1-1-2002

An Evaluation of Germ City : Finding A Suitable Design

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AN EVALUATION OF GERM CITY: FINDING A SUITABLE DESIGN

Thesis submitted
To the Graduate College
Of Marshall University

In partial fulfillment of the
Requirements for the Degree of
Master of Arts
In Family and Consumer Science

by

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Huntington, WV
May 2002

ABSTRACT

An Evaluation of Germ City: Finding a Suitable Design

By Suzanne C. Lusher

Evaluations are used to determine a program's merit. "Germ City" utilizes experiential learning of adequate hand washing skills. An elementary school in southwestern West Virginia served to determine if the evaluation design for "Germ City" would prove to be an effective assessment for the hand-washing program. Four hundred and eighty-four participants completed an eight-question pre/post test; one hundred and forty-nine students underwent a hand quadrant evaluation. In addition, a soap and paper towel usage log was recorded. Fifty-four percent of the participants were male, forty-six percent female (n=483) with a mean grade level of 3.6 (n=484). Post test results indicated that there was a significant increase in knowledge gain and in hand washing effectiveness; however, 50.6% (n=99) did not change or decreased their hand washing technique. There was an increase in paper towel usage post intervention, but a decrease of soap used in the rest rooms. A comparison between pre test and post test, hand quadrant treatment, along with the soap and paper towel usage log disproved the hypothesis, by rejecting the evaluation design.

ACKNOWLEDGEMENTS

A thesis requires dedication, and resiliency. I knew I possessed these qualities. I however did not realize the extent or how much I would gain through this project. Over the past year, I have learned an incredible amount about my own personal strengths, patience, and perseverance. Many were involved in this project providing guidance, support and assistance, for you I am truly grateful.

I owe a great deal of gratitude to my advisor and committee chair, Dr. Mary Jo Graham. She provided the backbone for my graduate studies. Her guidance and support is seen throughout this project and will continue to be seen throughout my future professional endeavors.

Assistant Professor, Kelli Williams, who served as a committee member and my Dietetic Internship director will never truly know the impact she has had in my life. Working with her I learned more about the strengths and determination that women possess, along with the goals that can be achieved when you take hold of the opportunity.

Dr. Robert Bickel, who served as a committee member, provided his wealth of knowledge in the matter of statistics and research design. His expertise in this area has been an extreme asset to this project.

Susie Craig from Washington State University Extension Service created and developed “Germ City.” Her insight and encouragement ultimately provided the opportunity for this project. Thank you for the opportunity to join the “Germ City” team.

Dr. Guen Brown, who served as an adjunct committee member, along with everyone at West Virginia University Extension Service, are owed a great deal of gratitude for the ability to network and utilize the resources you provide this great state.

Most importantly, my mother and father deserve the highest acknowledgment. Their love and support is what provided and will continue to provide me with the strength and desire to achieve my personal and professional goals. Their lives have shown me that true happiness and love is the secret to life.

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INTRODUCTION

Hand washing

Adequate hand washing is an imperative step in the prevention of infectious diseases, yet many Americans do not follow appropriate protocols. In a two-part survey in 1996, the American Society for Microbiology (ASM) and Bayer Pharmaceutical Division reported that ninety-four percent of people contacted by phone stated they "always wash their hands after using the bathroom". However, according to surveyors' observations in public restrooms in five American cities, only sixty-eight percent actually washed their hands using the proper technique (Nensteil, 1997, p. 56). The results are startling considering the rate of bacterial growth and risk of cross-contamination of illnesses from one person to the next is extremely high.

Bacteria are found everywhere. The human hand is the most widely used vehicle for the spread of bacteria. Cross-contamination occurs when one shakes another's hand, during food preparation, or even when one's hands come in contact with his/her own mouth. The final result of this contamination varies from an upset stomach to diarrhea or possibly death.

Evaluation

Educational programs along with other types of programs, must utilize evaluations as a means to rate their effectiveness. If these programs could not prove their effectiveness they would not be available to the public. As a result, evaluations are challenged to provide information to prove or disprove the value of the program.

Program evaluation is the systematic collection of information about program activities, characteristics, and outcomes to make judgments about the program, improve program effectiveness, and/or inform decisions about future programming (Patton, 1997, p. 23). Patton claims this definition emphasizes systematic data collection rather than applying social science methods.

The focus of this project is to look at three evaluation tools developed for a hand-washing program titled “Germ City”. Currently, there are no tested tool(s) available to evaluate “Germ City”. The tools that were developed will serve to evaluate behavior change, effectiveness of hand washing, and demonstrate knowledge gain of the students who are involved with this project. Ultimately, proving the assessment tools are appropriate for the evaluation of hand washing behavior, technique, and knowledge.

Germ City

Several years ago, Washington State University Cooperative Extension (WSU-CE) educators developed an exhibit made of three cardboard refrigerator boxes taped together containing a UV light. This exhibit would be used for hand washing education programs throughout the state and was named “Germ City”. Since that time, the “Germ City” display unit has evolved into an 11’ X 7’ X 3’ aluminum frame covered with a lightweight-coated nylon shell and has a UV light securely attached to the ceiling of the tunnel. The unit is handicap accessible.

Those who experience “Germ City” participate in a discussion about the importance of hand washing and the proper technique needed to wash his/her hands. Once the discussion has concluded, a special hand lotion with UV light sensitive pigment is applied before he/she enters the “Germ City” tunnel. While in “Germ City”,

his/her hands will glow under the UV light indicating, “pretend” germs. Participants leave “Germ City” and wash their hands at a near-by hand washing facility. After washing, participants revisit the tunnel checking for personal effectiveness. Immediately, they are able to see whether they have or have not practiced an effective hand washing technique if there are areas of the hand that are still glowing. These glowing areas represent the part of the hand that was not washed properly and “pretend” germs were left behind. Since 1999, the project has reached more than one hundred thousand school-aged children and adults.

The goals of “Germ City” are to enhance awareness of the importance of hand washing, improve effectiveness and frequency of hand washing of children, teach the adoption of effective hand washing methods, and finally foster the disposition to wash hands often and well. Cognitively, children and adults may understand the importance of effective hand washing, but could fail to practice the behavior. “Germ City” offers a unique method of reinforcing awareness while allowing children to practice behaviors that work and receive immediate feedback. Similar goals and objectives related to communicable diseases, food safety, and health are part of the mission and vision of project collaborators and volunteers (Craig, 2000).

Target Audience

“Germ City” was designed for educational use with school-aged children (K-12), and large-scale community events such as fairs, and festivals. “Germ City” received the Washington State University College of Agriculture and Home Economics Team Award in 2000, indicating participant and stakeholder satisfaction with the program. Public health officials, government officials, teachers, parents and children have shared

positive comments about the Germ City Program. Parents, teachers, and children have said that “Germ City” facilitated positive changes for them.

There has been no formal evaluation used or created for “Germ City”. As a result, an evaluation tool needed to be developed to prove the effectiveness of “Germ City” as a teaching tool for hand washing technique. This evaluation of “Germ City” is composed of three different evaluation tools. These tools will determine behavior change, effectiveness of hand washing, and knowledge gain of the students who participate. First a pre/post multiple-choice test was developed to predict behavior, measure attitudes, and assess the cause for hand washing habits. Second a paper towel and soap usage log was developed to determine if there was a behavior change in the amount that children wash their hands secondary to the “Germ City” intervention. The third tool utilized an observation of the hand washing results by visualizing the right hand divided into eight quadrants front and back to determine the location on the hand where “pretend germs” remain. These three assessments will determine if the evaluations are appropriate for an educational tool such as “Germ City”.

Research Question

Is the evaluation design useful to determine if “Germ City” is an appropriate educational tool for improving effectiveness and frequency of hand washing in a southwestern West Virginia elementary school?

Objectives

First, the evaluation tools will sever to determine the hypothesis below. In addition, I will analyze the outcome to determine the validity by reviewing each evaluation tool by looking for consistency of an increase, decrease or no change in

hand washing. Second, to determine knowledge gain of hand washing among elementary school aged children utilizing a pre/post test. I will analyze each test and determine if a knowledge gain occurred. Third, to identify the effectiveness of hand washing in six elementary school classes utilizing the hand quadrant evaluation tool. By noting the areas of the hand left unwashed I will be able to determine if an improvement of the child's hand washing technique took place within three different treatments. Fourth, to compare the amount of soap and paper towels used before and after the "Germ City" intervention. This will allow me to determine if the "Germ City" intervention caused an increase in hand washing frequency by measuring the usage of soap and paper towels at this elementary school.

Hypothesis

The pre test/post test evaluation tool will show a significant increase in knowledge gain due to the "Germ City" intervention.

The hand quadrant evaluation tool will show a significant improvement of hand washing technique due to the "Germ City" intervention three separate times.

The amount of soap and paper towels used after the "Germ City" intervention will dramatically increase due to the intervention.

All three evaluations should provide consistent results validating that this assessment design is an effective way evaluate "Germ City".

Limitations and Assumptions

First, I am assuming that the required amount of soap, paper towels and warm water is available. Second, the children may have not wanted to wash the lotion off their hands in order to see their hands glow again once inside the tunnel given the curiosity

of elementary school aged children. Third, the lotion tends to soak into the hand if chapped from winter weather making it difficult if not impossible to completely wash the lotion away. These are three limitations and assumptions that I will take into consideration while conducting this research

CHAPTER II

REVIEW OF LITERATURE

Hand washing

The fact that disease-causing organisms are frequently and consistently isolated from the hands has been well documented. The presence of such organisms on hands is necessary but not sufficient evidence of causation. By the end of the nineteenth century, hand washing and antiseptic practices received such universal acceptance that experiments of the effectiveness of hand washing were apparently considered unnecessary or unethical. Evidence, therefore, is primarily anecdotal. Studies have demonstrated or provided nonexperimental evidence of the role of hand washing to reduce the transmission of infectious agents or decrease rates of infection.

Boston physician, Oliver Wendell Holmes, was the first to propose hand washing as a measure to prevent puerperal fever, but it was Ignaz Philipp Semmelweis who originally instituted hand washing in the management of labor and delivery in 1847 (Nenstiel, 1997, p. 55). He determined that outbreaks of puerperal fever in a Vienna maternity hospital were related to patient contamination by the hands of medical students who had participated in autopsies of infected patients. His interest in the subject was the fact that mortality rates for women delivered by midwives, who did not participate in autopsies, were significantly lower that for women attended by the medical students (Nenstiel, 1997, p. 58). Once a strict hand washing policy was put in place, mortality rates dropped from twelve percent to three percent in a matter of weeks. Semmelweis continued his efforts later on his return to Hungary, and similar reduction in

infectious morbidity and mortality were documented in the several hospitals where he implemented hands washing protocols. Unfortunately, Semmelweis's study was not published until 1861, thirteen years later, and was not universally accepted until 1913.

In 1897, Galabin attributed a decrease in rates of septic fevers from forth percent in 1885 to two and a half percent in 1890 in a London hospital due to the introduction of antiseptic hand washing (Larson, 1988, p. 30). Likewise in the United States, Shoemaker cited the steady decline in mortality from puerperal fever and the dramatic reduction in the number of outbreaks as evidence for the effectiveness of antisepsis.

