ABSTRACT

ARMSTRONG, VIKKI M. An Investigation of Transfer of Learning in Diabetes Self-Management Education. (Under the direction of Dr. Conrad Glass).

Minimal research has been conducted in the health education profession on the implications of Transfer of Learning (TOL): the effective application by program participants of what is learned as a result of attending an educational program (Silberman, 1990; Kemerer, 1991; Killion and Laylor, 1991; Broad and Newstrom, 1992). The purpose of this study was to investigate transfer of learning in diabetes self-management education by examining differences that existed in preventive care maintenance and diabetes self-management practices for non-institutionalized adults age 18 and older with diabetes in North Carolina who reportedly had previously participated in a diabetes education course or class when compared to those respondents who had not ever participated in such a course.

The data used for this research investigation were derived from the 2003 Behavioral Risk Factor Surveillance System (BRFSS) Survey. This study used t-tests, chi square tests of independence to analyze responses to the BRFSS Survey. Respondents who indicated having Non-pregnancy related Doctor diagnosed diabetes comprised the sample for this study (N=9,441). Null hypotheses were formed to investigate
differences in glucose self-monitoring, self-foot examinations, exercise/physical activity, HbA1c and dilated eye examinations based on previous participation, or lack thereof in a diabetes self-management education course or class and controlled for the independent variables (age, gender, race, education, employment status, household income, marital status and number of dependent children under the age of 18) with linear and logistic regression analyses respectively.

Significant differences were found in glucose self-monitoring, self-foot examinations, non-work related exercise/physical activity and dilated eye examinations based on previous participation in diabetes self-management education. No differences were found for HbA1c testing. When controlled for the independent variables, it was further discovered that with the exception of HbA1c testing and non-work related exercise/physical activity, respondents who had previously participated in a planned diabetes education program, class or course, tended to practice self-management and preventive care maintenance behaviors more often or frequently than those who had not ever had any formal diabetes education. Overall, the findings suggest that transfer of learning in diabetes self-management education was achieved and further imply that formalized educational initiatives for diabetes care management in NC are effective and worthwhile.

All data were analyzed at the .05 level of significance.
An Investigation of Transfer of Learning in Diabetes Self-Management Education

By:

VIKKI MICHELLE ARMSTRONG

A dissertation submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the Degree of Doctor of Education

Department of Adult and Community College Education

Raleigh
2005

APPROVED BY:

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Chair of Advisory Committee
DEDICATION

This dissertation is dedicated to my son, Trey S. Armstrong.

Trey, you have been my sunshine and inspiration since the day you entered my womb and my life. I want to thank you for all of your patience and support when I used to attend night and weekend classes and also during the time that I was working on my “homework” ALL DAY AND ALL NIGHT for the last 5 years! Your smiles, drawings, hugs, smooches, ‘noseys’ and eyelash kisses brightened many of my cloudy days and I want you to keep them coming☺.

My prayer is that you will always remember that education is important- and the best thing about it is that once you have it- no one can take it away from you! Let nothing stop you from achieving your goals in life…you can do ANYTHING you set your mind to, I did!

There is a difference between smart and intelligent, transfer of learning facilitates the latter, which is optimal and preferred (I will explain what that means to you in 8 year old terms later☺, but as you grow up, you will understand!).

Finally, I want to share with you a poem that kept my spirits up and gave me the encouragement that I needed when times were hard, “homework” was hard, your head was hard and becoming a Doctor of Education seemed impossible! I like it most, because it goes with what I always say about the power of problem solving instead of giving up and/or making excuses: PLAN “B” IS TO MAKE PLAN “A” WORK!
Don’t Quit

When things go wrong, as they sometimes will,
When the road you’re trudging seems all uphill,
When the funds are low and the debts are high,
And you want to smile, but you have to sigh,
When care is pressing you down a bit,
Rest if you must, but don’t you quit.

Life is queer with its twists and turns,
As every one of us sometimes learns,
And many a failure turns about,
When he might have won had he stuck it out;
Don’t give up though the pace seems slow,
You may succeed with another blow.

Success is failure turned inside out,
The silver tint of the clouds of doubt,
And you never can tell how close you are,
It may be near when it seems so far;
So stick to the fight when you’re hardest hit,
It’s when things seem worse, that you must not quit.

Author Unknown

With Love,

Mommy
BIOGRAPHY

Vikki Michelle Armstrong is a native of Fayetteville, North Carolina where she now resides with her son Trey, and is the daughter of Michael Armstrong (Nancy) and Barbara Armstrong White (Jesse). She is the oldest of three siblings, Patrik, Khristien and Evan Armstrong and is the proud aunt of two nephews, Anthony (born 2003) and Donovan (born 2005). She graduated from E. E. Smith Senior High School in Fayetteville and continued her education at East Carolina University in Greenville, NC where she received a Bachelors Degree in Health Education. After the birth of her son Trey in 1997, she returned to ECU and within 1 year, completed a Masters of Arts in Education with a major in Health Education and Promotion and a minor concentration in Adult Education.

Upon completion of the Masters Degree, the author was offered and accepted an opportunity to serve on the Health Education and Promotion faculty at ECU as a lecturer and Program Director of the LIVING WELL DIABETES EDUCATION Program. This was a grant-funded initiative that focused on the integration of a health educator in a clinical setting and sought to reduce diabetes related complications through individualized and community-based education for residents of rural Bertie County.

In the Fall semester of 2000, upon the encouragement and support of her mentor, Dr. David M. White, Professor and Department Chair of Health Education and Promotion at ECU, the author enrolled in the Adult and Community College Education Doctoral Program at North Carolina State University and fulfilled the requirements of the Degree of Doctor of Education in the Spring of 2005.
The author’s professional practice includes nearly ten years of diverse experience in the field of health behavior education, teaching at the high school, community college and University levels as well as grant writing and administrative experience as the Department Chair of Vocational and Technical Education at a Community College in Eastern NC.

Currently, the author serves in a tenure-track position at the rank of Assistant Professor on the faculty in the School of Pharmacy at Campbell University and is the Director of Assessment and Evaluation.
ACKNOWLEDGEMENTS

First, I would like to acknowledge the presence of God Almighty, who has kept me, protected me, guided me this far and continues to lead me on. Without His grace and mercy, I would not be where I am today, nor, where I hope to be tomorrow.

I would like to extend my sincere appreciation to the advisory committee members, Dr. Saundra W. Williams, Dr. John Pettitt, Dr. Alton Thompson, Dr. David White, Dr. Conrad Glass, and the graduate representative, Dr. Jack Bacheler for seeing me through this process. I could not have asked for a better “team” to work with! I thank you all for your time, energy, expertise and sacrifice. Dr. Glass, the road has been rough, but through it all, I can honestly say that I am happy you made me edit, rewrite and revise my dissertation those “fifty eleven hundred million kazillion” times! Because of your standards of excellence, I have a product that I can be proud of…with no typos!

A special thank you to Dr. David M. White: You saw in me, what I could not…and did not see in myself. I can clearly recall being called into your office one sunny day in the Fall of 1999. That was the day that you gave me ‘the talk’. ‘The talk’ about the potential that you saw in me to go a step further than the Master’s Degree, the implications of being a year to year contract employee on job security, or lack thereof, and the importance of making choices for me today- that will affect Trey tomorrow. The thought of pursuing a terminal degree in order to one day be considered for tenure had never crossed my mind, before ‘the talk’. Being the first in my family to accomplish what I had so far, I was just happy to have a Master’s Degree and be a lecturer at the magnificent institution of higher learning that we know as East Carolina University! At the onset of this acknowledgement section, I gave God credit for helping me finish this degree. And now, I will give God credit for sending you into my life to give me the encouragement and support that I needed to start the degree. Because of your confidence in me and commitment to the “grow your own,” concept, I will now be referred to as Dr. Vikki M. Armstrong. I truly appreciate all of your support during and since my departure from ECU. I value the lessons that I learned under your supervision and leadership, and attribute a great deal of my professional growth and maturity to your mentorship and example.
I wish to thank Dr. Ronal Maddox, Dean of the School of Pharmacy, for having faith in my abilities and allowing me an opportunity to share my knowledge, skills and talents with the new faculty family that I have become a part of at Campbell University. Thanks also to Dr. Bob Cisneros, my comrade, confidant, lunch buddy and search committee chair. Thanks for all of your encouragement this semester. All I can say is… those books came in handy!!!

To my parents, Michael Armstrong and Barbara Armstrong White as well as my stepparents, Nancy Armstrong and Jesse White, respectively: I am proud to be your daughter and thank you for the example that you have set. Daddy, you never let me down and always keep me smiling- Mushi-Mushi! In my heart, I’m still Fancy☺. Mommy, it is because of you that I am the strong persevering woman that I am today. You have prepared me well for society and from childhood taught me how to “man-up”, but in my heart, I’m still a princess☺. To my grandfather, Earl Armstrong, I thank you for your support and am overjoyed that you were able to see me finish this race. To my brothers, Patrik, Khristien and Evan, thanks for being there. The sky is the limit. I love you all.

I wish to thank three special friends that have been supportive and involved with me at three different phases of this journey: In the beginning, my friend Sonya Holley and I battled the GRE field together in our quest to get accepted to Graduate School. In the Middle, my friend & Soror Vickie Smith and I both embraced the challenge of night and weekend classes and somehow survived! And towards the end, my friend & ‘play little sister’ Cheri Barcliff Clarke and I rekindled our childhood friendship and have been supportive to one another as parents and pals! Honorable mention goes out to my friend and statistical counselor, Betty Morrison☺.

To all of my friends, colleagues, and family members whom I did not name, your contributions have not gone unnoticed. I thank you for all of your phone calls, cards, thoughts and prayers.

