourage time allotment of at least ten seconds for proper handwashing to be met. By the end of week three activity, three was completed. Children were taught that even though they cannot see germs they are still there. A Glo Germ™ Liquid was placed on the students' hands to simulate "pretend germs". Children demonstrated handwashing and then an ultraviolet light was shone on the hands to show where the child did not wash off all of the "pretend germs".

Week four. During the beginning of the week, activity four was completed. Children watched a story in the form of a video from the Hooray for Handwashing website called "Soap and Sudsy" reinforcing the importance of handwashing. A

discussion summarizing what they have learned was conducted, and children demonstrated proper handwashing again.