Authors in the 1920's noted that as contamination of hands of nurses and medical house staff with hemolytic streptococci and the diphtheria bacillus decreased, so did the cross-infection rates, and vice versa. Others during this period-demonstrated transfer of pathogens from the hands in ninety percent of handshakes tested. This high rate of transmission is consistent with results obtained several decades later using a laboratory model to investigate contact transfer of microorganisms. Using this model, subjects grasped a fabric-covered bottle that had been artificially contaminated with a saprophytic Staphylococcus. When subjects' hands were moist, eighty-five percent of test organisms were transferred. Hand washing with plain soap reduced transfer by ninety-five percent; hand washing with seventy percent alcohol effected almost one hundred percent reduction in transfer (Larson, 1988, p. 31).

There is little other published experimental work specifically related to hand washing until the mid twentieth century. Some of the most graphic studies of the role of hand contact in staff-to-patient interchange of flora and the influence of hand washing were reported in a series of publications in the 1960's, according to Larson.

Experiments were conducted in a newborn nursery to trace the spread of staphylococci and streptococci from “carrier” babies and nurses. In a controlled environment, the relative importance of air and of direct contact in microbial transmission was carefully studied. There was little spread of strains from nurse to infants who were in proximity but not touching; the rate of staphylococcal transmission in the air was found to be six percent to ten percent. In contrast, fifty-four percent of infants handled by a “carrier’ nurse with unwashed hands through incubator ports on a single occasion became colonized with the nurse’s strain of Staphylococcus aureaus. When nurses handled a “carrier” baby and subsequently handled another baby without washing hands, the transmission rate was forty-three percent. Antiseptic hand washing reduced this rate to fourteen percent and ninety-two percent of babies attended by a nurse with unwashed hands acquired an index staphylococcal strain, as compared with fifty-three percent of babies handled with washed hands. It took four times as long for the infants handled with washed hands to become colonized. The investigators concluded that “some hand washing is better that none” and that “careful hand washing is better than a little.” The studies did enhance understanding of the importance of direct contact in the transmission of organisms, even those like Staphylococcus, which is know to be airborne.

Hand Washing and Hospitals

The spread of nosocomial infections can be attributed in large part to healthcare workers’ failure to wash their hands before and after each patient contact. Infectious diseases are the leading cause of death and disease worldwide, and the third leading cause of death in the United States (Nenstiel, 1997, p. 55). In 1989, a review was

conducted to report the hand washing habits of healthcare providers. The study found that non-nursing providers (i.e. physical therapists) had the best hand washing habits by washing before and after patient contact. Nursing staff, after being evaluated in much more detail, followed similar patterns as physical therapists. Hand washing in general was found to be poor among practitioners in the study. As a result, practitioners were consistently observed to be more conscientious about washing their hands after patient contact (Nenstiel, 1997, p. 57).

The development of universal precautions as a response to blood borne pathogens, such as human immunodeficiency virus, has convinced healthcare providers of the need to protect them from possible contamination. Nenstiel describes that strict adherence to this basic and most effective infection control practice should not be limited to hospitals; medical professionals in clinical setting also need to ensure that hand washing is a routine part of patient care. Unfortunately, too many healthcare workers still seem to ignore this century-old knowledge, with dire consequences (Nenstiel, 1997, p. 56).

With an occurring rate of five to ten per one hundred hospital admissions, nosocomial infections carry significant financial cost. A 1985 report estimated the annual direct cost in the United States at five billion to ten billion dollars. According to Nenstiel (1997), “Two hundred fifty bed hospital with eight thousand admissions per year and a low five percent infection rate, fourteen extra deaths could occur annually as a result of nosocomial infection” (p. 58). Using very conservative mortality estimates, this model would cost the health care system between one thousand seven hundred eight-six dollars and seven thousand one hundred forty-three to treat the infection. As

for morbidity, the marginal or variable cost of extra hospitalization in this theoretical hospital setting with a five percent infection rate would be eight hundred forty thousand dollars per year in 1994 dollars (Nenstiel, 1997, p. 58).

The human hand provides bacteria with the vehicle to move onto other surfaces where they multiply. Rayan (1987) divides bacteria found on the skin into two categories, transients and residents. “Transient bacteria are found free on the skin or are loosely attached with dirt. The resident bacteria are a stable population in both size and composition. Scrubbing with a brush, soap and water readily removes most of the transient flora, but the resident flora is removed more slowly” (p. 605).

Most bacteria are found on the outer three tenths of a millimeter of the skin where the sebaceous glands and hair follicles of the skin acts as reservoirs for resident bacteria (Rayan, 1987, p. 605). Resident flora of the skin of the hand is found most prevalent around the fingernails. Since fingernails collect large amounts of bacterial flora, healthy nails at a length two millimeters are considered to be safe. Hann states that it is difficult to sterilize living skin, but vigorous scrubbing plus washing with alcohol should effectively disinfect healthy skin. Only in areas that could not be washed effectively, such as nail folds, where viable bacteria remain.

In Rayans’ research, twenty patients who underwent hand surgery participated. Fingernails of each digit, of each participant were clipped and sent to the Microbiology lab for culture. In the lab, the nails were observed macroscopically for dirt and other materials. The fingernails were placed in a sterile test tube where several tests were run. The results showed of the twenty participants, nineteen had bacterial isolates, eight had molds, and three had yeasts. The bacteria isolates were identified as:

Staphylococcus epidermidis, Diphtheroids, Klebsiella oxytoca, and Enterobacter agglomerans. No correlation was found between nail contamination and appearance (i.e. dirty versus clean).

This research reinforces the fact that transient and resident bacteria can be passed from hospital employees to patients, resulting in nosocomial infections. Contaminated hands of health care personnel are major vehicles for the spread of nosocomial infection. Some gram-positive microorganisms such as Staphylococcus aureus, are resistant to drying and can survive a long time on the hands of hospital personnel. Enterobacter agglomerans are commonly found on the hands of health care personnel. Attempts have been made by some to reduce the number of bacteria residing on the hands, but some gram-positive flora remain stable, regardless of changes in the external and physiologic environment.

Isolation of the microorganisms from the fingernails of all the patients in Rayan's study indicated that fingernails could be a source of contamination. Heavy bacterial growth occurred in fingernails that were more than one millimeter in length, in spite of "adequate" preoperative hand scrubbing with Betadine. The predominant bacteria residing on the fingernails Staphylococcus epidermidis along with several molds and yeast were also present. These isolates many become pathogens in the right environment and therefore should not be considered merely contaminants.

The Centers for Disease Control (CDC) have recognized hand washing as the single most important factor in the prevention of nosocomial infections, especially since the hands of healthcare providers transmit most endemic nosocomial infections (Nenstiel, 1997, p 60). A simple hand washing habit should eliminate many of these

infections, decreasing the cost of healthcare and reducing hospital morbidity and mortality. There have been several reports written about the use of antimicrobial soaps and alcohol-based hand rinses, location of hand washing sinks, mechanism of scrubbing, and so on. Yet all of these considerations are meaningless unless hand washing is performed thoroughly and without exception.

Hand washing and Child Day Care Centers

Child care is a unique environment for transmission of respiratory viruses; young children have developing immune systems and little personal hygiene, they are unable to wipe or blow their own nose are exposed to their peers for long periods of time. Colds may spread by aerosols produced through coughing or sneezing or they may result from a combination of both.

Acute respiratory infections are common in children who attend childcare. The increased risk of illness with childcare attendance is greatest in the first two years of a child's life but decreases in their third year (Roberts, 2000, p. 739). These illnesses carry economic and opportunity costs from parent loss of work and leisure time and can predispose to secondary infections, such as middle ear infections. Kotch (1994) estimated the cost of daycare illnesses to be almost two billion dollars for children alone. This figure doesn't consider the cost of the parents or the caregivers when they develop the transmitted cold.

Roberts (2000), hypothesized that in childcare, "the caregiver wipes many children's noses, the caregiver's hand may be contaminated and transmit respiratory viruses" (p.743). The children's hands may also become contaminated with viruses as

they touch or wipe their hand around their nose or touch objects that a contaminated child just finished touching.

In Roberts study, training was conducted for the childcare workers concerning the proper technique developed by the Australian National Health and Medical Research Council. The duration of a hand wash was specified as an approximate “count to ten” to wash and “count to ten” to rinse (Roberts, 2000, p. 739). GloGerm, a lotion with a UV light sensitive pigment that glows under a black light, was used as the visual hand washing educational tool. The recommended circumstances for hand washing for staff and children were after toileting, before eating, after changing a diaper, and after wiping a nose unless a barrier was used to protect the hand from contamination. This barrier was defined as a small plastic bag used like a glove to cover the childcare worker’s hand.

Results from this study showed that colds per child were reduced between eleven percent and seventeen percent in young children. There was also a lower incidence of colds in the intervention centers than in the control centers.

Diarrheal diseases are second only to acute respiratory infections as the most common group of infections in young children (Bartlett, 1985, p. 495). These diseases are likely to be problems in child care centers, where risk of transmission may be enhanced by frequent child-to-child contact, lack of fecal continence before toilet training, repeated mouth contact with hands and objects, and need for frequent hands-on child contact by staff. Day Care Centers in Houston have indicated that centers where infants and children are not yet toilet trained are at greater risk of transmitting diseases spread by the fecal-oral route (Bartlett, 1985, p. 495). About thirty percent of

the child population in the United States receives out-of-home day care, and the demand for infant-toddler day care has grown in recent years.

In a study conducted by Bartlett (1985), twenty-two day care centers were randomly selected to participate. These day care centers underwent active surveillance for diarrheal illnesses for two years. A specimen was collected from each sick child at the day care center and was tested for Shigella, Campylobacter, Rotavirus, and Giardia Lambia. Regulations required that each child infected with an enteric pathogen be excluded from the day care center. Advice regarding treatment was provided to the child's parents. After eight months of surveillance, nurses evaluated specific hygienic and child-handling procedures in each center over a three-month time period. These observations included facilities and practices for diaper changing, toilet training, child and staff hand washing, food preparation, toilet facilities, and mixing of child groups.

During the two-year surveillance six hundred seventy-five diarrheal cases were identified. One hundred seventy of these six hundred seventy-five were associated with outbreaks. The overall rate of diarrheal illness identified by surveillance was 1.02 cases per infant-toddler year, and was about the same one and one tenth per toddler-child year. Within the hygiene evaluation, risk of diarrhea was most strongly associated with lower scores on child and staff hand-washing practices, food preparation and serving, sharing of food, and eating in areas used for other activies.

Diarrheal diseases and hepatitis A continue to be a public health concern. Primary schools and day care centers are often involved in outbreaks of these diseases. In 1988, nearly a tenth of reported hepatitis A cases were part of school outbreaks (Kaltenthaler, 1995, p. 527). This has important health and economic implications for

both schools and families. Until recently, most research into the epidemiology of hepatitis A and diarrheal diseases has concentrated on day-care centers. Kaltenthaler (1995), states, “hand washing must play a role as part of controlling diarrheal diseases in day-care centers” (p. 527). Research groups advocate hand washing and diapering hygiene as a means of reducing the spread of intestinal diseases in child day care centers. In a study from Columbia, forty-four percent of diarrheal cases were related to unhygienic toilet conditions in schools (Kaltenthaler, 1995, p. 528).