Finally, to my son Trey, thank you for your patience, it is finally over!!!
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CHAPTER ONE

Introduction

Transfer of learning (TOL), also termed “transfer of training” and “follow-up to training”, is the effective application by program participants of what is learned as a result of attending an educational program (Silberman 1990; Kemerer, 1991; Killion and Kaylor, 1991; Broad and Newstrom, 1992). TOL has been described as ‘the ultimate aim of teaching’. However, achieving this goal is regarded as ‘one of teaching’s most formidable problems’ (McKeogh et al. 1995:vii). Many definitions of transfer of learning exist within various professional contexts with most specifically addressing organizational transfer of learning in the workplace or from a vocational education perspective. The widely used working definition by Baldwin and Ford (1988) is: “the degree to which trainees effectively apply the knowledge, skills, and attitudes gained in a training context...and [are] maintained over a period of time” (p.63). Ottoson (1997) suggests that new ideas or innovations be considered a product of transfer and warns against limiting transfer to application of knowledge, skills, or attitudes only. In educational psychology, “transfer” has a broader meaning and is regarded as an experience that can exist solely within the boundaries of the classroom. Here, transfer is the foundation of all learning and therefore is often referred to as “transfer of learning” as opposed to the interchangeable reference to this process as “transfer of training” (Baldwin and Ford, 1988). Klausmeir
& Davis (1969) offer the following paradigms regarding the relationship of transfer of learning. In order to perform algebra, one must be capable of transferring simpler skills, such as addition, subtraction, multiplication, division, etc. This is an example of vertical transfer. Lateral or horizontal transfer is presented in learning concepts that require transfer or discernment of attributes among a class of objects, such as distinguishing a dog from a cow (Klausmeir & Davis, 1969).

In 1988, Baldwin and Ford concluded that the problem of transfer in organizational training has received growing recognition, and that “it is estimated that while American industries annually spend up to $100 billion on training and development, not more than 10% of these expenditures actually result in transfer to the job (p. 143)”. Nonetheless, Holton and Baldwin (2000), point out that while there is little empirical basis for the aforementioned 10% figure, they acknowledge the problem of transfer as significant and expensive despite the best efforts of Human Resource Development professionals who attempt to resolve it.

This failure to apply or transfer what has been learned into the workplace or organizational setting is also common in situations where health behavior intervention and self-management of a chronic disease is concerned. “Assisting people to make changes is what transfer of learning is all about...changes in themselves, other people, practices, organization, and/or society (Rogers, 1983; Fox, 1984; Hall and Hord, 1987; Martin and
Mazmanian, 1991; Ottoson, 1993, p. 213). Though minimal research has been conducted on the implications of transfer of learning in the health education profession, more adult learners are insisting that planned education programs facilitate knowledge exchange and yield outcomes that are applicable, practical and worthwhile in their quest to improve health behaviors and decrease preventable complications of chronic diseases. This is a constant challenge for health educators charged with planning diabetes education programs as well as the adult learners who participate.

In this chapter, the researcher will present: a background of the problem along with a synopsis of diabetes epidemiology, statement of the problem, purpose of the study, research questions, significance of the study findings, limitations of the research study and finally, the researcher will define and identify associated concepts and terms as appropriate.

**Background of the Problem**

Diabetes affects 18.2 million Americans and is the seventh leading cause of death in the United States. In addition to the deaths from diabetes as a primary cause, diabetes is the leading cause of end-stage renal disease, lower limb amputation and blindness in adults. Diabetes doubles the risk of cardiovascular disease, including coronary heart disease and stroke and is more common among ethnic minority groups, such as African Americans, Native Americans, and Hispanics (Duren-Whitfield, 2000). North Carolina has the 12th highest mortality rate compared to other states, and diabetes is
the 7th leading cause of death in the state. As reported by the NC State Center for Health Statistics (2002), each day in North Carolina 300,000 people struggle with the disease, 150,000 have the disease, but are unaware of it, 15 deaths occur due to complications related to the disease, $400,000 is spent on in-patient care, 8 feet and legs are amputated, 3 new patients begin dialysis and 616 patients are hospitalized for heart, stroke and circulation diabetes complications.

Though this investigation was focused on Statewide Survey Data, this researcher deemed it equally important to emphasize the impact that this manageable chronic disease has had on the Eastern Region of the State and Bertie County, particularly since these areas served as the inspiration for the investigation. The 29 counties that make up Eastern North Carolina have a population of approximately 1.2 million people, over one-third of which is non-white. It is a rural, poor, and medically under-served region whose elderly population is substantial and growing. Nearly 20% of the residents have incomes below the federal poverty level (compared to 14.5% nationally), and in a number of counties, up to 20% of the population are uninsured (NC State Center for Health Statistics, 2002). Mortality rates for most chronic diseases are above state averages and are even more alarming when a closer look is taken at individual rural counties in the eastern part of the state.
Tier one counties signify the most economically depressed counties in North Carolina. Residents of tier one counties exhibit poor health outcomes and deaths from chronic diseases that are 1 ½ times the state average. Tier one counties also have high Medicaid eligibility rates and fewer practicing health professionals. According to the 2000 Bertie County Community Health Assessment, diabetes continues to be a tremendous health concern for this tier one county and has an age adjusted death rate for diabetes of 59.7 per 100,000 compared to a rate of 25.3 for the state. Bertie County also has a large Medicare/Medicaid population, with nearly 38% of the county’s population receiving Medicare and Medicaid benefits. Bertie has an older population compared to the state average and has some of the highest mortality (age adjusted) rates in the state from diabetes (21.0 per 100,000), heart disease (178.7 per 100,000) and stroke (53.2 per 100,000). Bertie County has the fifth highest age adjusted stroke mortality rate of the 29 counties in Eastern North Carolina (North Carolina Division of Aging, 2000).

**Epidemiology of Diabetes**

Diabetes is a chronic disease that results in the body either not producing enough insulin, or not using the insulin in the body properly. Insulin is a chemical that is produced by the pancreas. It is released from the pancreas into the bloodstream when blood glucose levels increase. Insulin works as a regulator that regulates blood glucose levels and brings high blood glucose levels down to acceptable levels. Therefore, medications
such as insulin and oral agents or pills are essential in achieving diabetes control.

There are two main types of diabetes: Type I and Type II. Type I diabetes is called juvenile diabetes or insulin dependent diabetes. Here, the individual's pancreas produces no insulin or not enough. Many doctors believe that heredity plays a key role in the cause of Type I diabetes. However, with Type I diabetes, nothing could have prevented an individual from developing this disease. Type I diabetes requires one to keep a tight control of blood glucose levels by checking them three or more times a day. Also, more advanced nutrition and exercise therapy are needed. In short, Type I diabetes is often more serious and complex than Type II.

Type II diabetes is called adult onset diabetes or non-insulin dependent diabetes. This is the more common form. Here, the individual's pancreas produces minimal amounts of insulin, however, the body is unable to use the insulin efficiently. Most people with Type II diabetes are overweight, over the age of forty, and have a family history of the chronic disease with the same diagnosis.

According to the American Diabetes Association, pregnant women who have never had diabetes before but who have high blood sugar (glucose) levels during pregnancy are said to have gestational diabetes. Gestational diabetes affects about 4% of all pregnant women - about 135,000 cases of gestational diabetes in the United States each year (2005). This research investigation is solely focused on the outcomes of individuals who report have doctor diagnosed diabetes that is not pregnancy related.
Statement of the Problem

Chronic disease management is to a large extent dependent upon the patient’s understanding about appropriate self-care management and more importantly, the motivation to follow physician recommendations through preventive care maintenance. Patients with chronic conditions require care that is fundamentally different from acute care, which has traditionally been, and continues to be the focus of the American health care system. However, busy clinical practices have little time for education and motivation of patients. Deficiencies in the medical care of patients with chronic illnesses, such as hypertension and diabetes, have been well documented, especially among poor and financially needy patients.

Medication compliance and poor glucose self-monitoring are also challenges for successful diabetes management. Glucose self-monitoring, often called self-testing, indicates how much sugar is in a patient’s blood at any point in time. This testing signifies how effective the current treatment plan is at the time of the test and whether nutrition, medication and exercise changes should be made right away. Blood sugar levels may vary frequently in a 24-hour period.

The best way to control immediate blood sugar levels from day-to-day is by self-testing regularly, however; self-testing cannot provide an adequate assessment. A glycosylated hemoglobin (HbA1c or Hemoglobin A1c) test provides a better indication by indicating the average blood sugar level over
the last 6 to 10 weeks, which suggests whether or not treatment changes should be made. Failure to follow the recommended treatment plan may result in poor disease management and increase the likelihood of disease complications that may require extensive treatment while placing a heavy financial and medical burden on the patient and the health care system. If patients could successfully and independently apply what was learned from the health care provider outside of the clinical or educational setting, a greater degree of overall diabetes self-management could be achieved.

**Purpose of the Study**

Based on the aforementioned problems, the purpose of this research study on a macro level was to investigate transfer of learning in diabetes education. This investigation of Transfer of Learning was conducted by analyzing the statistical relationship between preventive care maintenance tendencies and self-management practices among survey respondents in NC with diabetes who indicated that they had previously taken a course or class in diabetes education in comparison to those who had not ever participated in such a course.

According to Caffarella (1994), “Program evaluation is a process used to determine whether the design and delivery of a program were effective and whether the proposed outcomes were met (p. 199)”. Evaluation, when conducted properly, serves as an indispensable tool for stakeholders and other interested parties. In this study, the researcher references evaluative
processes only to examine if transfer of learning occurred through practice of self-management techniques, not to evaluate an educational intervention itself. Evaluation is an essential component of any health education program, not just to ensure the success of the program, but also to improve upon it. The criteria for measuring success of the program can be varied. One criterion could be the transfer of learning, or the extent to which learning in the program is transferred and incorporated into the practice of the participant or learner. However, sometimes transfer of learning is left to chance (Caffarella, 1994). Sleezer (1994) refers to this neglect of the evaluation of the transfer of learning in program development as the transfer-assumed approach to program planning. For change in practice to occur, attention should be focused on what happens after the program is over. Therefore an important question to ask when planning programs is ‘will the learning be applied?’ (Goody & Kozoll, 1995). While participants might attend the same program, the same program is not necessarily experienced. The learning activities might become common to all, but an assortment of factors may influence how the activities are experienced and understood; thus affecting how learning is transferred. These factors may include the content of the program, prior experience and knowledge of the participant, context and environment from which they come and individual motivation for participating and for attempting change (Ottoson, 1997).

While there were many individuals and entities that may have benefited from the findings of this research study, chief stakeholders were Centers for
Assumptions:

Boone (1985, p.171) offers assumptions for the evaluation and accountability subprocess of planned adult education programming design and implementation that the researcher found applicable and relevant to this investigation of transfer of learning in diabetes education.