In Kaltenthalers’ research, twenty primary schools were studied. Samples from hands and environmental surfaces were taken over a period of three days. Impression plates were used to isolate fecal streptococci and the children’s fingers were placed on an agar plate for five seconds. Each child was sampled five times over three days. A second test was done on surfaces such as the toilet seat flush handle, restroom floors and the classroom carpet. Finally, surveys were used to ask the children behavior questions (Kaltenhaler, 1995, p. 530).

Results showed seven percent of the children’s hands were positive for fecal streptococci. For the surface testing, no difference was found between the boys’ toilets and the girls’ toilets (Kaltenhaler, 1995, p 533). The teachers did state their concern that the children received little hygiene education from home. Low scores on the children’s surveys correlated a higher risk of fecal contamination on their hands, than children with better answer scores. According to Roberts’ study (2000), the centers that underwent training on hand washing, demonstrated that by simply increasing hand washing the incidence of diarrhea per child was lower in intervention centers than in control centers.

This indicates that the curriculum needed to focus more on the hygiene of the children and teachers' hands.

Escherichia Coli 0157:H7 (E coli) is increasingly reported as a cause of both sporadic and outbreak-associated gastroenteritis in the United States. According to the Centers for Disease Control and Prevention, most of the estimated twenty thousand cases are sporadic (Roberts, 2000, 745). Although studies of common-source outbreaks have identified several risk factors for infection, it is not clear what role these or other risk factors play in sporadic disease.

Hand washing and Food Handling

Risk factors for sporadic infection with E coli 0157:H7 have been evaluated in several studies. In these studies an association between illness and eating undercooked ground beef has been found. However only twenty-five percent of cases in each study suggest that additional factors must also be important. Individual cases have been linked to drinking contaminated water, raw milk, and working with cattle, but the contribution of these exposures to the overall incidence of sporadic infection is unknown (Mead, 1997, p. 207).

In Meads' (1997) study, "sporadic infection was strongly associated with eating a hamburger within seven days preceding an illness, and most hamburgers eaten by ill persons were prepared at home" (p. 207). However, the research team believed that the hamburgers were not the direct vehicle of transmission, they believed that transmission occurred more commonly when the hands of food prepares, contaminated by handling raw ground beef, cross-contaminated other meal items or utensils. This conclusion was supported by the finding that food prepares in case households were significantly less

likely than those in control households to report always washing their hands with soap and water after handling raw ground beef (Mead, 1997, 207). However, there was an absence of illness among persons who ate other dishes made with ground beef. The risks of cross-contamination from raw ground beef to other foods are increased since hamburgers are usually prepared before or at the same time as the rest of the meal, whereas spaghetti sauce, meatloaf, or meatballs are prepared well in advance decreasing the risk of cross-contamination (Mead, 1997, p. 208).

Throughout this study, the potential effect of adequate hand washing on the incidence of E coli 0157:H7 infections in the study population, assumed eighty percent of all cases were sporadic and that controls were representative of the broader population. Given those assumptions, the estimated population for inadequate hand washing is thirty-four percent. A recent National survey of one thousand six hundred twenty randomly selected US residents found that thirty-four percent of food preparers do not wash their hands with soap after handling raw meat or poultry. With thirty-four percent used as the prevalence of inadequate hand washing, the estimated populations' attributable risk for inadequate hand washing increases to fifty-nine percent (Mead, 1997, p. 208). This information enforces the importance for the proper hand washing technique and the proper practice for kitchen hygiene.

Hepatitis A virus has caused a worldwide infectious epidemic. This disease is commonly spread among communities but outbreaks regularly occur in hospitals, day-care centers, school and eating establishments. It has been recognized that fecal contaminated food (shellfish) and potable water are vehicles for Hepatitis A. However, nearly fifty percent of the cases the vehicle responsible for the spread of the virus

remains unidentified (Mbithi, 1992, p. 757). Research has shown that virus-contaminated hands play a major role in the spread of the virus, particularly in institutional settings.

In order for hands to serve as the vehicle for the Hepatitis A, the virus must remain viable on human skin. Research has shown that the virus can survive on hard surfaces for prolonged periods. This virus is also relatively resistant to many of the commonly available hard-surface disinfectants. Mbithi's research was designed to determine what factors (inoculum age, pressure, and friction) might play in the transfer of infectious Hepatitis A virus from contaminated surfaces to hands.

The results showed that considerable amounts of the Hepatitis A Virus remained infectious on the finger pads after four hours, even though sixty-eight percent of virus infectivity was lost in the first hour. Whereas the reason for the biphasic pattern of virus decay and the relatively rapid drop in virus titer during the first sixty minutes are not clear, it may have been related, at least in part, to the rate of moisture loss from the inoculum. Although the Hepatitis A Virus inocula appeared dry after about twenty minutes, the decay curve showed a leveling off at around sixty minutes. That suggested that sixty minutes was the end of the drying period.

The physiology and chemistry of the skin surface may also play a role in Hepatitis A Virus survival and inactivation on hands. Both immunoglbulins and serum proteins contained in normal human sweat have been shown to inhibit bacteria growth. It was not clear to the author how these substances behave in a similar way with viruses. Surface immunoglobulin A has also been shown to contribute to the immunological defense of the skin.

Because a fecal suspension of Hepatitis A Virus was used to simulate natural conditions in which the Hepatitis A Virus contaminates both animate and inanimate surfaces, it is expected that the results may be an indication of what may occur in the field. Hepatitis A Virus on human hands at the end of four hours could also be transferred to others and may be enough to initiate infection upon self-inoculation (Mbithi, 1992, p. 761). The research showed that virus transfer between contaminated and clean surfaces is greatest when the surface is wet and is observed to decrease as the virus dries.

The federal government has recognized the potential importance of raw meat and poultry in kitchen cross-contamination. However, it has been suggested that eggs may be a potential source of cross-contamination of Salmonella. According to Humphrey, there has been little or no scientific work carried out on cross-contamination with Salmonella Enteritidis when Salmonella positive eggs are used in cooking. In Humphrey's research the research team was able to show that cross-contamination can occur during the handling or processing of eggs contaminated with Salmonella Enteritidis. The bacterium was isolated from fingers, after eggs were cracked and from utensils in which egg dishes were prepared. In addition the homogenization of eggs or the preparation of batter, where eggs were mixed with milk, sugar, and flour resulted in the production of contaminated droplets, which meant that Salmonella could be isolated from work surfaces (Humphrey, 1994, p. 407).

There appears to be a strong relationship between levels of contamination and either the production of contaminated aerosols or the contamination of hands. As a result, when intact eggs containing Salmonella were cracked, five percent of finger

rinses were found to be Salmonella positive. The lack of hand washing was noted, as a means of cross-contamination. Fresh eggs seem to have lower amounts of contamination. However, it has been found that Salmonella is able to grow in eggs stored in simulated kitchen conditions, which is the reason the Government advises consumers to refrigerate eggs immediately after purchase. This advice is primarily aimed at reducing the direct hazard from the consumption of heavily contaminated eggs.

It is now well accepted that viral and bacterial infections are spread through the hands. However, no standard test methods exist for assessing hygienic hand disinfection against viruses. Bellamy, states that the only test that assesses viral disinfection is a European test that only relates to bacterial efficacy and some aspects may not be entirely suitable for assessing viral disinfection.

Evaluation

Definition of Evaluation

Evaluation is the systematic assessment of the operation and/or the outcomes of a program or policy, compared to a set of explicit or implicit standards, as a means of contributing to the improvement of the program or policy (Weiss, 1998, p. 4). The first of the five elements that were mentioned in the above definition was systematic assessment. Systematic assessment indicates the research nature of evaluation procedures, whether the research is quantitative or qualitative. The second and third elements are operation and outcomes. Operation evaluations learn the extent that the program is following the prescribed practices, where as outcomes are the effects of the program. Many times these types of evaluations seek to answer the question: Are

participants gaining the benefits that they were intended to receive? Or, in more open-ended design, what is happening to them because of the program's intervention (Weiss, 1998, p.5.) The fourth element, standards for comparison assesses the merit of the program by comparing the evidence to some set of expectations. Finally, the fifth element, purpose for which it is done; contribute as to the improvement of program and policy.

Weiss (1998), states that evaluation is a practical craft, designed to help make programs work better and to allocate resources to better programs. Evaluators expect people in authority to use evaluation results as a guide to wise action. They take satisfaction from the opportunity to contribute to social betterment (p.5).

Who Benefits from Evaluations?

Identifying people who can benefit from an evaluation is so important that evaluators have adopted a special term for potential evaluation users: stakeholders (Patton, 1997, p. 41). Evaluation stakeholders are people who have a vested interest in evaluation findings. Program funders, staff, administrators, and clients or program participants, are a few examples of stakeholders.

Using stakeholders, the nature and the size of stake, may vary considerably from group to group. A stake may be counted in terms of money, status, power, face, opportunity, or other coin, and may be large or small, as constructed by the groups in question (Guba, 1989, p. 50). Nevertheless, the existence of a stake, whatever its form or size, is sufficient in an open society for a stakeholder group to expect, and to receive, the opportunity to provide input into an evaluation that affects it and to exercise some

control on behalf of its own claims, or raise whatever questions, it deems appropriate, and to have those inputs honored.

Stakeholders are open to exploitation, disempowerment, and disenfranchisement. Evaluation is a form of inquiry whose end product is information. Information is power and evaluation is powerful. This power can be used in a variety of ways depending on the interests of stakeholder groups. At one level, the information obtained in an evaluation can be used against the groups from whom it is solicited. The most obvious example is the use of information collected from a sample of the individuals to whom a product may be marketed to persuade the potential market that it has a need for the product, or that it is well served by investing in it. Needs assessments too often identify just those needs that the sponsor's product happens to be capable of fulfilling, to which the sponsor's values dictate what is to exist according to the needs of the target group (Guba, 1989, p. 52).

Why Do Evaluations?

Evaluations are done for several reasons, one is to judge the worth of ongoing programs to estimate the usefulness of attempts to improve them or to assess the utility of innovative programs and initiatives. Another is to increase the effectiveness of program management and administration and to satisfy the accountability requirements of program sponsors (Rossi, 1989, p. 13).

Evaluations are used with management and administrative purposes, to assess the appropriateness of program changes, to identify ways to improve the delivery of intervention, or to meet the accountability requirements of funding groups. They may be undertaken for planning and policy purposes, to test innovative ideas on how to deal

with human and community problems, to decide whether to expand or curtail programs, and to support advocacy of one program as opposed to another. Finally, they may be undertaken to test a particular social science hypothesis or a principle of professional practice (Rossi, 1989, p. 44). For all these purposes, the key goal is to design and implement an evaluation that is as objective as possible to provide a firm assessment, one that would be unchanged if the evaluation were replicated by the same evaluators or conducted by another group.

The scope of evaluation depends on the specific purposes for which it is being conducted. In addition, how the evaluation questions are asked and what research procedures are used depend on whether the program under evaluation is an innovative intervention, a modification or expansion of an existing effort, or a well-established, stable human service activity (Rossi, 1989, p. 44).

Evaluation, Program Evaluation, Evaluative Research

The terms, evaluation, program evaluation, and evaluative research actually refer to quite different aspects of the same phenomenon, or more specifically, each is a special instance of the term preceding it (Franklin, 1976, p. 24). Evaluation is the most global and inclusive of the three terms, denoting as it does, the determination of value or worth. Evaluation is an element in nearly all-managerial decisions as well as all other decisions. Franklin (1976) describes another common use of the term evaluation, as the "Assessment of needs or eligibility of individuals or families for services" (p. 20). The term evaluation does not make any judgment concerning the value or worth of the individuals being evaluated but only their problems and eligibility. Evaluation, when the

term is applied to programs, is not related to this use of the term and is concerned with individuals only in the aggregate.

Franklin (1976) describes program evaluation, as an “Evaluation that is concerned with the ‘value’ of particular programs or program elements” (p. 23). Various definitions have already been presented that reflect different opinions as to what should be the scope of program evaluation, the proper model of program evaluation, or the proper role of program evaluators. It is a broader term than evaluative research because many types of program evaluation do not require the rigors of scientific research, and many situations requiring program evaluation do not permit such rigors and their associated investments of time and other resources.

Suchman (1967), summarized the distinction between evaluation and evaluative research as:

> “In our approach we will make a distinction between ‘evaluation’ and ‘evaluative research’. The former will be used in a general way as referring to social process of making judgments of worth. This process is basic to almost all forms of social behavior, whether that of a single individual or a complex organization. While it implies some logical or rational basis for making such judgments, it does not require any systematic procedures for marshalling and presenting objective evidence to support the judgment. Thus, we retain the term ‘evaluation’ in its more common-sense usage as referring to the general process of assessment or appraisal of value. ‘Evaluative research,’ on the other hand, will be restricted to the utilization of scientific research methods and techniques for the purpose of making an evaluation. In this sense, ‘evaluative’ becomes an adjective specifying

> a type of research. The major emphasis is upon the noun ‘research’, and evaluative research refers to those procedures for collecting and analyzing data, which increase the possibility for ‘proving’ rather than ‘asserting’ the worth of some social activity” (p. 7-8).

This quotation indicates that evaluative research is a particular type of program evaluation and is the method of choice when possible and appropriate. It is essentially the application of scientific methods to management decision-making about the worth or productivity of programs.

Types of Evaluations

According to Fink (1978), there are two kinds of evaluations. One is to “improve a program” and the other is to “determine the effectiveness of a program” (p. 2). These types of evaluations are usually distinguished from one another by how information is used rather than by the kinds of information collected or the stage at which it is gathered. In an improvement context, evaluation information is used to modify and improve a program; in an effectiveness context, information is used to establish the program’s quality and outcomes.

The purpose of an improvement evaluation according to Fink is to “Determine how a program can be upgraded and refined” (p. 2). The creators and organizers of a still-developing program typically request improvement information. Evaluation conducted for improvement focuses on finding out what goes on within a program. Because of this, comparisons with other programs are not as useful as information about how well the program itself has been implemented and how well it is achieving its goals (Fink, 1978, p. 2).

The purpose of an effectiveness evaluation is to appraise a program's overall impact and to determine the consistency with which it produces certain outcomes. Effectiveness evaluations are usually requested by a program's sponsors, its potential participants, and by legislators.

Conducting evaluations

Fink (1978), describes the seven activities that are involved with conducting evaluations as follows: formulating credible evaluation questions, constructing evaluation designs, planning information collection, collecting evaluation information, planning and conducting information analyses, reporting evaluation information, and managing an evaluation.

Understanding the program

To guarantee an evaluation's quality, the evaluator must first formulate questions that will give clients the information they need (Fink, 1978, p. 3). To do this, the evaluator must get to know the program's goals and activities. The evaluator should become familiar with the political and historical circumstances that created the program, its physical location, its organizational structure, its staff, and any documents, reports, or products produced by the program. Finding out what kind of information will be accepted as convincing evidence of the program's merit is the second item to certify programs' worth. There are many different ways to prove that a program is worthwhile. The evaluator must decide what information will provide the most believable evidence of the program's merit to the individuals who must use the evaluation's findings. Creating credible questions requires that the client understands the procedures and products of the evaluation. The researcher must make sure that the client understands what an

evaluation is, the reason for conducting the evaluation, and the way evaluation information will be presented.

Written documents are among the most useful, easily obtained, and least expensive sources of information for an evaluation of a developing program. Consultation with staff is crucial. Making sure that its goals, activities, and evidence of program merit are described accurately. Program staff can provide valuable insight, and their involvement in planning the evaluation may make it easier to obtain their cooperation for later information collection activities. Program sponsors can be foundations, community groups, and local, state and federal agencies (Fink, 1978, p. 7). Their ideas about the programs' goals and activities and their definitions of the programs' merit may be very different from those in the program's documents or those held by the program's staff and sponsors. The evaluation's sponsors are especially important sources of information when performing an effectiveness evaluation since many program documents may not seem relevant or may be missing, and the original staff may no longer be involved in the program. Participants of the program and their families, advisory committees, and other citizens' groups can provide valuable information about the political and social atmosphere in which the program's goals and activities were created and those in which they currently exist.

Evaluation Questions

The Evaluation Questions (EQ) is a device for specifying all questions to be answered by the evaluation. The evaluation question that clients consider important will vary. In one evaluation the questions might be related to the program's goals and activities, while in another they might focus on costs. In any case, the number of

questions that can be answered depends upon the client's priorities and the money, time, and resources available for evaluation.

It is difficult to fit everything into a survey that can measure only a few categories. Most things that surveys are used to measure can be regarded as attitudes, beliefs, predictions, or facts (Weisburg, 1996, p.13). However, not all of these can be measured with the same degree of accuracy. Attitudes are likes and dislikes. An attitude is a positive or negative orientation toward an object, and it can be strong or weak. Many techniques have been developed to measure how positively or negatively people feel toward attitude objects of all kinds, and they are often used in surveys. Beliefs are opinions about the objective state of the world. Beliefs may be true or untrue; what is important is that the person who holds a belief thinks it is true. When survey researchers measure beliefs, they are not usually interested in finding out the truth (Weisburg, 1996, p. 14). Surveys could also be useful in the predictions of the future, which are really the respondents' beliefs about what the future will be like. Researchers usually measure beliefs in surveys to determine what people think to be true. Surveys are often used to measure people's beliefs about how important various things are. However, just like attitudes, belief surveys may not be "correct", but they are useful in their own right.

Surveys that measure facts are to learn the truth about specific matters, so it is important that what people tell interviewers is actually true. The distinction between facts and beliefs is not always clear-cut. Many questions about facts actually turn out to be questions about beliefs. For example, the answer to how often a person was a victim of a crime in the past month depends on the person's personal definition of a crime.

Weisberg (1996) stated, “The problem involved in asking about beliefs and facts are somewhat different, but the differences are not as large as one might expect” (p. 94).

Evaluation Design

Evaluation design involves deciding how people will be grouped and which variables will be manipulated during an evaluation. The evaluator identifies independent and dependent variables and assesses the internal and external validity of the design. Validity is documented when evaluating new survey instruments or when applying established survey instruments to new populations. It is an important measure of a survey instrument’s accuracy (Litwin, 1995, p. 34). For example, an item that is supposed to measure pain should measure pain and not some related variable such as anxiety. Validity, according to House, means “worthiness of being recognized.” (House, 1980, p. 489)

There are several types of validity that are typically measured when assessing the performance of a survey instrument: face, criterion, and construct (Weisberg, 1994, p95). Face validity, is one of the easiest ways to measure validity. It looks at the degree to which it seems to measure the appropriate concept on its face. However, face validity is a subjective matter, so it should not be the only test of a question’s validity.

Comparing people’s answers to a survey question with a direct measure of the concept of interest can assess criterion validity (Fink, 1978, p. 35). For example, checking official records in voting registration offices can validate a question asking people whether they voted in a particular election. Unfortunately, it is impossible to obtain official criteria for most survey questions, particularly those measuring attitudes. When it is possible to assess criterion validity, though, it often turns out to be

surprisingly low. It is therefore important to assess criterion validity whenever possible in order to identify inadequate questions (Fink, 1978, p. 13).

Construct validity uses theories that may indicate how the concept being measured should be related to other concepts. If the measure of the concept is not related to other concepts as the theory suggests, then either the theory is disproved or the measurement is invalid. If the theory is widely accepted, the construct validity of the measure is considered to be low.

Data Collection

Major techniques for information collection are: performance tests, rating and ranking scales, archive reviews, observations, interviews, questionnaires, and achievement test. Performance tests involve having an individual or group perform an activity or task and making an assessment of the quality of the performance (Fink, 1978, p. 25). The major advantage of performance testing is that it relies on tasks that are close to “real world” activities. Its major disadvantages are that it is usually very time consuming and expensive. Examples of performance tests would include having an individual type a letter and then count the number of words typed correctly in a set amount of time, or appraising a teacher’s ability to instruct, using a rating scale specially designed for the purpose.

Rating and ranking scales can be used for self-assessment or to assess other people, events, or products on a given dimension (Fink, 1978, p. 25). A numerical score is obtained for each thing that is judged. Advantages are that they are relatively inexpensive to construct, and they are easily understood. However, the disadvantage is that they are subject to many types of bias. Some raters may be easier and others may

not be so easy; some base their ratings on personal feelings; and sometimes raters are asked to make distinctions when they do not perceive any differences.

The information collected by observers can be reported by checklists, rating scales, field notes, and summary reports to name a few. In a work-training program, observations might be used to determine if training is taking place according to plan. The advantages are that they help the information collectors become familiar with and sensitive to the program, and that they are often the only feasible and economical way to gather certain kinds of information. The disadvantages of this technique are that it is costly to train information collectors, that the people being observed may not behave normally because of the presence of the information collector, and that several observations may be needed to get reliable results (Fink, 1978, p. 26).

The actual collection of information is a complex task that has a direct bearing on the quality of an evaluation's findings. This task includes validating the instrument, training collectors, implementing a collection plan and organizing evaluation information for analysis. Before information collection for the evaluation begins, the instruments and procedures are validated through pilot testing and possibly by expert review (Fink, 1978, p. 30). The purpose of the pilot test is to discover if the instrument will provide the intended information. Are certain words or questions misleading? Is the instrument appropriate for the audience? Pilot testing should be conducted under conditions similar to those expected for the evaluation and should include a representative sample of the evaluation's participants.

To implement the information collection plan, the evaluation team must obtain clearance. When confronted with clearance requirements, it is a good idea for the

evaluator to ask the program monitor or the evaluation's sponsor for assistance. Because the intervals between submissions of drafts may take many months, the evaluator must organize the information collection schedule to permit enough time for obtaining the necessary authorizations. It's also the evaluator's responsibility to explain the purpose, nature and schedule of their participation to the participants. To do this, the evaluator can hold a meeting or workshop or use the mail or telephone. Fink (1978) explains that a "Written description of the program as well as the evaluation and its information collection activities should be available. Information collection must be carefully monitored to see that it is going according to plan and that all relevant data are being collected and returned" (p. 47). This can be accomplished by having someone take responsibility for monitoring activities and check as the information is returned to determine whether it was collected according to plan, and whether there were any unanticipated or unusual findings or violations of confidentiality.

Data Analysis

Information collected during an evaluation cannot be immediately analyzed. Tests may have to be scored or interview responses a need to be coded and tallied. Information is usually collected at different times and it must be coordinated so that a complete set is eventually available. Because many evaluations involve gathering large amounts of data, it is important to find a way to organize all the responses. Coding is the process of assigning a numerical value to each piece of information. Numerical codes are just names for data that are shorter than words therefore, easier to record, store, analyze, and retrieve. Usually codes are only assigned to information that is going to be analyzed by a computer (Fink, 1978, p. 47).