The six basic assumptions are:

1. "The primary purpose of the planned adult education program is to effect desirable behavioral changes in a specified public.
2. Outputs/outcomes of planned adult education programs can be identified and evaluated.
3. An adult education organization proceeds through the programming process as a series of conscious choices and decisions. It is further assumed that each choice and decision is rational and based on values that are understood.
4. Management and renewal of the adult education organization depend upon continuous generation of program outputs and feedback through evaluation and accountability.
5. Participation of target publics in evaluating how well their educational experiences met the planned program’s objectives is both desirable and necessary.
6. The adult education organization has both a commitment and an ethical responsibility to account for program choices (input) and outputs to its learners, funding sources, the profession, and where appropriate, its governance body.”

In the instance of the first and second assumptions, it is fair to assume that a diabetes education course or class would be primarily focused on positively effecting behavioral change, i.e. preparing publics for successful transfer of learning through identification and evaluation of the presence, or absence of desired outcomes. The outcomes that were identified for the purposes of this study were 1) Glucose Self-Monitoring, 2) Self-Foot Examination, 3) Exercise/Physical Activity, 4) HbA1C and 5) Dilated Eye Exam based on the assumption that education on these outcomes would have been provided in a diabetes education course or class. Assumptions three, four, five and six are organizational, and can be reasonably supposed based on guidelines and standards of professional practice for health care professionals acting as change agents through the planned education process. Curriculum planning, participant needs assessment, feedback through evaluation, ethical responsibility and accountability are subprocesses that are assumed to be embedded in the design of a planned adult education program, thus it is assumed for the purposes of this study that these assumptions were met by the practicing health professionals responsible for the facilitation and delivery of the planned diabetes education course or class on preventive care maintenance and self-management practices. The Patient and Professional Education Task Force
of the NC Diabetes Advisory Council developed a diabetes self-management education curriculum written by and for North Carolinians (Appendix A). This curriculum is revised every four years and provides teaching tips and educational modules with accompanying resources and materials to assist in providing diabetes self-management education in a group setting.

Branham (1992) contends that the evaluation process serves several purposes:

(1) Helps keep facilitators focused on the goals and objectives of the program
(2) Provides information for decision making on all aspects of the program
(3) Identifies improvements in the design and delivery of the learning events
(4) Increases application of the learning by participants
(5) Allows for program accountability
(6) Provides data on the major accomplishments of the program
(7) Identifies ways of improving future programs

This was not an evaluative study, rather an investigation of desired outcomes in relation to previous participation, or lack thereof, in a course or class on preventive care maintenance and diabetes self-management education practices. Defining the role of the Health Professional as a change agent within the philosophy of health education and further examining the
utility of the Health Belief Model (HBM) in adult education program planning and curriculum development as a means to facilitate the transfer of learning in diabetes education was central to the development of the objective for this research investigation. Therefore, the objective was to determine whether preventive care maintenance and self-management practices differed for respondents who had previously attended a class or course in diabetes self-management and those who had not. (The specific preventive care maintenance and self-management practices that were analyzed were glucose self-monitoring, self-foot examinations, and participation in exercise or physical activity; as well as length of time since having a dilated eye examination and a glycosylated hemoglobin test (HbA1c) respectively).

**Research Questions**

Based on the problem, purpose, and objectives of the study, the following research questions were used to guide this investigation:

(1) Is there a significant difference in the practice of glucose self-monitoring for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education?
(2) Is there a significant difference in the practice of self-foot examinations for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education?

(3) Is there a significant difference in exercise or physical activity for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education?

(4) Is there a significant difference in the rate at which Glycosylated Hemoglobin (HbA1c) is tested for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education?

(5) Is there a significant difference in the rate at which respondents in NC with diabetes who had previously participated in a diabetes self-management education course tend to receive dilated eye examinations when compared to those had never had any formal diabetes education?
**Significance of the Study**

There are a number of institutions, agencies and individuals that might benefit from this study. Dissemination of findings could have a positive or negative impact on future participation and support of members from the target public, in this case, diabetes patients in North Carolina, but on a larger scale, people with diabetes in general and learners with other chronic or manageable diseases and conditions such as asthma and high blood pressure that can be controlled through use of preventive health interventions and efforts. If the results of this study indicate a significant difference in preventive care maintenance and self-management practices in relation to previous participation in a diabetes education course, or lack thereof, people may be more apt to become involved with preventive programs, grants and health education intervention initiatives in the future.

Another major contribution of this study may be that the findings can be employed for replication and expansion purposes or as a guide for revamping existing programs to achieve better outcomes. While transfer of learning is not a new component of the learning process (Michalak and Yager, 1979; Nadler, 1982; Fox, 1984), it is an element of the process that is currently receiving increased attention as both participants and sponsors of educational programs demand more concrete and useful results (Caffarella, 1994).
Finally, this study can also be very valuable to the fields of health promotion, adult education, and community pharmacy as the interdisciplinary approach to community-based programming is an evolving concept and is constantly being built upon. Research on transfer of learning is scarce, but valuable to all professions nonetheless.

**Limitations of the Research Study**

The results of this study can be used to make generalizations about adults in North Carolina with doctor diagnosed diabetes. Considerable strengths and advantages of the telephone survey methodology include, but are not limited to, relatively low cost, speed of data collection and computer-assisted-telephone-interviewing system to ensure data collection quality control. Additionally, the BRFSS methodology has been utilized and assessed repeatedly by the CDC and participating states since 1984. As a result, the content of the survey questions, questionnaire design, data collection procedures, interviewing techniques and editing procedures have been carefully developed to improve data quality and lessen the potential for bias” (CDC, 2003). On the contrary, the following observations are deemed limitations of this research study:

1. Lack of coverage of persons living in households without a telephone.
   
   According to the CDC (2003), this limitation is further explained by offering the rationale that households without telephone service are typically of lower income status. As a result, the likelihood of an
understatement exists for the true level of risk in the total population of adults in NC. However, with at least one phone in an estimated 95% of households in NC, the degree of understatement is minimal. Additionally, people in nursing homes or other institutionalized settings without home telephones were also not eligible to participate in the BRFSS survey, therefore the results of the survey cannot be safely generalized to those segments of the population. Ironically, individuals that fall into this category are often of low socio-economic status- a factor associated with poor health behavior, low education and increased health risks (American Diabetes Association, 1995).

2. All data from the BRFSS survey were obtained by self-report. Which, depending on the subject areas being queried, may have been prone to some inaccuracy as a result of inaccurate recall, lack of information, or discomfort with self-disclosure. Moreover, it is highly probable that respondents may have underreported, or over-reported health risk behaviors, particularly those that are illegal or socially unacceptable, but also socio-demographic factors.

3. Diabetes education and awareness efforts and campaigns have been heightened over the past couple of years and may have had an impact on the practice of preventive care maintenance and diabetes self-management practices regardless of previous participation in a diabetes education course.
4. Societal forces are unknown and may have served as barriers or enhancers to the transfer of learning process.

5. Undiagnosed diabetes was not considered in the data collection. This, according to the 2002 Summary Report on Diabetes In North Carolina (Appendix F), is alarming, as an estimated one-third of the 584,000 people in the state who have diabetes do not know that they have the disease.

**Definitions of Associated Concepts and Terms**

**Transfer of Learning:**
“The effective application by program participants of what they learned as a result of attending an educational program (Silberman, 1990; Kemerer, 1991; Killion and Kaylor, 1991; Broad and Newstrom, 1992, p. 8).

**BRFSS: Behavioral Risk Factor Surveillance System**
A standardized random telephone survey of state residents, age 18 and older in households with telephones developed and conducted to monitor state-level prevalence of major behavioral risks among adults associated with morbidity and mortality.

**BRFSS Purpose:**
To collect data on actual behaviors, rather than on attitudes or knowledge, that would be especially useful for planning, initiating, supporting, and evaluating health promotion and disease prevention programs according to the Centers for Disease Control and Prevention, 2003).
Adult Education:

“a process whereby persons whose major social roles are characteristic of adult status undertake systematic and sustained learning activities for the purpose of bringing about changes in knowledge, attitudes, values, or skills” (Darkenwald and Merriam, 1982, p.9).

Adult Learner:

“a participant in any adult learning opportunity, whether special or regular, to develop new skills or qualifications, or to improve existing skills and qualifications, or to acquire information” (Boone, 1985, p.14).

Diabetes Self-Management:

“the process by which patients exhibit ongoing, health affirming behavior that helps them maintain blood glucose levels within target ranges, thus reducing the risk of complications associated with elevated levels. To this end, patients need to have the knowledge, skills, positive attitudes, and resources that support self-management behavior” (NC Diabetes Advisory Council, 1999, p. 1.11).

Education:

“The word ‘education’ comes from the Latin word educare, which is a combination of e, meaning ‘out’, and ducere, ‘to lead’. Ideally, education is a process by which a person is ‘led out’, into a search for knowledge, deeper insights, and increased wisdom” (Cantor, 1992, p.8).
**Empowerment:**
Defined by Lord and Farlow (1990) as having a sense of control and participatory competence, as it relates to health promotion.

**Glucometer:**
Blood glucose testing device

**Health Belief Model:**
According to Rosenstock, Stretcher & Becker, (1994) two major factors influence the likelihood that a person will adopt a recommended preventive health action. First, the individual must feel personally threatened by the disease i.e. feel personally susceptible to a disease with serious or severe consequences. Second they must believe that the benefits of taking the preventive action outweigh the perceived barriers to (and/or costs of) preventive action.

**Health Education:**
Culturally competent learning designed to result in positive changes in behavior (Centers for Disease Control, 1995)

**Health Professional Shortage Area (HPSA):**
HPSA’s established under the U.S. Public Health Service Act, are federal designations of a geographic area, which meet the criteria as needing additional primary health care services. Designation as a HPSA is based on the availability of health professional resources within a rational service area.
Hemoglobin A1c, (HbA1c or glycosylated hemoglobin):
According to the Centers for Disease Control and Prevention, this is a form of hemoglobin (the oxygen-carrying molecule of the blood) that reflects the average blood glucose concentration over a 3-month period. A high percentage of hemoglobin A1c indicates poor diabetes control while a low percentage indicates good control.

Insulin-dependent diabetes mellitus (IDDM):
TYPE 1 Diabetes, according to the American Diabetes Association (2002), results from the body's failure to produce insulin, the hormone that "unlocks" the cells of the body, allowing glucose to enter and fuel them. There are an estimated 850,000 to 1.7 million people - or 5-10% of the U.S. population - with type 1 diabetes. Insulin treatment is required in all patients and its omission results in life-threatening diabetic ketoacidosis ("diabetic coma").