Once the information has been collected, the evaluator must analyze the information. This process must be thought about before the collection of information begins. The methods actually used for analysis range from statistics-based methods that attempt to describe evaluation information by tallies or frequency counts, summaries, averages, and measures of variation and range.

Evaluation results

An evaluation report answers some or all of the evaluation questions and explains the procedures used to derive the answers. The evaluation report is the official record of the evaluation, making public the evaluator's activities and findings. A credible evaluation report clearly and logically describes the evaluation questions as well as the procedures used to get the answers. This report includes an introduction to the evaluation report, design and sampling, information collection, information analysis and the evaluation findings.

Proper management of evaluations give program sponsors and stakeholders evidence that what was paid for and deemed desirable was actually undertaken. In many programs, regular feedback of evaluation information is one of the most powerful tools to document the operational effectiveness of the organization (Rossi, 1989, p. 45). Monitoring can also alert project personnel to such problems by providing a systematic assessment of whether or not a program is operating in conformity to its design and reaching its specified target population.

Reporting the results back to the stakeholders or program sponsors, require the evaluation team to convey the information into a format that is useful to that team. This includes an introduction that is brief in describing the program being evaluated, the

group that is conducting the evaluation, and their approach to evaluation. Program goals, activities, and evidence of program merit should also be included.

Recommendations sometimes accompany answers to evaluation questions, but not all clients ask for or want recommendations. Instead, they prefer to make their own. The evaluator should always find out in advance if recommendations are required, and if they are, how extensive they should be. The report must provide clear answers or describe the progress being made toward obtaining them. Fink suggests, “When reporting answers to evaluation questions, it is important to point out the strengths and weaknesses of the program.”

Summary

It has been proven that hand washing plays an important role in the prevention of illness and infections. The proper hand washing technique must be taught and practiced by children at school and at home in order to decrease days missed from school and work due to illnesses. “Germ City” provides an educational opportunity for elementary school aged children to see first hand their personal accomplishment of washing all the “pretend” germs from their hands. Developing an evaluation system that evaluates the effectiveness of "Germ City" provides stakeholders the information needed for funding, growth, and future endeavors.

CHAPTER III

METHODOLOGY

Study population

"Germ City" was implemented at a predominately rural elementary school in southwestern, West Virginia. The school was chosen for its diversity of urban and rural attendance, good working relationship with the principal and teachers along with a mix of socioeconomic backgrounds of the children. Six individual classes were selected from each grade to undergo the hand quadrant evaluation. These six teachers volunteered allowing their class to participate when the process was described and they understood that this required two additional treatments they would be pulled from class time. There is a recorded attendance of five hundred and ten students between Kindergarten and Fifth grade. Each grade consisted of four classes of approximately twenty to twenty-five students each.

Evaluation tools

Evaluation of "Germ City" required the development of three evaluation tools. There has been no formal evaluation used or created for "Germ City". As a result, an evaluation tool needed to be developed to prove the effectiveness of "Germ City" as a teaching tool for hand washing technique. These tools served to review behavior change, show effectiveness of hand washing, and demonstrate knowledge gain of the students who participated. A pre/post multiple-choice test was developed to measure and predict hand washing behavior, measure attitudes of hand washing, and assess the cause of the subjects' hand washing behavior, Appendix D. The custodial staff used an

inventory log, Appendix E, to record the amount of paper towels and soap used before and after “Germ City” was implemented in the school. The third evaluation tool, the hand quadrant, Appendix F, utilized an observation of results after the children washed their hands by visualizing the right hand divided into eight quadrants, front and back, recording the areas that still glowed from the UV sensitive lotion.

The Pre/post survey was tested for face validity by a group of elementary school aged children. They were asked to answer the questions and report if they had any problems understanding or answering each question. It was discovered that the children in second through fifth grade did not have a problem understanding the directions and were able to navigate through the survey without any problems. The children in grades Kindergarten and first needed assistance with the questions. Content validity was evaluated by sending each evaluation tool to a panel of experts for their review. Through this process the panel accepted the pre/post test for data collection based on the fact that the evaluations evaluated knowledge gain, behavior change, and technique of hand washing.

Development of the soap and paper towel inventory log required different custodial staff to be questioned on how the restroom stock items are recorded for stock purposes. These custodians were asked to review the inventory log and determine if it was clearly set up and if they understood the format. They replied stating that they already do this type of log to keep track of stock for reordering purposes and that they would have no problem keeping this record as well.

The hand quadrant tool was tested by using the tool with a group of elementary school aged children, to see if this was a useful evaluation tool to note areas of the

hand that were left unwashed. Through this test, it was discovered that it would be necessary to allow only one child at a time into “Germ City” with myself. This enabled me to take the appropriate amount of time to review the child’s palm and back side of their right hand. If more than one child was in “Germ City” they tended to become occupied with each other and wouldn’t allow the appropriate amount of time for me to evaluate their hand washing results.

Development of the hand quadrant tool required me to trace the palm and back of a hand, divide each up into four quadrants to give a total of eight quadrants by simply drawing a line using a ruler and black felt tip marker. I scanned this image into the computer. This image was saved as a bitmap and placed on a Microsoft Word document to be manipulated with the size and placement on the page. An evaluation key was developed and placed to the side of the hand quadrants, providing me with a quick reminder of the appropriate marks to utilize during an evaluation. Text boxes were added to serve as labels for each individual hand quadrant numbering from the top left corner and proceeding to the quadrant on the right and continuing clockwise until each quadrant on the palm was designated with the appropriate number (Q-1, Q-2, Q-3, Q-4). The same occurred for the back of the right hand. The top left quadrant served as the continuation point from the palm of the right hand as the number continued until each quadrant was designated the appropriately (Q-5, Q-6, Q-7, Q-8).

Evaluation Tool Format

The format for the pre/post test was set up in three sections with a total of eight questions. The first section has three questions that measure behavior by asking questions that deal with the frequency of hand washing by using a Likert scale. These

statements included “After playing with my pet, I wash my hands”, “Before I eat, I wash my hands”, “After using the restroom, I wash my hands.” The second section also has three questions to predict behavior by asking questions that evaluate the hand washing process and reasons for washing hands. These statements are set up in a multiple-choice format and are as follows; “When washing my hands I should… “ I should use ___ to dry my hands”, and “The most important reason for washing my hands is….” The multiple-choice options were given to allow the children to completed each statement. The third section of the pre/post test has two questions to assess the cause of hand washing. These questions are also set up in a multiple-choice format, and are as follows; “If sometimes you don’t wash your hands before eating, why don’t you?” and “Is hand washing important?”

The answers on the pre test allow the researcher to determine what the children know about hand washing and if they know how to correctly wash their hands prior to the “Germ City” intervention. The post test, which utilizes the same evaluation tool as the pre test, allows the researcher to determine how much information the students were able to retain from the hand washing lesson or intervention.

The second evaluation tool was set up in a format to evaluate behavior change by utilizing an inventory log to keep track of the soap and paper towel stock. This log was kept by the custodial staff of the school and was cleared for usage by the school principal. This log required the staff to keep track of how much paper towels and soap the children used two weeks before “Germ City” was introduced in the school. After “Germ City” was presented to the students, the staff was asked to keep another record of how much soap and paper towels were used for two weeks immediately following

implementation of “Germ City”. Through this evaluation, I will be able to determine if “Germ City” increased the frequency of hand washing, by evaluating the amount of soap and paper towels used by the children before and after “Germ City” visited the school.

Finally, the hand quadrant evaluation tool was formatted to measure the effectiveness of the children’s hand washing technique. This tool has a graphic of the backside and the palm side of the right hand. Each side is divided into four quadrants for a total of eight quadrants. The researcher utilized a key to note the effectiveness of the hand washing. A marking of “C” in any quadrant meant that that quadrant was clean from the UV lotion. A marking of “•” indicated that an area in the quadrant was left soiled from the UV lotion. A marking of “D” indicated that the entire quadrant was left soiled from the UV lotion. This tool portrays the child’s hand and allows me to note the specific areas that were left unwashed and still glowing from the UV lotion. This tool was utilized three different times to provide me with three different portrayals of the child’s hand over a six-week period. Less UV lotion on the child’s hand at the third observation compared to the first or second would indicate a positive change in hand washing technique.

Evaluation process

The principal of the elementary school provided me permission to conduct my research on the evaluation of “Germ City” (See Appendix C). Two weeks before the scheduled research began, permission slips were sent home with the children for parental notification and permission of their child’s involvement in the research project (See Appendix B). Each child in the school has a student ID number that is given to them by the West Virginia Educators Association (WVEA) Board. This six-digit number

is individualized for each student. This ID number was used on each evaluation tool to remove any personal identification and ensure confidentiality.

I visited the school two weeks prior to the “Germ City” presentation. At this time, the pre test was distributed to the students. The soap and paper towel inventory usage log was also distributed to the custodial staff.

Two weeks after the pre test, “Germ City” was brought into the school and a hand-washing lesson was taught in a group environment, Appendix G. Objectives for the lesson were to enhance awareness of the importance of hand washing using science based education for youth, improve effectiveness and frequency of hand washing, modify attitudes, enhance personal motivation, and facilitate positive behavior change for hand washing. Supplies that were utilized during the lesson were the “Germ City” unit, evaluation materials, and Glitter Bug UV lotion (in a pump bottle) from the Brevis Corporation. “Germ City” was set up in the gymnasium which easily accommodated 40-60 children, teachers, classroom assistants, volunteers and myself. The gymnasium had access to restrooms that were equipped with an adequate number of sinks, soap and paper towels.

The lesson utilized several teaching methods to include different learning styles. A conversation took place with the children about what they knew about germs. Some of the facts that the children brought up were “Germs are everywhere, they can make you sick”, “They’re so small you can not see them”, and “You can get rid of germs by washing your hands.” An imaginary game of “catch” was played to show how germs are spread by cross-contamination. I told the class that I had an imaginary basketball in my hands and was going to pass it to someone. I “pretended” to sneezed loudly into my

hands, and proceeded to pass the pretend ball to several of the children. This activity was followed by a discussion of how germs resulted from the sneeze, were passed to the ball and subsequently to the children who caught and tossed the ball

Story telling was another method used to teach the term cross contamination. The story was told about a little girl and little boy who were at the petting zoo. They played with and pet the baby calves, and lambs. When they left they ate some cotton candy. A question was asked to the students if they knew what happened next. They were able to state that the little girl and boy got sick from eating cotton candy with their dirty hands.

Pantomime was the next teaching method used to teach children about the proper way to wash their hands. I had the class pantomime these steps; procuring a paper towel, placing it under the arm, turning on the water and wetting the hands, getting the soap and scrubbing for twenty seconds or for the time that it takes to sing “Happy Birthday” twice, rinsing under running water, taking the paper towel from under the arm and using it dry and turn the water off.

The students participated in the hand washing demonstration and “Germ City” experience by having the UV lotion applied to their hands then going through the tunnel to see the “pretend” germs on their hands. Once each child completed their hand washing, they were able to revisit “Germ City” to immediately see their hand washing effectiveness. Once each child had an opportunity to see how effective their hand washing had been, a discussion was conducted about why certain areas of their hand were left soiled after washing their hands.

Before the hand-washing lesson, one teacher from each grade volunteered his/her class to participate in the hand quadrant evaluation. They participated in the lesson with the other students, but during this visit to “Germ City” the researcher used the Hand Quadrant evaluation to evaluate their effectiveness. The evaluation required the researcher to look only at the palm and back of the right hand to record the results of each quadrants, by utilizing the evaluation key of “C”, “•”, or “D”, as previously described. In addition, the custodial staff was asked to start their post “Germ City” paper towel and soap usage log the day following the “Germ City” demonstration.

Two weeks after “Germ City” was introduced at the school, the researcher returned to administer the post-test and to collect the paper towel and soap usage log from the custodial staff. During this time, the volunteered sample of children was asked to experience “Germ City” for the second time. I again observed the hand washing results by recording a second evaluation using the hand quadrant tool.

Two weeks after the post-test and the second hand quadrant evaluation was conducted, “Germ City” revisited the school for the third and final time. I again observed the hand washing results by recording a second evaluation using the hand quadrant tool. Refer to Table 3.1 for the scheduled visits of “Germ City” into the school.

TABLE 3.1 SCHEDULE OF EVALUATIONS

	Pre-test	Paper towel & soap log	Hand quadrant evaluation	Post-test	Paper towel & soap log
2 wks before "Germ City" visit	X	X			
Initial "Germ City" visit			X		
2wks after initial "Germ City" visit			X	X	X
4wks after initial "Germ City" visit			X		

The hand quadrant evaluation tool was utilized three times with the treatment group to provide the researcher with three separate pictures of the children's hands in order to evaluate the hand washing technique. The first hand quadrant evaluation was completed the day of the hand washing intervention, the second two weeks after the intervention, the third and final was conducted four weeks after the initial intervention. The two-week time period allowed me to determine if a positive hand washing technique was developed among the treatment group by seeing hands with less UV lotion compared to the first experience in "Germ City".

CHAPTER IV

RESULTS AND DISCUSSION

Pre and Post Test

An eight-item pre/post test was administered to four hundred eighty four elementary school aged children in a southwestern West Virginia elementary school. The test consisted of three sections. The first had three questions that measure behavior utilizing a Likert scale such as “After I play outside, I wash my hands”, providing the choice of answers “always, sometimes, never” for the participants to designate their response. The second section also had three questions that were used to predict behavior by asking questions such as “I should use ___ to dry my hands”, providing multiple choices to fill in the blank. The third section had two questions that assess the cause of hand washing by asking the participants if they thought hand washing was important, providing multiple choices to answer this question (See Appendix D).

General Descriptive Data of Sample

The research sample can be described as elementary school aged children, with a mean grade level of 3.6 (n=484). A minimum grade level of 1.00 represented kindergarten and a maximum grade level of 6.00 represented fifth grade. The research sample consisted of forty-six percent females, and fifty-four percent males (n=483): females were coded as 0 and males were coded as 1. Pre test scores had a minimum score of 6 and maximum score of 22 the mean score reported was 14.12 with a 2.36 standard deviation (n=375). Post test scores with a minimum score of 6 and maximum score of 22 the mean score reported was 15.61 with a 2.08 standard deviation (n=397).

There were several absentees during the pre test, post test distribution and during the treatment interventions. This caused several cases to be incomplete and therefore thrown out during data analysis.

The hand quadrant evaluation, visually divided the back and palm side of the right hand into eight quadrants. Utilizing this evaluation the effectiveness of the children's hand washing techniques would be shown (See Appendix F). The group variable (n=99) underwent the additional hand quadrant evaluation, once during the entire group intervention and twice at separate individual times. The mean value on the variable group was 0.2481(Table 4.1).

TABLE 4.1 GENERAL DESCRIPTIVE DATA OF SAMPLE

	N	Minimum	Maximum	Mean	Std. Deviation
Grade	484	1.00	6.00	3.6343	1.76478
Gender	483	.00	1.00	0.5362	0.49920
Pre Test	375	6.00	22.00	14.1173	2.36329
Post Test	397	6.00	22.00	15.6096	2.08317
Group	399	0	1	0.2481	0.0249

Correlation between variables

TABLE 4.2 BIVARIATE CORRELATION MATRIX

	Gender	Grade	Post test	Pre test	Group
Gender					
Pearsons Correlation					
Significant (2-tailed)					
N					
Grade					
Pearsons Correlation	-.032				
Significant (2-tailed)	.479				
N	483				
Post test					
Pearsons Correlation	-.153**	-.014			
Significant (2-tailed)	.002	.780			
N	396	397			
Pre test					
Pearsons Correlation	-.091	-.092	.329**		
Significant (2-tailed)	.007	.076	.00		
N	374	375	311		
Group					
Pearsons Correlation	-.018	.038	.162**	.164**	
Significant (2-tailed)	.692	.411	.001	.002	
N	475	476	394		

**Correlation is significant at the 0.01 level (2-tailed)

Regression Analysis

Regression analysis summarizes the relationships between the independent variables, pre test, gender, grade, and group and the dependent variable, post test. Regression analysis is used for the purpose of isolating the separate effects of the independent variables on the dependent. R Squared shows how much variability on the outcome measure is explained by the independent variable. The R Squared value of 13.8% showed that the independent variable accounted for 13.8% of the variability to the post test.

The regression analysis showed the pre test made a difference on the post test; this is commonplace. In addition males tend to do less well than the females on the post

test according to the regression analysis. Results showed that grade did not make a significant difference with the post test. Most importantly, the statistical significant coefficient corresponding to the group variable shows that those who underwent the hand quadrant treatment, scored, on the average .513 points higher than students in the control group (Table 4.3).

TABLE 4.3 REGRESSION RESULTS

Variable	**Unstandardized**	**Standardized**	**Significance**
Pre test	.257	(.306)	.001
Gender	-.510	(-.130)	.015
Grade	.017	(.016)	.767
Group	.513	(.115)	.032

R-squared = 13.8%

T-Test for Independent Samples

A T-Test was utilized to compare the two-post test means of the treatment group and the control group to determine if the treatment was significant for the awareness of hand washing. The treatment group was designated 1.00 and the control group was designated 0.0 Results showed the treatment group scored 16.2128 (n=94) and the control group scored 15.4200 (n=300). These results show that the treatment group did overall better on the post test by 0.793, which is significant to the .001 level (Table 4.4). This is consistent with my regression analysis results

TABLE 4.4 T-TEST COMPARISON OF POST TEST MEANS

Group	**N**	**Mean**	**Standard Deviation**
1.00	94	16.2128	.18079
0.0	300	15.4200	.12381

Frequency Distribution

The frequency distribution below displays the number of cases in each category of a specific variable. In this analysis the variable, gain score, compares Treatment One of the hand quadrant to the Treatment Three. Results show that 11.1% (n=99) of the participants remained at the 0-level and did not constitute a change in either direction. However, 49.4% (n=99) did make a positive change in their hand washing technique. Unfortunately, 40.5% (n=99) made a negative change if any change at all (Table 4.5).

TABLE 4.5 FREQUENCY DISTRIBUTION OF TREATMENT 1 TO TREATMENT 3

Score on treatment	Frequency	Cumulative Percent
-16 to – 8	7	7%
-7 to –1	32	32.4%
0	11	11.1%
1 – 7	33	33.4%
8 – 16	16	16%
Total	99	100%

Soap and Paper Towel Log

A soap and paper towel usage log was distributed to the janitorial staff to keep record of the amount of equipment that used to stock the restrooms throughout the school. At the end of each week the janitorial staff would record the amount that was used. This log was to determine if a behavior change caused the children to wash their hands more frequently after the “Germ City” intervention.

Soap and Paper Towel Usage

Results indicated that there was not a correlation in the usage of soap and paper towels after “Germ City” compared to amount used prior to the intervention. The total amount of soap used two weeks prior to “Germ City was fourteen containers of liquid

soap. The total amount of soap used two weeks post “Germ City” was six containers. The total amount of paper towels used two weeks prior to “Germ City” was seven bundles of accordion folded paper towels. The total amount of paper towels used two weeks post “Germ City” was eleven bundles of paper towels (Table 4.6).

TABLE 4.6 SOAP AND PAPER TOWEL USAGE

	Total Stock Used	**Difference**
Pre Soap Usage	14	
Post Soap Usage	6	-8
Pre Paper Towel Usage	7	
Post Paper Towel Usage	11	+4

Hypothesis Testing

The relationship between pre test, post test and hand quadrant evaluation, hand washing effectiveness was explored through the use of regression analysis, T-Test for independent samples and a frequency distribution. The post test, dependent variable, was considered to measure knowledge of hand washing. Other independent variables such as grade, gender, pre test, and group were taken into account as controls, indicating a statistically significant change.

Research findings of the evaluation tools indicated that regardless of the intervention frequency the participants did not improve their hand washing skills to a significant value among a southwestern elementary school in West Virginia. Findings of both the regression analysis and the T-Test show a statistically significant improvement. However, It is not clear that such a substantially small difference is of practical value. The research hypothesis was rejected, due to the lack of correlation between the pre test post test, hand quadrant evaluation, and a soap and paper towel usage log.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

Hand washing continues to play an important role in the preventative steps in the transfer of infectious diseases. Nenstiel (1997) estimated that a two hundred fifty bed hospital with eight thousand admissions per year with a low five percent infection rate could occur in fourteen extra deaths on an annual basis as a result of nosocomial infections. Roberts (2000) stated that acute respiratory infections are common among children who attend daycare. Economic and opportunity costs from parental loss of work and leisure time to the development of secondary infections, such as middle ear infections, play a major role in the daily function of the household, ultimately costing an estimated $1.8 billion in health care cost for children alone not considering the cost of the parents or caregivers when they develop the transmitted illness.

"Germ City" was developed to enhance awareness for the importance of hand washing, and to improve effectiveness and frequency of hand washing among elementary school aged children. This educational opportunity utilizes the "Germ City" unit, an 11' X 7' X 3' tunnel covered by a lightweight canvas with a black light hung securely above providing an environment for children to experience and immediately see how effectively they washed their hands. The research at an elementary school in southwestern, West Virginia focused on the development of the evaluation tools to measure the effectiveness of the participants' hand washing skills.

The research sample was consisted of four hundred and eighty-four elementary school aged children between kindergarten and fifth grade. There were six classes that underwent the hand quadrant treatment for a total of one hundred forty-nine separate

interventions. The research sample was almost evenly divided among genders with fifty-four percent males and forty-six percent females.

The pre test/post test and the hand quadrant tool showed a significant increase in knowledge and technique, however the soap and paper towel log was inconsistent, resulting in an ineffective assessment of "Germ City" as an effective hand washing educational tool. I question the use of the pre test/post test evaluation with kindergarten and first grade children due to the difficulty in utilizing this testing format. I would recommend careful use of this tool among this age group.

Conclusions

Results of the research found that fifty percent of the students did make an improvement with their hand washing technique when utilizing the hand quadrant assessment tool. There was an increase in knowledge scores but not to the extent that was expected according to the hypothesis. Results showed a slight increase in post test scores, and that males did not do as well as females.