Non-insulin-dependent diabetes mellitus (NIDDM):
Type 2 Diabetes, according to the American Diabetes Association results from insulin resistance (a condition in which the body fails to make enough or properly use insulin), combined with relative insulin deficiency. Approximately 90-95% (16 million) in the U.S. have type 2 diabetes. Patients may be treated by diet or oral drugs ("sulfonylureas") but many are best managed by insulin.

Gestational Diabetes:
Gestational diabetes mellitus (GDM) is defined by the American Diabetes Association as “any degree of glucose intolerance with onset or first recognition during pregnancy”.
**Program Evaluation:**

“a process used to determine whether the design and delivery of a program were effective and whether the proposed outcomes were met. Evaluation done to improve or change a program while it is in progress is termed formative evaluation. When the evaluation focuses on the results or outcomes of a program, it is called summative evaluation” (Caffarella, 1994 p.119-120).

**Self-Efficacy:**

The perception or judgment of one's ability to perform a certain action successfully or to control one's circumstances (Survey of Social Science, 1993).

**Centers for Disease Control and Prevention (CDC):**

The Centers for Disease Control and Prevention (CDC) is recognized as the lead federal agency for protecting the health and safety of people - at home and abroad, providing credible information to enhance health decisions, and promoting health through strong partnerships. CDC serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and education activities designed to improve the health of the people of the United States. The CDC, located in Atlanta, Georgia, USA, is an agency of the Department of Health and Human Services.
CHAPTER TWO

Conceptual Framework and Review of Literature

This chapter seeks to identify and define significant concepts relevant to diabetes and this research study, presents a synthesis of related literature and theory, displays the conceptual framework designed to guide this inquiry, and explicates the research hypotheses that were subjected to testing and analysis.

CONCEPTS

Six major concepts framed this research: 1) The philosophy of health education; 2) the health professional as a change agent; 3) standards of care: preventing diabetes related complications; 4) the health belief model of behavior change in curriculum development; 5) Application of Caffarella’s Interactive Program Planning Model and 6) factors that influence the transfer of learning.

Therefore, the rationale for conducting this quantitative study was to investigate transfer of learning in diabetes education through examination of the aforementioned concepts in a framework designed to explore differences in desired outcomes, i.e. preventive care maintenance and self-management practices, based on previous participation, or lack thereof in a planned diabetes education course or class.
The Philosophy of Health Education

The philosophy of health education is not directed at a high level of health simply for health’s sake, but rather to help each individual view health as a way of life that will help to attain individual goals and utilize one’s highest potential for the betterment of self, family, and community. The ultimate goal of health education is the improvement of the nation’s health and the reduction of preventable illness, disability, and death. The health educator facilitates cognitive, affective, and behavioral changes in others to attain overall well-being and serves as a liaison between health care providers and/or health-related disciplines and the consumer, patient, learner or program participant.

Health education is that dimension of health care that is concerned with influencing behavioral factors. Hence, the result is an applied field of learning that relies largely upon the knowledge of the physical, biological and medical sciences, and related fields for its subject matters and upon the application of behavioral science theory for its methodology. It is a discipline in which the relevant knowledge and ideas from several fields are combined and synthesized. Because the concept of unity is its primary focus, health education strives toward the application of knowledge in achieving the integrated self.
This research study classified health professionals (physicians, nurses, health educators, pharmacists, nutritionists, etc.) as adult educators who operate and function as change agents in the programming process. Boone (1985) characterizes a change agent as:

“a professional, practicing adult educator or lay leader who consciously endeavors to relate to a learner, learner group, or system (client system) for the purpose of creating awareness of a need; definition and acknowledgement of the need; agreement of the need to change; definition of goals/objectives with regard to the need; decisions on change strategies to be pursued; action on strategies; and plans for evaluation. The change agent functions as an educator, a facilitator, and an action strategist” (p. 14).

Based on this definition, the change agent is very instrumental in influencing behavioral intentions, attitudes, knowledge and ultimately, diabetes self-management practices. According to Hohn (1998), four different types of change exist: change by exception, incremental change, pendulum change, and paradigm change. Change by exception occurs when an individual makes an exception to an existing belief system. For example, on the basis of an experience with a person of another culture, an individual might make an exception to what is fundamentally a racist belief system but only for that person, not for the entire culture. Incremental change occurs at such a gradual pace that the individual is not aware of the transformation that has taken place. Changes that result in extreme exchanges of points of view are considered pendulum changes. Paradigm change involves a fundamental rethinking of premises and assumptions,
and may apply to both individuals and organizations. Paradigm change involves a changing of assumptions, beliefs, and values about how the world works. When adult educators speak of change, they are generally referring to paradigm change (Hohn, 1998, Havelock and Zlotolow, 1995).

**Standards of Care: Preventing Diabetes Related Complications**

Several years ago, there was not much hope for people living with diabetes. Research teams as well as doctors, treatments, and general knowledge regarding the disease have been broadened in today’s time. Thus, health care professionals now know more about ways of helping those living with diabetes prevent future diabetic complications. Diabetes Forecast’s article “Standards of Care- Better Care, NOW,” lists eight steps for diabetic patients to follow to prevent the most common diabetic complications:

- Keep glucose levels under control
- Keep blood pressure levels under control
- Keep cholesterol under control
- Stop smoking
- Take advantage of diabetes education programs to learn about the disease, treatments and new research findings
- Have eyes checked regularly; early detection of glaucoma and diabetic retinopathy is key for successful treatment.
- Check feet daily for cuts, bruises, discoloration, etc., and contact a physician immediately if problems surface.
- Have kidney function monitored regularly to detect diabetic kidney disease early.
Following these key guidelines for diabetes self-management will aid in the process of controlling blood glucose levels and preventing long-term complications. Often, chronic diseases such as diabetes are not taken seriously. Many people in North Carolina, having been diagnosed with diabetes, refer to the disease as “a touch of sugar” and have an attitude that reflects an “everybody has it- or will get it” mentality. This plays a large role in the lack of concern about the care management of diabetes and contributes to the low perceptions of seriousness and severity that ultimately result in poor diabetes care management. Diabetes is one of the few diseases where the patient is truly in control of the progress and where there are more options available for control and treatment than medication. The burden is placed on the patient to eat properly, exercise regularly, inspect feet, and test blood sugar levels daily to monitor the blood glucose levels. Some of these precautions can be costly, stressful and perceived as physically impossible for some people with diabetes. However, it is a fact that in this case, the benefits far outweigh the barriers. Additionally, resources are available to defray cost of diabetes self-management for testing equipment as well as supplies. Often, people with diabetes that are overweight or physically disabled have difficulty performing the foot inspections independently. One of the ways that the foot inspections can be done without assistance and in spite of the aforementioned difficulties involves the use of a hand mirror. The mirror
should be propped up using the floor and a wall or bathtub, while the patient sits on the top of the toilet. This will allow the patient to survey and inspect the entire foot for cuts, bruises, discoloration, etc. If anything unusual is discovered, a physician should be contacted immediately. Delay in seeking medical attention for foot problems for a person with diabetes could result in the unnecessary amputation of a lower limb extremity. According to the Centers for Disease Control (2005), every 24 hours in America, 180 amputations are performed because of diabetes. However, practicing diabetes self-management techniques and daily foot examinations could prevent this extreme complication of diabetes.

Dr. Michael Pfeiffer, author of “Standards of Care- Better care NOW”, explains that good communication between the physician and the patient is vital for the overall health of the patient. He also explains that self-care or self-management is stressful and depletes a great deal of the patients’ energy. Yet, he knows, as a physician, and as a diabetic patient, that self-care is not an option— it is a must! Pfeiffer also suggests that diabetic patients keep a checklist at all times to be sure that the endocrinologist or primary physician performs all of the necessary screenings and tests on schedule.

Proper nutrition is another essential component to controlling diabetes. What, when, and how much a person with diabetes eats, all play an important part in determining one’s blood sugar levels. Food,
particularly carbohydrates, will cause blood sugar levels to increase, and those living with diabetes need to maintain a balanced diet that includes each of the food groups. Sugar, and any ingredient that ends in “ose”, such as fructose, sucrose, maltose, etc. should be minimized in the diet plan (Webb, 2002). Particular ingredients may cause blood glucose levels to drastically increase to dangerous levels of 300 or higher (Webb, 2002).

The article “Food Obstacles in Intensive Diabetes Therapy”, discusses certain situations where alcohol is concerned. For example, diabetics who consume alcohol “run the risk of severe hypoglycemia (low blood sugar)...” (Davis, 1998). It is suggested that if a person with diabetes consumes alcohol during the evening, 10-15 grams of carbohydrate should be eaten for each serving of alcohol consumed before bedtime. This is because alcohol causes blood sugars to increase upon consumption, but may become dangerously low during the night (Davis, 1998).

When a person with diabetes is experiencing a low blood sugar, it is very important that the person eat immediately. The best foods to eat during a period of hypoglycemia are simple carbohydrates (Davis & Lipps, 1998).

However, when a high blood sugar, or hyperglycemia is experienced, the patient should choose other options such as exercise, oral medications and/or insulin injections as opposed to eating. Eating is a part of sustaining life and, therefore, is the most difficult behavior for people with diabetes to change. Nonetheless, to maintain normal blood sugar readings,
people with diabetes must maintain a healthful and proper diet and make wise decisions about consuming alcohol (Williams, 1999).

Being overweight and obese is another big obstacle that individuals with Type II diabetes are faced with. Type II diabetes is often primarily controlled by only diet and exercise, although according to Williams, 1999), managing a patient with Type II diabetes and obesity can sometimes be seen as contradictory, because the most effective treatments for this type of diabetes are insulin and sulphonylreas (pills), which frequently lead to weight gain. Outweighing this barrier is the fact that intensive treatment with insulin therapy and/or sulphonylreas have proven to be most effective in improving glycemic control for patients evidenced by a reduction in Hemoglobin A1C values (Sarkadi, 1998).

The hemoglobin A1C (glycosylated hemoglobin) test is one that according to the American Diabetes Association should be performed every three to four months to determine the average blood sugar readings over the last 6-10 weeks. The average diabetic has a hemoglobin A1C reading of approximately 10%, which is double the percentage of those without diabetes (Goldstein, 1997). However, these readings may vary with different laboratories. This test is performed to monitor true blood glucose values so that patients and providers can prevent complications that may arise. Also, this test can make those living with this disease more aware of what needs to be done to prevent future problems and improve the overall health status.
The following table illustrates how HbA1c lab results relate to finger stick or self-testing results:

### TABLE 1. Relation of HbA1c results to self-testing blood sugar levels and overall control

<table>
<thead>
<tr>
<th>HbA1c Reading</th>
<th>Average Blood Sugar Level</th>
<th>Your Blood Sugar Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>14%</td>
<td>360 mg/dL</td>
<td>Very poor control, take immediate action to lower</td>
</tr>
<tr>
<td>10%</td>
<td>240 mg/dL</td>
<td>Poor control, take action to lower</td>
</tr>
<tr>
<td>9%</td>
<td>210 mg/dL</td>
<td>Poor control, take action to lower</td>
</tr>
<tr>
<td>8%</td>
<td>180 mg/dL</td>
<td>Marginal control, take action to lower</td>
</tr>
<tr>
<td>7%</td>
<td>150 mg/dL</td>
<td>Good control</td>
</tr>
<tr>
<td>6%</td>
<td>120 mg/dL</td>
<td>Very Good Control</td>
</tr>
</tbody>
</table>

A hemoglobin A$_{1c}$ higher than 7% is a warning sign that diabetes is out of control. If the hemoglobin A$_{1c}$ value is high, the healthcare team may change or alter the diabetes care management plan to help control blood sugar levels better (Anderson, 2000). Changes are expected from time-to-time and will help bring HbA$_{1c}$ levels closer to normal. When the HbA$_{1c}$ is close to normal (7% or below), it can be assumed that the patient is doing all that can be done to achieve or maintain optimal health and prevent diabetes related complications (Glasgow, 1999).

When blood glucose levels remain elevated over long periods of time and healthy lifestyle guidelines have not been adhered to, people with diabetes are extremely prone to develop complications (McGroarty, 1992).
According to the American Diabetes Association (2002), good blood sugar control may lower risk of major health problems and diabetes related complications including, but not limited to:

- Heart disease
- Stroke
- Kidney disease
- Eye disease (blindness, retinopathy, glaucoma, etc.)
- Nerve damage
- Lower extremity amputations
- Circulation problems

Receiving diabetes education and keeping blood sugar levels close to normal will stop or delay the damage to blood vessels and nerves, thus preventing some or all of the aforementioned diabetes related complications (Reichard, Nilsson & Rosenqvist, 1993).

Education of patients for diabetes self-management plays a crucial role both in the quality of control of the disease and in the quality of life. The ultimate goals for diabetes education are optimal glycemic control, prevention of both acute and chronic complications and a high quality of life, while keeping health care cost to a minimum (de Weerdt, Visser, Kok & van der Veen, 1991). Patients who are not properly educated will experience excessive medical visits and may require recurrent hospitalizations (Assal, Jacquemet & Morel, 1997). To keep healthcare spending down and optimize self-management of diabetes, it is essential that diabetes education programs are effective and result in significant improvement in blood glucose levels and diabetes related knowledge. To be effective, diabetes
health educators need to be both knowledgeable about diabetes and skilled in teaching.

Obtaining diabetes education is the single most important factor in controlling diabetes (Lopez-Ovejero, 1992). Education should begin when the individual is first diagnosed with the disease. This complex disease affects all aspects of life: travel, health, ability to work, etc. Though diabetes is not curable, it is treatable.

The most difficult barrier to optimal health for those living with diabetes is that 95% of their progress and health depends on medication compliance, exercise, diet, education and glucose self-monitoring or testing the blood sugar at home (Brill, 1993). These are all tasks that require the patient to take control of the diabetes care management and be responsible for the improvements or failures.

In all of these situations, education is the key; research has shown unequivocally, that the more a person knows about the disease or condition, the more equipped, prepared and likely he or she will be able to improve the overall state of physical health and wellness (Brill, 1993).

Education of the individual and the family is included in all diabetes care plans, emphasizing the centrality of the learner (Legget-Frazier, 2000).

For example, the Learning Skills Council (LSC) guidelines on Self-Assessment and Development Plans maintain that new arrangements have been designed to ensure that the interests of the learner come first and are of paramount importance. The context for this research includes a
significant body of material addressing the principles and practicalities of identifying achievement in non-accredited learning (2002).

This education may be facilitated in a group or on a one-on-one basis, and may be provided by an endocrinologist, nutritionist, nurse and/or diabetes health educator. Most education modules consist of core learning objectives that cover how to give insulin injections, understanding the epidemiology of the disease, nutritional education, prevention of diabetes related complications and training on how to test and treat low/high blood sugars. There are also classes on counting carbohydrates and proper foot care. The list of subjects related to diabetes education is endless, as Diabetes Nurse Educator, N. Legget-Frazier (2000) stated, “Diabetes education should begin with the diagnosis of the disease and should continue throughout the rest of the patient’s life. A diabetes educator can guide the process for individualized self-care” (p.9).

Having someone to talk to about a health condition facilitates a coping mechanism, which is why many support groups have been formed for people and families dealing with diabetes. Education is most often the primary focus in the support group meetings and many find it beneficial to have a diabetes health educator available to address questions and concerns from patients and family members (Pergallo-Dittko, 1996).

Diabetes health educators can be found in hospitals, public health centers, outpatient clinics, community settings and medical schools. Many sites have met strict criteria to become recognized programs by the
American Diabetes Association (ADA, 2000). Some of the outreach education strategies of community health education programs share three common focal points or objectives:

- Teach people about the signs, symptoms and risk factors of diabetes
- Assist the faith communities to implement health promotion activities
- Assist the medical providers in early detection of diabetes

Diabetes education is a vital component in the wellness plan for a patient living with diabetes. Maintaining “tight control” on blood sugars can help patients control blood sugars and delay or prevent complications (Peragallo-Dittko, 1996). As stated by Peragallo-Dittko, tight control consists of an intense effort on the patient’s part to test blood sugars frequently, make adjustments in insulin based on food choices, exercise, and see health care professionals as scheduled (1996).

While most diabetes programs provide free education and screenings, the cost of diabetes education varies from place to place. Some programs charge an overall fee while others charge for each visit. Recently, Medicare and Medicaid have agreed to pay for diabetes education in an outpatient setting facilitated by certified providers working in ADA recognized programs (Legget-Frazier, 2000). Medicare and Medicaid have already been paying for diabetes education in hospital-based programs. This is important because 19% of all Medicare patients have diabetes; 90% of all persons with diabetes have Type II, which has an average onset age of 40 (Legget-Frazier, 2000). Many insurance companies do not cover education, so it is imperative that community based education programs remain available for the at-large
population that cannot afford this type of essential education. Leggett-Frazier (2000) says, “An ounce of prevention is worth a pound of cure; what is learned in a diabetes education program may determine the outcome of a patients’ next 20 years and the overall quality of life for that patient” (p. 10).

The Health Belief Model of Behavior Change in Curriculum Development

Health education has entered a new era in which the exclusive use of the traditional model is inappropriate for a chronic disease such as diabetes where the major emphasis is on behavior and lifestyle changes. Improvements in the quality of diabetes education require the assessment of delivery methods and the incorporation of innovative interventions. An educational model of health which emphasizes behavior and lifestyle as determinants of health status requires that education be a core element in the treatment process and behavior change, which is the desired outcome (Bryan, 1999). Most researchers would concur that this model has obvious flaws and frequently does not suffice when used independently. The traditional model for health education is based on four assumptions: (a) knowledge increase will mean a change in behavior, (b) the health care professional knows what the patient wants and needs to know, (c) information is the same as education and (d) when information is provided, the patient will learn (Tupling, 1981).

Providing information is the primary method of knowledge exchange. However, there is minimal consideration of feelings and motivation, relevance of information, patient beliefs about life and application of the new
knowledge, or how the information can be translated into actions (Tupling, 1981).

**FIGURE 1. The Traditional Model for Health Education**

Although the traditional model for diabetes education continues to be used, current models are based upon the belief that self-care training must be the cornerstone of diabetes education. Diabetes education programs attempt to increase knowledge, develop skills and encourage new lifestyle behaviors that challenge deeply embedded attitudes. Effective education models will consider and include the following components: (a) assessment of current needs, priorities, feelings, attitudes and knowledge with the opportunity for feedback to stimulate a more successful process of teaching and learning, and (b) the availability of effective strategies for dealing with
the effects of successful behavior change, regular follow-up and patient need for support services (Tupling et al., 1981). Rubin, Peyrot and Saundex (1989) agree with Tupling et al. and advocate that educational models and interventions that incorporate effective behavioral strategies for improving self-care behavior are more successful than those that do not.

A prime example of this is the very popular Health Belief Model (HBM), which is one of the most widely used conceptual frameworks for understanding health behavior and has been used with great success for almost half a century to promote greater condom use, seatbelt use, medical compliance, and health screening use, to name a few behaviors (Becker, 1974). The model was first developed in the 1950s by U.S. Public Health Services social psychologists Godfrey Hochbaum, Irwin Rosenstock, and Stephen Kegels in response to a free tuberculosis (TB) health-screening program that was rendered unsuccessful (Rosenstock, 1974).

The TB screening program was designed to provide adults with free TB screening x-rays via mobile units conveniently located in various neighborhoods. Because of the low rate of participation, program organizers began to investigate why more adults did not participate. Hochbaum, on the contrary, began to study what motivated the few who did come out. He rapidly discovered that perceived risk of disease and perceived benefits of action were critical factors in motivation (Rosenstock, 1974).

The HBM was originally developed as a systematic method to explain and predict preventive health behavior. It focused on the relationship of
health behaviors, practices and utilization of health services. In later years, the HBM was revised to include general health motivation for the purpose of distinguishing illness and sick-role behavior from health behavior. Originated around 1952, it is generally regarded as the beginning of systematic, theory-based research in health behavior.

The HBM states that the perception of a personal health behavior threat is itself influenced by at least three factors: general health values, which include interest and concern about health; specific health beliefs about vulnerability to a particular health threat; and beliefs about the consequences of the health problem. Once an individual perceives a threat to his/her health and is simultaneously cued to action, and his/her perceived benefits outweighs his/her perceived barriers, then that individual is most likely to undertake the recommended preventive health action. Many variables, (demographic, sociopsychological, and structural) can influence an individual’s decision (Eisen, 1992).