Implications

Additional development of the hand quadrant tool should occur. An inclusion of both right and left hands, palm and back side, to provide better data on both hands instead of one. Utilization of two researchers in "Germ City" with the child would allow one to place a "germ" sticker on the area of the child's hand that was left unwashed, or to provide each child a picture of their hand noting the areas that were left soiled to serve as a reminder as too where the child needs to concentrate when washing his/her hands. This allows the education to take place while reviewing the results with each

individual child. Mean while, the second researcher could be observing and noting the soiled areas on the newly designed hand quadrant for research purposes.

I would recommend utilizing a different way to capture knowledge gain. Children in this age group tend to give answers that adults want to hear not what they believe to be right. Perhaps developing focus groups within each grade to determine knowledge by interviewing, instead of the traditional paper pencil test.

Information gathered from this southwestern, West Virginia elementary school must be shared with the West Virginia University Extension Service and Washington State University Extension Service to allow the search for a suitable design to continue and prove that “Germ City” is an effective hand washing educational experience.

Certainly, more information concerning the importance of hand washing must be promoted to the general public educating on the risk of bacterial infection and the ramifications of missed school and work days.

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APPENDICES

APPENDIX A: INSTITUTIONAL REVIEW BOARD

Marshall University
Institutional Review Board

Cabell Huntington Hospital
Institutional Review Board

Department of
Veterans Affairs
Human Studies Subcommittee

St. Mary's Hospital
Institutional Review Board

COORDINATOR
1542 Spring Valley Drive
Huntington, West Virginia
25704
(304) 696-7320
Fax: (304) 696-7391

March 14, 2002

Suzanne Lusher
3 Hapgood Hill
Huntington, West Virginia 25705

Re: Proposed Exempt Study No. EX02-0047 - Germ City: An Interactive Hand Washing Demonstration, Exhibit, and Education Program.

Dear Ms. Lusher:

Thank you for the submission of the above non-risk study. The purpose of the study is to educate students on the importance of proper hand washing. The study poses no potential risk to the students.

Written permission has been obtained from the school, permission slips will be forwarded to the parents. The study as submitted would be exempt from IRB review and approval in accordance with 45 CFR 46.101 b.

Sincerely yours,

Henry K. Driscoll, M.D.
IRB Chairperson

HKD/tjs

Lusherexemptmar02

APPENDIX B: LETTER REQUESTING PARENTAL PERMISSION

January 29, 2002

Dear Parent or Guardian,

My name is Suzanne Lusher, and I am a graduate student at Marshall University. As part of my graduation requirement, I'm collecting data based on the hand washing practices of elementary school-aged children.

I will be collecting data at Buffalo Elementary School, Wayne County, West Virginia. Student participation in this study involves washing their hands after a lotion is applied and answering a brief pre/post survey. Participation is voluntary and results will remain confidential. If you **do not** wish for your child to participate please return the bottom portion of this letter.

If you have any questions, please feel free to call me at 304.529.1513. Thank you in advance for your assistance.

Sincerely Yours,

Suzanne C. Lusher
Marshall University Graduate Student

- ❑ I **DO NOT** want for my child, _____ (Name of Child) to participate in the data collection conducted by Marshall University.

_____ (Parent or Guardian Signature)

_____ (Date)

APPENDIX C: LETTER GRANTING PERMISSION FROM ELEMENTARY SCHOOL

BUFFALO ELEMENTARY
331 BUFFALO CREEK ROAD
KENOVA, WV 25530
(304)429-2911

Jan Hackney
Principal

Russell Copeland
Assistant Principal

January 31, 2002

Ms. Suzanne Lusher
3 Hapgood Hill
Huntington, WV 25705

Dear Ms. Lusher:

In accordance with our previous conversation, this letter is to give you permission to gather your data based on the hand washing practices of elementary school-aged children. We look forward to seeing you next week. When arriving at our school you will be working with Mr. Copeland, our Assistant Principal.

Sincerely,

J Hackney

Jan Hackney, Principal

JH:se

APPENDIX D: PRE TEST AND POST TEST EVALUATION TOOL

School: _____ Student ID: _____

County: _____Grade: _____ Boy_____ Girl _____

Put an "X" in the box that answers the following questions.

	Always	Sometimes	Never
1. After I play outside, I wash my hands:			
2. Before I eat, I wash my hands:			
3. After I use the restroom, I wash my hands:			

Circle the letter that completes the following sentences.

1. When washing my hands I should:
   A. wash for the time it takes to sing "Happy Birthday" twice.
   B. wet my hands, then dry them off.
   C. wash just until soap covers my hands and quickly rinse.

2. I should use _____ to dry my hands.
   A. my clothes
   B. a kitchen towel
   C. paper towels

3. The most important reason for washing my hands is:
   A. to make them look clean.
   B. to make others, like my parents or teachers, happy.
   C. to stop the spread of germs.

Circle the letter that you feel answers the question:

1. If sometimes you don't wash your hands before eating, why don't you? <u>(Check ALL that are true for you.)</u>
   A. I don't think about it
   B. There's no soap at my house
   C. It takes too long
   D. I always wash my hands before eating.

2. Is hand washing important? <u>(Check only ONE)</u>
   A. Yes, very important.
   B. Maybe a little important
   C. No, not at all important
   D. I don't care

APPENDIX E: SOAP AND PAPER TOWEL USAGE LOG

County: _____ School: _____

Please keep a record of the soap & paper towel usage of your school for a total duration of 4 weeks, two weeks before and two weeks after "Germ City" has visited your school. In the chart below, record the amount of soap and paper towels on stock before and the amount on stock after "Germ City".

Soap Usage **Before** "Germ City"			
	Beginning Stock	Ending Stock	Total Stock Used
Week 1			
Week 2			

Total used _____

Paper Towel Usage **Before** "Germ City			
	Beginning Stock	Ending Stock	Total Stock Used
Week 1			
Week 2			

Total used _____

Soap Usage **After** "Germ City"			
	Beginning Stock	Ending Stock	Total Stock Used
Week 1			
Week 2			

Total used _____

Paper Towel **After** "Germ City"			
	Beginning Stock	Ending Stock	Total Stock Used
Week 1			
Week 2			

APPENDIX F: HAND QUADRANT EVALUATION TOOL

County: _____ School: _____ Grade: _____

Student ID: _____ B____ G____ 1st ____ 2nd ____ 3rd _____ Time in "Germ City"

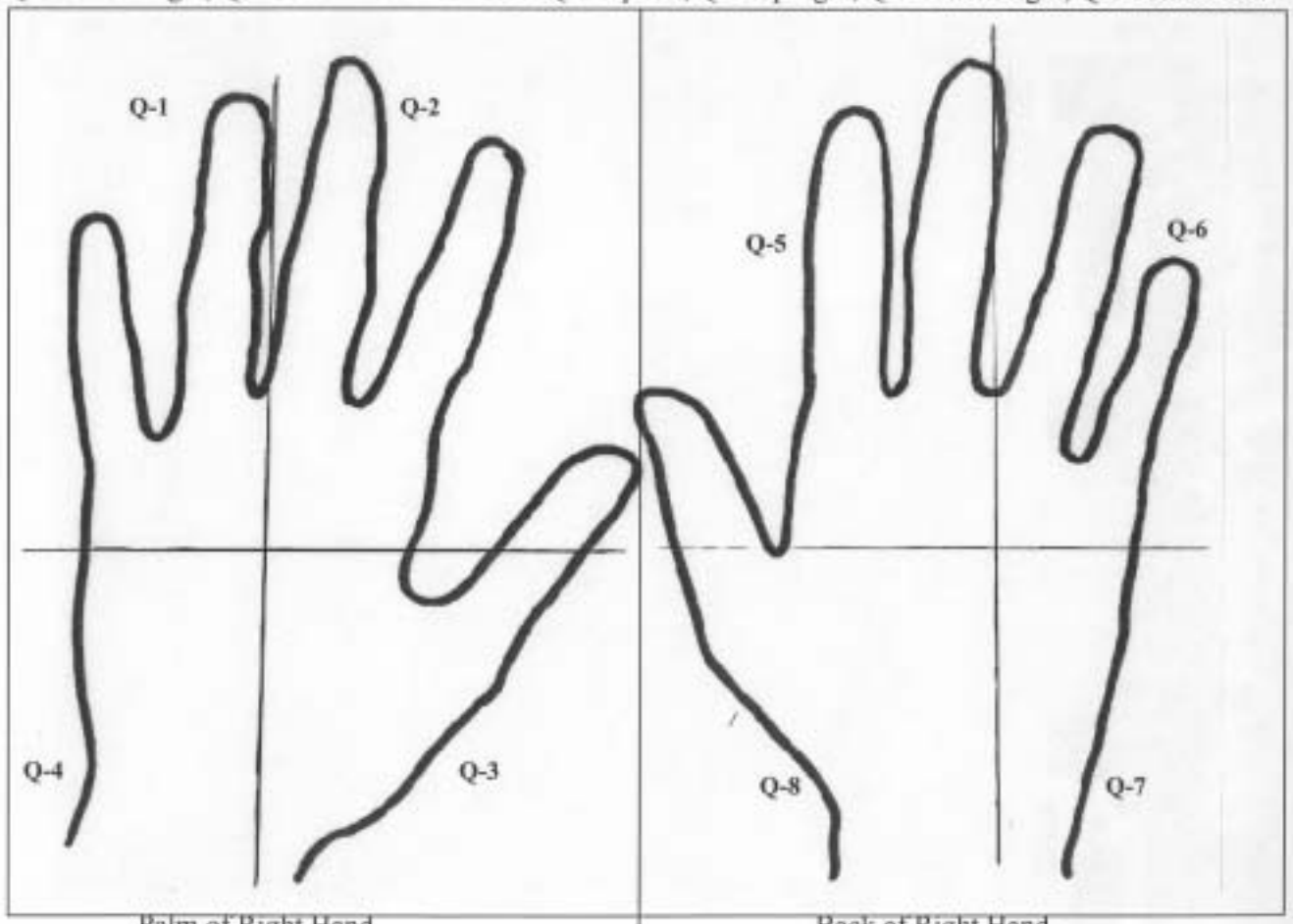
Use the model hands below to record pretend germs left in each quadrant of the child's right hand. Mark the quadrant by using the codes in the evaluation key and note the placement of glow germ after their first washing. Quadrants are numbered clockwise Palm side: Q-1 top left, Q-2 top right, Q-3 bottom right, Q-4 bottom left. Back side: Q-5 top left, Q-6 top right, Q-7 bottom right, Q-8 bottom left.

Evaluation Key

C - Indicates the entire quadrant is clean from glow germ.

• - Indicates that particular area was left soiled.

D – Indicates the entire quadrant is dirty from glow germ.



APPENDIX G: OPERATIONAL DEFINATIONS

Aerobic - Living in air

Anaerobic - Living without oxygen

Bacteria - A unicellular prokaryotic microorganism that usually multiplies by cell division and has a cell wall that provides a constancy of form; they may be aerobic or anaerobic, motile or nonmotile, and free-living, saprophytic, parasitic, or pathogenic.

Cross Contamination – The transfer of harmful substances or disease-causing micro-organisms to food by hands, food-contact surfaces, or cleaning cloths that touch raw food, are not cleaned and sanitized, and then touch ready-to-eat food. Cross-contamination can also occur when contaminated food or stored raw food touches or drips fluids on cooked or ready-to-eat food.

Diphtheroids – One of a group of local infections suggesting diphtheria, but caused by microorganisms.

Enterobacter agglomerans – A species found in water, soil, sewage, dairy products, and the feces of man and other animals.