The model was first presented with only four key concepts: **Perceived Susceptibility**, a person’s opinion of the chances of getting a certain condition; **Perceived Severity**, a person’s opinion of how serious the condition is; **Perceived Benefits**, a person’s opinion of the effectiveness of some advised action to reduce the risk or seriousness of the impact; and **Perceived Barriers**, a person’s opinion of the concrete and psychological costs of this advised action. The concept of **Cues for Action** was added later to “activate a person’s readiness to act and stimulate an observable
behavior” (Eisen, 1992). Finally, in 1988, the concept of **Self-Efficacy**, a person’s confidence in his/her ability to successfully perform an action was added to address the challenges of habitual unhealthy behaviors such as smoking and overeating (Eisen, 1992) or in the context of this research study, not performing glucose self-monitoring (finger prick tests for blood sugar levels).

In its most final form, the HBM is based on six key concepts. The following table, excerpted with minor modifications from “Theory at a Glance: A Guide for Health Promotion Practice” (1997), presents definitions and applications for each of the six key concepts. Examples of the concepts as they apply to diabetes education are presented after the table.

**TABLE 2. Components of The Health Belief Model**

<table>
<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
<th>Application</th>
</tr>
</thead>
</table>
| **1. Perceived Susceptibility** | One’s belief of the chances of getting a condition | • Define population(s) at risk and their risk levels  
  • Personalize risk based on a person’s traits or behaviors  
  • Heighten perceived susceptibility if too low |
| **2. Perceived Severity** | One’s belief of how serious a condition and its consequences are | • Specify and describe consequences of the risk and the condition |
| **3. Perceived Benefits** | One’s belief in the efficacy of the advised action to reduce risk or seriousness of impact | • Define action to take — how, where, when  
  • Clarify the positive effects to be expected  
  • Describe evidence of effectiveness |
4. **Perceived Barriers**  
One’s belief in the tangible and psychological costs of the advised behavior  
• Identify and reduce barriers through reassurance, incentives, and assistance

5. **Cues to Action**  
Strategies to activate “readiness”  
• Provide how-to information  
• Promote awareness  
• Provide reminders

6. **Self-Efficacy**  
Confidence in one’s ability to take action  
• Provide training, guidance, and positive reinforcement


The HBM is based on the understanding that a person will take a health-related action (i.e., practice glucose self-monitoring) if that person:

1. Feels that a negative health condition or diabetes related complication (i.e., blindness, kidney failure, amputation) could be avoided.

2. Has a positive expectation that by accepting and participating in a recommended plan of action, he/she will avoid a negative health condition (i.e., regular practice of glucose self-monitoring will prevent or delay the onset of a negative health condition or diabetes related complication) and

3. Believes that he/she can skillfully and successfully perform a recommended health action (He/she performs glucose self-monitoring independently, comfortably and with confidence).

The Health Belief Model is a framework for motivating people to take positive health actions that use the desire to avoid a negative health consequence as the prime motivation (Glanz, 1997). For example, syphilis
is a negative health consequence, and the desire to avoid syphilis can be used to motivate sexually active people into practicing safe sex. Similarly, the perceived threat of a heart attack can be used to motivate a person with high blood pressure into exercising more often and becoming more physically active. On the contrary, if a person increases a personal exercise regimen to look good and feel healthier, that would not fit the model because the motivation would be positive, not negative, possible outcomes. This is true even though the action of increasing exercise is identical for the person that is avoiding a heart attack.

An individual’s perception of the levels of susceptibility and seriousness provide the force to act. Benefits (minus barriers) provide the path of action. However, it may require a ‘cue to action’ for the desired behavior to occur. There are several challenges to consider with the use of the HBM. The first of which being that factors other than health beliefs heavily influence health behavior practices including: special influences, cultural factors, socioeconomic status and previous experiences. Additionally, although the HBM uses “appropriate fear-based messages” (AFBM’s) to heighten perceptions of severity, going “over the top” with these AFBM’s would leave the learners with a feeling of helplessness instead of empowerment. Finally, the HBM is best used for a relatively short intervention to achieve a specific change. Experts warn that it may be less effective in achieving long-term change (Eisen, 1992).
The following checklist was presented by Glanz and Rimer (1997) for adult educators utilizing the HBM in program planning and curriculum development:

**TABLE 3. Health Belief Model Checklist for Adult Educators**

<table>
<thead>
<tr>
<th><strong>Checklist for Educators</strong></th>
<th><strong>Implementation Ideas</strong> (applicable HBM concepts appear in parentheses)</th>
</tr>
</thead>
</table>
| 1. Do you include an activity that **increases** learners’ perception of their own vulnerability to the condition and its’ complications? | • Show learners videos, which have learners like them with the condition or complication.  
• Ask learners to complete confidential personal risk assessments.  
• Present recent statistics of learners their age, or from the community, with the condition.  
• Have them explore web sites that show learners with the condition.  
• Invite guest speakers who look like the learners to share experiences with the condition.  
**Perceived Susceptibility** |
| 2. Do you **assess** learners’ perception of their own vulnerability to the condition or complication? | • Generate discussion about whether or not learners feel they could get the condition or complication.  
• Ask learners to anonymously write down on an index card whether they believe they could get the condition and then collect the cards.  
• Have learners’ analyze the results of their personal risk assessments (under #1 above) and generate a discussion of their perceptions.  
**Perceived Susceptibility** |
| 3. Do you include activities that **teach** the seriousness of the condition and its consequences? | • Show graphic photos of people suffering with diabetes complications.  
• Share case studies of people experiencing difficult consequences of the condition.  
• Lead a visualization having learners imagine they have the condition and are dealing with its consequences.  
• Tell learners to imagine having the condition and ask them to each write a letter to a best friend explaining what happened and how it feels to have the condition.  
• Share compelling statistics of negative consequences of the condition.  
• Invite a guest speaker with the condition to explain what he/she has had to cope with under the circumstances.  
• Show a video showing people with the condition talking about how their lives have changed.  
• Ask learners to brainstorm at least 20 ways the condition would change their lives.  
**Perceived Severity** |
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 4. Do you **assess** learners' perception of the severity of the condition? | • Ask learners to answer questions about how serious the condition is, or how much they want to avoid it (e.g., on a scale of 1 - 7).  
• Ask learners to write down on index cards whether or not they believe the condition is serious, with their reasons, and collect the cards.  
(Perceived Severity) |
| 5. Do you clearly **present** the desired action to take to avoid the condition? | • Present the desired action in various ways — explain it, post it, distribute it in print, and reinforce it throughout the session.  
• Model how to take the action in front of the group.  
• Be sure learners have all the information they need to take the action (e.g., where to get glucometers and test strips, when to test blood glucose, how to, etc.)  
• Clearly present the benefits of the recommended action using reliable resources (e.g., information or statistics from the Centers for Disease Control and Prevention [CDC], Surgeon General, etc.).  
(Perceived Benefits) |
| 6. Do you **assess** whether the learners believe the action will benefit them by preventing the condition? | • Generate discussion among learners about whether they really think that the action will prevent the condition (including their reasoning).  
• Have learners in triads discuss whether they believe that the desired action will prevent the condition. Have each triad report back to the group/class, listing the different reasons reported on the board.  
• Invite learners to voice any doubts they may have about the benefits of the desired action and then gently help them see all sides of the issue.  
• Have a guest who experiences benefits from using the action address the class. Alternatively, a video may be used.  
(Perceived Benefits) |
| 7. Do you help learners **identify** personal barriers to action? | • Have the group brainstorm all imagined barriers to taking action. Then ask each learner to pick out one or two barriers that apply.  
• Give each learner a list of common barriers to taking action, and then instruct learners to circle the ones that apply to them.  
• Show a video or present a case study in which learners can recognize barriers experienced by someone else. Ask if they can relate.  
(Perceived Barriers) |
| 8. Do you **support** learners in reducing or eliminating barriers (or perception of barriers) to taking action? | • Consider whether perceived barriers can be reduced by helping learners obtain additional information, use more time for skill-building, or build their own confidence taking action.  
• Ask learners to role-play advising a family member or friend who is faced with the same barriers to taking action.  
• Brainstorm with large group strategies to overcome each barrier.  
• Have learners work in small groups to brainstorm ways to reduce stated barriers.  
(Perceived Barriers) |
9. Do you provide learners with cues to action?

- Provide learners with incentive items (e.g., pencils, key chains, magnets), which contain visual reminders of the message or recommended action.
- Hang posters with the action messages in community or setting.
- Encourage learners to write newsletter articles or take on art projects to creatively express the action message.
- Organize school or agency-wide events showcasing the action message.
- Encourage learners to discuss the recommended action with family members and friends.

(Cues to Action)

10. Do you assess whether participating learners feel confident that they can take the recommended action correctly?

Educators should determine their learners’ level of confidence in using a skill or taking an action by:

- Observing the skill practice;
- Promoting discussion about individual practice experience, which may bring up doubts or perceived barriers to confidently using the skill;
- Positively reinforcing desired behaviors and steps to the desired behaviors.
- Conducting a brief anonymous survey after the skill building session to elicit questions or concerns that remain.

(Self-efficacy)


The HBM model is influenced by the theories of Kurt Lewin, which state that it is the world of the perceiver that determines what an individual will and will not do. Nonetheless, the early researchers also included in the model a strong component of the behaving individual’s perceptual world. Later, researchers included motivation as a major component as well as a strong concentration on the individual’s current dynamics, believing that prior experience exercises influence only insofar as it is still represented in the individual’s present state of affairs.
**The Interactive Model of Program Planning**

Grounded in the scholarly works and ideas of previously proposed models of program planning (Houle, 1972; Knowles, 1980; Sork and Caffarella, 1989; and Tracey, 1982), the interactive model of program planning appears seemingly similar in structure, but differs in comprehensiveness, utility and practicality, including tasks for each of the 11 components of the model. Also, this model does not follow the traditional step-by-step linear appearance, instead Caffarella introduces a flexible, dynamic model that is designed for people with diverse interest and can be “tailored to meet the demands of a specific planning situation” (Caffarella, 1994, p.19). This framework is illustrated in Figure 2.