Glitter Bug – A specialized lotion with a UV pigment that will emit a glow under a black light. Manufactured by the Brevis Corporation.

GloGerm – A specialized lotion with a UV pigment that will emit a glow under a black light.

Klebsiella oxytoca – An anaerobic, nonmotile, nonsporeforming bacteria. These organisms may or may not be pathogenic. They occur in the respiratory, intestinal, and urogenital tracts of man as well as in soil, water, and grain.

Nosocomial infections - Relating to a hospital. Denoting a new disorder (not the patients' original condition) associated with being treated in a hospital, such as a hospital-acquired infection.

Staphylococcus aureus – a common species found especially on nasal mucous membrane and skin; it causes pneumonia, osteomyelitis, endocarditis, suppuration of wounds, other infections, and food poisoning. Humans are the chief reservoir.

Staphylococcus epidermidis – A species, originally found in small stitch abscesses and other skin wounds, which occurs on parasitic skin and mucous membranes of man and other animals.

APPENDIX H: HAND WASHING CURRICULUM

Germ City Hand Washing Program

"Clean Hands, Healthy People"

Curriculum Guidelines and Presentation Suggestions

Format: 50 minute sessions with 20-50 students.

Objectives:
The objectives and project goals of Germ City Hand Washing Program are to:

1. Enhance awareness of the importance of hand washing using science-based education for youth, adults, and older Americans preparing food in the home.
2. Improve effectiveness and frequency of hand washing reaching a diverse audience in rural and urban settings including children, adults, senior citizens, and at-risk population groups.
3. Modify attitudes, enhance personal motivation, and facilitate positive behavior change for hand washing.
4. Generate data/research base to support future study and evaluate effectiveness of hand washing education programs related to behavior change, attitudes, and personal motivation.

The lesson emphasis is on Learning About the Importance of Hand Washing, Why It Is Important, and Practicing Effective Hand Washing for Behavior Change.

Supplies:

Germ City Unit
Evaluation Materials
Glitter Bug (in a pump bottle) from the Brevis Corporation – one pump is good for approximately 500 students. A small amount is satisfactory

Set-up:

Set-up the Germ City Unit in a central location that will accommodate 20-50 students, teachers, and volunteers. The location must be within easy reach of restrooms with an adequate number of sinks for hand washing. Your will need one grounded three prong electrical hook-up. Make arrangements with school maintenance for supplies of paper towels and soap. Possible locations include a school library, the gymnasium, or a large hallway in the school. Generally, students are seated on the floor.

Think ahead about the "flow" of students through the Germ City Unit. With large groups, it usually works best to line students up, ready to enter and then give directions for going through the tunnel, hand washing, and re-visiting the tunnel. Thinking ahead can save lots of valuable time for student interaction.

Ensuring Success in the Classroom:

While the message and the objective for the Germ City Hand Washing Program are straightforward, personal delivery often makes the difference between giving a talk and a presentation that engages children and facilitates behavior change.

The Lesson Plan

Components of the lesson

1. Introduction
2. Germs and Hand Washing – A Conversation with Children
3. Discussion of Germs, Hand Washing, and Food Safety
4. Effective Hand Washing – The Method
5. Visit the Germ City on your hands
6. Hands–On Practice with Hand Washing
7. Re-visit Germ City on Your Hands
8. What we've learned – A Conversation with Children

Introduction

- Introduce Yourself
- Children's Overview – Learning and Practicing Hand Washing

Germs and Hand Washing – A Conversation with Children

- Ask children what they know about Germs. Introduce another name from Germs – Bacteria, Virus.
- Many children will talk about germs making you sick
- Stress these points: Germs are everywhere, germs can make you sick, germs are so small that you can not see them, you can get rid of germs by washing your hands
- Transition to a discussion about Hand Washing
- Ask children what they know about Hand Washing

Discussion of Germs, Hand Washing, and Food Safety

- Play a game with the imaginary ball. Ask two children to volunteer to play an imaginary game of ball. Ask them what their favorite color is and design a ball just for them to play with you. The educator coughs or sneezes loudly into their hand, then pretends to roll the ball to each of the children. It's easy to build onto the cross-contamination story by transferring your cold germs to the ball – to their hands. Then, ask students to pretend that it's lunchtime. Ask if they're hungry. Transition by moving the germs from their hands to the sandwich they eat at lunch… and three days latter they can pretend to start coughing.
- Be inventive, use their favorite colors, get "into" the pretend game, and/or create their favorite lunchtime sandwich.
- Discussion of Cross Contamination – "Moving germs from one place to another.

Learning Through Story-Telling:

- Discussion of Petting Zoo and Eating Cotton Candy
- Here's a story in narrative to illustrate cross contamination.

    - There was a little boy and a little girl who went to the fair with their parents. The little boy and little girl were having so much fun at the petting zoo. How many of you have visited a petting zoo? The little boy and little girl were petting the baby calves and lambs. After they finished petting the animals, they came out of the barn and got into a small, red wagon. Their parents were pulling them around the fair grounds. They mush have been hungry because their parents opened a big plastic bag of pink cotton candy and ate it. Let's pretend there were germs or bacteria on the baby calf. Where have the germs moved? From the calf – children's hands – cotton candy – children's mouth – children's body. What might happen?

- Identify Important Times for Hand Washing: Making the connection to germs/bacteria and cross contamination. 1 before you eat. 2 after using the restroom. 3 after playing with pets or visiting the petting zoo. 4 after coughing or sneezing. 5 after playing with toys or outside.

Effective Hand Washing – The Method
This section works best if you pantomime the process with the children

- Look for a Paper Towel. Take one and place it under your arm.
- Turn on the water. Get hands wet – with warm, running water.
- Add soap.
- Scrub hands for 20 seconds. 1st show them how to do it – under and around nails, fingers, front and back side of hands, and wrists.
- Practice washing while singing a favorite song: Row, Row, Row Your Boat (twice), Happy Birthday (twice), Twinkle, Twinkle, Little Star, or the Alphabet Song.
- Rinse well under running water.
- Take the paper towel from under your arm and dry.
- Shut off water with paper towel and open door with paper towel
- Place the paper towel in waste basket

Visit Germ City

- Place a small amount of Glitter Bug lotion on hands. Instruct to rub in like hand lotion.
- Stress these are pretend or make-believe germs – which they will not hurt you or make you sick.
- When you go into Germ City, you will be able to see the make-believe germs on your hands.
- Ask children to line up quietly outside Germ City. Request they look at their hands inside the tunnel then go to the restroom and wash their hands – stressing practicing what they learned.
- Ask them to return line up outside the tunnel after they wash their hands.

Hands-on Practice with Hand Washing

- Teachers, volunteers, classroom assistance are present in restrooms – reinforcing the steps of hand washing.
- Keep things moving by helping pull off paper towels, and leaving water running during class participation.
- Keep things safe – checking for water and soap on the floor.

Re-Visit Germ City

- Re-visit the tunnel with the children drawing attention to any Glitter bug lotion that remains on hands.
- Remain inside the tunnel pointing out remaining make believe germs as each child walks through.

What we've learned – a Conversation with Children

Ask children what they observed or learned by looking at their hands the last time they visited Germ City.

- Need to wash/scrub longer
- Important to use soap and warm water
- Missed spots on their hands

Re-emphasize the importance of hand washing, practice or pantomime hand washing, and review important times to wash hands.

Outline created by B. Susie Craig, Washington State University Corporative Extension Area Faculty – Food Safety

APPENDIX I: CURRICULUM VITAE

Suzanne C. Lusher

Education

Dietetic Internship
Anticipated Completion 7/ 2002 — Marshall University — Huntington, WV
Accredited by the Commission on Accreditation for Dietetics Education

Master of Arts
Anticipated Completion 5/ 2002 — Marshall University — Huntington, WV
Family and Consumer Science/Nutrition
Thesis: *"An Evaluation of Germ City: Finding a suitable design."*

Bachelor of Science
12/ 1999 — Marshall University — Huntington, WV
Dietetics

Employment Experience

8/2001 – present — **Marshall University** — **Huntington, WV**
Graduate Assistant

- Created and maintained Marshall University Dietetic Program web site
- Co-wrote Dietetic Master of Science Program Proposal
- Supervised Quantity Foods Lab

2/ 2000 – 8/ 2001 — **WVU Extension Service** — **Charleston, WV**
Program Coordinator, "Be Smart. Eat Smart." Nutrition Education Program

- Provided administrative support for policy, budget, and operating procedures.
- Assisted with writing and co-administering grants and proposals.
  - FFY 2001 - $566,452
  - FFY 2000 - $360,827.
  - Co-Principal Investigator - Refrigerator Food Safety Research Grant - $19,000.
- Developed curriculum including publications and nutrition education resources.
- Networked with federal, state, and local partners to achieve program goals.
- Assessed needs of communities and program participants through formal and informal studies, surveys, and other research instruments.

5/ 1999 – 2/ 2000 — **WVU Extension Service** — **Wayne, WV**
Extension Associate, "Be Smart. Eat Smart." Nutrition Education Program

- Taught community nutrition classes targeted for limited-resource families.
- Networked with local agencies and businesses to secure resources
- Worked with program participants to assess current status, educate, and improve
  - Diet Quality
  - Food Safety
  - Food Security
  - Food Consumerism

11/ 1997 – 7/ 1998 **St. Mary's Hospital** **Huntington, WV**
Diet Clerk

- Modify and distribute menus to hospital patients.
- Conduct nutritional assessments
- Coordinate diet orders and distribute diet orders to kitchen staff.

Professional Affiliations

American Dietetic Association	1998 – present
West Virginia Dietetic Association	1998 – present
Kappa Omicron Nu Honorary Society	1998 – present
Vice-President Marshall University Chapter	1998
Society for Nutrition Education	2000 – present
WV Association of Family and Consumer Science	2001 – present

Committee Membership

Fairland High School FCS Advisory Board	2002
WVU Extension Service Diabetes Symposium	2001 & 2000
Exhibit Committee Chair	2001
WV Office of Child Nutrition Child Nutrition Symposium	2001

Awards and Honors

Outstanding Dietetic Student DI Program Award	2002

Professional Presentations

Cabell/Wayne Educare **Milton, WV** **10/ 2001**
- *"Nutrient needs for the growing preschooler."*

Child Nutrition Symposium **Fairmont, WV** **6 / 2001**
- *"Germ City, an Inter-Active Hand Washing Demonstration, Exhibit, and Education Program."*

Priester Nutrition Health Conference **Dallas, TX** **5/ 2001**
- *"Family Mealtime: A Joint Venture."*

WV Families and Communities **Flatwoods, WV** **12/ 2000**
- *"Be Smart. Eat Smart.": A Community-Based Nutrition Program."*

National Extension Assoc. of FCS **Baltimore, MD** **10/ 2000**
- *"Be Smart. Eat Smart.": A Community-Based Nutrition Program."*

WV Public Health Conference **Snowshoe, WV** **9/ 2001**
- *"Be Smart. Eat Smart.": A Community-Based Nutrition Program."*

Society for Nutrition Education **Charleston, SC** **7/ 2000**
- *"What Temperature is Your Refrigerator?"*

WV WIC Conference **Wheeling, WV** **10/ 1999**
- *"Be Smart. Eat Smart.": A Community-Based Nutrition Program."*