**FIGURE 2. Application of the Interactive Program Planning Model**
This model for interactive program planning is derived from classical and current descriptions of program planning, principles and practices of adult learning and practical experience of learners or program participants. Some of the chief principles and practices of adult learning were implemented in the development of this model. According to these principles and practices of adult learning, adults can and do want to learn, are motivated based on complex internal and external forces, regardless of age and tend to learn best when new information builds on past knowledge and experience.

**Factors that Influence the Transfer of Learning**

Transfer of learning occurs when information received in a planned education program is transferred and incorporated into practice or action by the participant or learner (Caffarella, 1994). According to Caffarella, one of the fundamental principles or ideologies of learners who attend, plan, and sponsor educational programs is that participants be able to use what has been learned after the program is completed. Planning for this transfer of learning is essential because learners who participate in planned education programs have insisted upon applicable and practical outcomes that can make a difference. Moreover, many learners need assistance in reflecting on and planning for internal change in preparation for translating what has been learned into concrete results (p 109). Finally, planning for the transfer of learning was important and necessary because personal, environmental
and social issues in addition to concerns of learners were not being addressed in educational programs; therefore, no solutions of strategies for change were identified. Many justifications have been offered to explain why learners/program participants do or do not apply what has been learned in a planned educational program. Caffarella (1994) offers a categorized list of six key influencing factors that explain this phenomenon:

- **“Program Participants”:** Participants bring to educational programs a set of personal characteristics, experiences, attitudes and values that influence what is learned and whether it can and is desired to be applied in the personal lives of learners.

- **Program Design and Execution:** Program planners can include strategies for the transfer of learning as part of designing and conducting educational programs before, during and/or after the program has been completed.

- **Program Content:** The knowledge, skills, and/or attitudes/values that are addressed through the program content. What is taught is not necessarily learned.

- **Changes required to apply learning:** The nature of the changes required in people, professional practices, organizations, communities, and/or society to apply the learning describes the scope, depth and consequences of those changes.

- **Organization Context:** People, structure and cultural milieu of an organization, and it either supports or inhibits the transfer of learning.

- **Community/Societal Forces:** The social, economic and political conditions that exist in a specific community or society”. (p.110)

Caffarella (1994) goes on to warn that these factors may function as barriers or enhancers to the transfer of learning process and that not all of
the major factors that influence the transfer of learning come into play for every educational program (Table 4). As program planners continue to have most of the decision-making authority over the design and execution of educational programs, “it is important that planners consider planning for the transfer of learning as an integral part of the planning” (p.113).
<table>
<thead>
<tr>
<th>BARRIERS</th>
<th>FACTORS</th>
<th>ENHANCERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Do not possess required prior knowledge or experience</td>
<td>* Have useful prior knowledge and experiences that they are able to link to what they have learned</td>
<td></td>
</tr>
<tr>
<td>* Do not have time to incorporate what they have learned into what they do</td>
<td>* Are ready and willing to learn and apply that learning</td>
<td></td>
</tr>
<tr>
<td>* Are not interested in making changes</td>
<td>* View the program content as relevant and practical</td>
<td></td>
</tr>
<tr>
<td>* Lack emphasis on application in terms of instructional methods</td>
<td>* Include applications exercises as a major part of the instructional activities</td>
<td></td>
</tr>
<tr>
<td>* Include no follow-up strategies</td>
<td>* Recognize that responsibilities of planners include ensuring that learning transfer actually happens</td>
<td></td>
</tr>
<tr>
<td>* Offer unrealistic transfer-of-learning strategies</td>
<td>* Include transfer-of-learning strategies that are well executed</td>
<td></td>
</tr>
<tr>
<td>* Focuses on knowledge when it is skill and attitude changes that are needed</td>
<td>* Is relevant and practical</td>
<td></td>
</tr>
<tr>
<td>* Is not relevant or useable</td>
<td>* Builds on previous knowledge and experience of participants</td>
<td></td>
</tr>
<tr>
<td>* Are unrealistic</td>
<td>* Are doable and realistic</td>
<td></td>
</tr>
<tr>
<td>* Are too disruptive to present practices/routines</td>
<td>* Are allotted enough time to develop</td>
<td></td>
</tr>
<tr>
<td>* Have no ownership in the program changes by affected parties to build on</td>
<td>* Take place in an environment where the change process is perceived as caring and equitable</td>
<td></td>
</tr>
<tr>
<td>* Lacks concrete support from peers, superiors, and/or managers</td>
<td>* Offers support from key leaders and superiors</td>
<td></td>
</tr>
<tr>
<td>* Builds in reward systems that work against changes</td>
<td>* Makes tangible rewards apparent</td>
<td></td>
</tr>
<tr>
<td>* Offers non-supportive climate for learning</td>
<td>* Adapts to new structures and norms</td>
<td></td>
</tr>
<tr>
<td>* Result in economic conditions that are poor</td>
<td>* Result in economic conditions that are favorable</td>
<td></td>
</tr>
<tr>
<td>* Offer societal norms that are not supportive of changes</td>
<td>* Offer support from key leaders</td>
<td></td>
</tr>
<tr>
<td>* Include key leaders who are openly hostile</td>
<td>* Make receptive political climate</td>
<td></td>
</tr>
</tbody>
</table>

A framework for planning for the transfer of learning is presented by Caffarella (1994), identifying three key elements that need to be addressed as a part of the process of designing and conducting educational programs: 1) decide *when* the transfer strategies should be employed, 2) determine the key players who need to be involved in the transfer of learning process and 3) choose strategies that will be the most useful in assisting participants/learners in applying what has been learned (see Table 5).
## TABLE 5. Applying Various Transfer of Learning Strategies

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Before</th>
<th>During</th>
<th>After</th>
<th>Planners</th>
<th>Instructors</th>
<th>Other Players</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involve key people in the planning process</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pretrain supervisors of participants</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have participants select projects to complete prior to the start of a program</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Build into organizational policies, practices and procedures recognition for meeting goals of program</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop individualized learning plans or contracts</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Use the formal supervisory process</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Provide mentors for participants</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Use organizational development interventions</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involve people in conducting the program (on-site coordination and instruction)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Use applications exercises and simulations</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use participant self-assessment for what has been learned and what participants believe they can</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Give assignments/activities that need to be completed after the program</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide a session on reentry advise</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Develop individual action plans</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Develop self-help groups</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop support groups</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Supply and use job aids and other resource materials</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Model skills or attitudes/values needed for learning transfer</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Provide and use peer coaches or teachers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop self-monitoring instruments and techniques</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Involve key players in follow-up activities</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule learner refresher sessions</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
</tbody>
</table>

SUMMARY AND CONCEPTUAL FRAMEWORK

Through this review of the diverse educational models and theoretical frameworks that exist, it has been made apparent that in order for diabetes self-management education efforts to be successful, behavioral or tacit knowledge components must be included in addition to the conventional explicit educational elements that are traditionally integrated into diabetes self-management education programs. Additionally, standardized educational programs and interventions are not optimal for everyone and programs should be modified to fit the population being targeted.

Glasgow (1999), also argued that neither the patient, nor the primary care provider should be blamed for non-compliance or poor results in diabetes control indicators, but rather a system, which seems to be disabled and in need of rehabilitation. The various models and frameworks that were examined here were not employed individually to guide this research inquiry, but collectively as an influence in the investigation of transfer of learning in diabetes education. Figure 3 illustrates a conceptual schema developed by the researcher to guide the data analysis and investigation.

Based on previous participation in a planned diabetes education program, or lack thereof, the researcher assessed progress from the input phase of education to the output phase which indicates successful transfer of learning. The indicators for success were the translation of knowledge into action, resulting in health behavior change toward preventive care maintenance and diabetes self-management practices. The independent
variables were personal and situational demographic characteristics, specifically age, gender, race, education, employment status, income, marital status and number of dependent children. These variables were analyzed and included in an attempt to account for outcomes occurring prior to or independent of participation in a planned diabetes education course. The researcher often referred to survey respondents collectively as adult learners with diabetes, under the assumption that all adults are learners regardless of previous participation in a formal diabetes education class or course.

Labeled intervening variables, respondents were either classified as having ever attended a planned diabetes education program or not. Significant differentiation in the shift of adult learners with previous education versus those without from the input to output stage indicated a convergence of knowledge into action, resulting in health behavior change toward preventive care maintenance and diabetes self-management practices—transfer of learning in diabetes education. This was determined by the dependent variables or indicators of success which include frequency of glucose self-monitoring practices, frequency of self-foot inspections for learners, participation in exercise or physical activity, recent HbA1c test and recent dilated eye examination.

The concepts of health education philosophy, the health professional as a change agent, standards of care: preventing diabetes related complications, and transfer of learning, were central to this inquiry and
were incorporated into the conceptual schema which was derived from the interactive model of program planning along with the health belief model of behavior change.

Figure 3 displays the conceptual schema that was developed to guide this research and is a graphical illustration of the independent, dependent and intervening variables as well as the indicators of success for the planned adult education program.

FIGURE 3. Conceptual Framework for Achieving Transfer of Learning in Diabetes Education
Research in Diabetes Education

Although a plethora of research studies exist involving diabetes education, the following section of the literature review will focus only on the studies that appear to be most relevant to the research, which was conducted.

To compare the differences in hemoglobin A1C readings, the Diabetes Control and Complications Trial conducted both intense therapy sessions as well as sessions that were not intense (DCCT, 1993). The DCCT was a clinical study conducted from 1983 to 1993 by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and is the largest, most comprehensive diabetes study ever conducted. The DCCT involved 1,441 volunteers with type 1 diabetes and 29 medical centers in the United States and Canada. Volunteers had diabetes for at least 1 year but no longer than 15 years. They also were required to have no, or only early signs of, diabetic eye disease (DCCT, 1993). The diabetic patients that underwent intense therapy of monitoring their blood sugars regularly, eating healthy, and exercising daily resulted in having much lower hemoglobin A1C readings than those that did not undergo the intense therapy (DCCT, 1993). Furthermore, according to the results of this trial (1993), this study showed that even lowering HbA$_{1c}$ levels by 1% would help lower risk of future problems from diabetes.

A similar randomized controlled trial of diabetic patient education explored the possibility of improved knowledge in the absence of improved
metabolic status (Bloomgarden, 1987). Of 345 Mount Sinai Medical Center Diabetes Clinic patients, 165 were assigned to the education group while the remaining 180 were assigned to the control group. Knowledge scores increased from $5.3 \pm 1.6$ to $5.8\pm1.6$ in the education group, with no change in the control group, whose score was $5.3\pm1.7$ before and after the intervention ($p=.0073$). HbA1c values in the education group fell from $6.8 = 2.1$ to $6.1 \pm 2.0\%$ in the education group and from $6.6\pm2.0\%$ to $6.3\pm2.0\%$ in the control group, yielding an insignificant difference ($p=.1995$). This study suggested that patient education might not have been an effective therapeutic intervention in most adults with insulin-treated diabetes mellitus. In most cases, this would be in reference to people with type 1 diabetes, although some patients with type 2 diabetes undergo insulin therapy as well (Bloomgarden, 1987).

Conversely, a study at Louisiana State University (Krier, Grayson and Byrd, 1999) investigated the effects of diabetes education on glucose control by randomly assigning 39 adult patients with type 2 diabetes to either an educational group or a control group ($n=39$). Both groups received the same medical care and follow-up, although the education group met with a diabetes educator on at least a quarterly basis. No significant changes were present for either group in HbA1c levels; however, the education group experienced a lower attrition rate, increased knowledge and a better improvement in self-rated dietary compliance. This study suggested a need for health professionals to developing stronger and more supportive
relationships with patients in order to improve the overall management of diabetes care.

An assessment of the function and effect of diabetes education programs in Taiwan (Jiang, 1999) concluded that integrated intensive diabetes education programs provide effective methods for improving diabetes self-care techniques as well as positive metabolic outcomes. This study involved the evaluation of diabetes self-care, assessed by a questionnaire before and four (4) months after attending a diabetes education course for 208 adult subjects with type 2 diabetes. Advanced education courses were offered to the 121 subjects who were assigned to the experimental group and the control group of 87 subjects received basic diabetes education. Diabetes self-care techniques were significantly improved in the experimental group and the multiple regression analysis confirmed the intensity of diabetes education as the only significant variable correlated with the decrease of fasting blood glucose and systolic blood pressure (Jiang, et al. 1999).

Another study examined whether study circles could be used to train newly diagnosed patients with type 2 diabetes on glucose self-monitoring and increase knowledge. The author stated that the aim of studies in a study circle was to gain knowledge, that did not only include learning facts about the subject, but also enabled one to understand and change one’s existence (Sarkadi, 1998). The study concluded that the group setting promoted learning through peer help and gave emotional support to
participants. Metabolic control as measured by HbA1c values improved significantly after 6 months, but reverted to baseline levels again at 12 months. No explanation was available for this occurrence (Sarkadi, 1998).

Occasionally, certain barriers (transportation, cost, child care, commitment) may be responsible for the reversion of clinical values over a period of time, as in the study circle investigation. A similar study was launched to determine if a group of predominately low-income, low-education, African-American women with type 2 diabetes and multiple chronic conditions could achieve good compliance and improved health outcomes with a carefully structured health promotion intervention. Participants (n=30) took part in a 12-week intervention at a university-based health promotion program and experienced 72% compliance with attendance, significant improvements in total and LDL cholesterol levels, cardiovascular fitness, muscular strength and endurance as well as diabetes-related knowledge. This study concluded that removing barriers to participation prior to and during the intervention made it feasible for African American women living in difficult living environments to achieve satisfactory compliance and health outcomes (Rimmer, et al. 2002).

In 1999, a study was conducted to evaluate the effectiveness of a cluster visit model led by a diabetes nurse educator for delivering outpatient care management to adult patients with poorly controlled diabetes. This study involved a randomized controlled trial among patients of Kaiser Permanente’s Pleasanton, CA, center who were aged 16-75 years and had
either poor glycemic control (HbA1c > 8.5%) or no HbA1c test performed during the previous year. Intervention subjects received multidisciplinary outpatient diabetes care management delivered by a diabetes nurse educator, a psychologist, a nutritionist, and a pharmacist in cluster visit settings of 10-18 patients/month for 6 months. Outcomes included change (from baseline) in HbA1c levels; self-reported changes in self-care management practices, self-efficacy, and satisfaction; and utilization of inpatient and outpatient health care. After the intervention, HbA1c levels declined by 1.3% in the intervention subjects versus 0.2% in the control subjects (P < 0.0001). Several self-care practices and several measures of self-efficacy improved significantly in the intervention group. Satisfaction with the program was high. Both hospital (P = 0.04) and outpatient (P < 0.01) utilization were significantly lower for intervention subjects after the program. In conclusion, a 6-month cluster visit group model of care for adults with diabetes improved glycemic control, self-efficacy, and patient satisfaction and resulted in a reduction in health care utilization after the program (Sodur, 1999).

In a study designed to determine the efficacy and ease of administration of education and behavior modification classes taught by an interdisciplinary team of health professionals, eighteen (18) patients completed six (6) months of structured office-based classes, and twenty (20) similar patients were assigned to the control group. Based on the results, the researchers concluded that the education and behavior modification
program was clinically worthwhile. Following the intervention, the treatment group experienced increased knowledge of diabetes and significant decreases in mean fasting blood glucose, HbA1c values, total and LDL cholesterol values. The control group only showed improvements in HbA1c values and body weight (Ridgeway, et al., 1999).

Lord and Farlow (1990), in an investigative study of personal empowerment and implications for health promotion, sought to identify factors that facilitate personal empowerment, review relevant literature and interview key informants via detailed biographical interviews with 38 diverse individuals who reported a previous experience of empowerment. An inductive data analysis approach was utilized and the study findings were that four main areas have implications for people involved with health promotion:

1. The importance of personal control beyond “just coping”.
2. The process of empowerment.
3. The role of resources and services.
4. The importance of personal participation and consumer involvement.

The researchers contend that there is a necessity for professionals to learn to relinquish power, in order to become facilitators of empowerment. They further suggest that professionals should make information available and accessible to learners and link individual efforts towards empowerment movements in the community, such as support groups. Possible implications for this research study are that this significant issue will lead
to changes in the planning and implementation of current and future health promotion programs.

The development of diabetes self-management skills requires active involvement in the learning process (Henley 2002). For that reason, it was logical to assume that part of the inconsistency in the results of the studies cited above may have been attributed to different teaching methods in the various programs and respective curricula. Knowles’ andragogical model of instruction is learner-centered versus instructor-centered and emphasizes the importance of experience as well as self-direction and intrinsic motivation. It also emphasizes the role of problem-solving and immediate value in learning activities (Knowles, 1980). This is ironic, considering the fact that andragogy and self-directed learning are both grounded in humanistic learning theories and introduce a greater potential for planning and experiencing a ‘true learning society’, as “there is a natural tendency for people to learn and that learning will flourish if nourishing, encouraging environments are provided” (Cross, 1981, p.228).

**RESEARCH HYPOTHESES**

Based on the presented concepts, the conceptual framework and the review of the related literature, the following null hypotheses were tested in this research:
**Hypothesis 1:** There will be no significant difference in the practice of glucose self-monitoring for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education.

**Hypothesis 2:** There will be no significant difference in the practice of self-foot examinations for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education.

**Hypothesis 3:** There will be no significant difference in exercise or physical activity for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education.

**Hypothesis 4:** There will be no significant difference in the rate at which respondents in NC with diabetes who have previously participated in a diabetes self-management education course tend to have glycosylated hemoglobin (HbA1c) tested when compared to those who have never had any formal diabetes education.

**Hypothesis 5:** There will be no significant difference in the rate at which respondents in NC with diabetes who have previously participated in a diabetes self-management education course tend to have a dilated eye examination when compared to those who have never had any formal diabetes education.
CHAPTER THREE

Methodology

The purpose of this chapter was to describe the methodology that was used in this research investigation by providing a detailed portrayal of the research design, population and sample, instrumentation, validity and reliability, procedures for the data collection, description of variables, and analysis of data. Data from the 2003 Behavioral Risk Factor Surveillance System (BRFSS) survey were analyzed to investigate transfer of learning in diabetes education.

RESEARCH DESIGN

According to Gall, Borg and Gall (1996), “the term survey frequently is used to describe research that involves administering questionnaires or interviews” (p. 289). The authors further suggest that the intended function of survey data is to allow generalization of findings to a population that the sample is intended to represent by collecting data from participants in a sample with regard to personal and situational characteristics, experiences and opinions. Best described as explanatory and descriptive, as is the basis for the development of the BRFSS, the research design for this study placed emphasis on identifying and describing variables associated with differences in desired preventive care maintenance outcomes and diabetes self-management practices based upon previous participation in a diabetes self-management class.
Gall, Borg and Gall (1996) stated that, “only an experiment can provide a definitive conclusion about a cause-and-effect relationship” (p. 414). In accordance with this statement and tenet, neither the research study, nor the BRFSS, was designed to assert or claim causation. The primary purpose of the BRFSS is to monitor state-level prevalence and provide state-specific estimates of the major behavioral risks among adults associated with premature morbidity and mortality related to the leading causes of death in the U.S. (Nelson, Holtzman, Waller, Leutzinger and Condon, 1998). Moreover, the rationale behind its development was to collect data on actual behaviors, rather than on attitudes or knowledge, with the idea that resulting data would be especially useful for planning, initiating, supporting and evaluating health promotion and disease prevention programs. Utilizing the Behavioral Risk Factor Surveillance System (BRFSS) survey, this study investigated transfer of learning in diabetes education by examining differences in preventive care maintenance tendencies and self-management practices for non-institutionalized adults aged 18 years or older in NC who had previously participated in a planned diabetes education program in comparison to those who had not ever attended such a course. (Figure 4)
FIGURE 4. Research Design

BRFSS Survey Methodology:
Independent probability sample of non-institutionalized NC residents, age 18 years of age and older in households with telephones.

Identify Respondents With Previously Diagnosed Diabetes

Comparative analysis of differences in Preventive Care Maintenance and Diabetes Self-Management Practices for each subgroup based on previous diabetes self-management education (DSME)

(+) Previous participation in a planned DSME Program

Dependent Variables:
Preventive Care Maintenance & Diabetes Self-management Practices

(-) NO previous participation in a planned DSME program

Independent Variables:
AGE, GENDER, RACE, EDUCATION, EMPLOYMENT STATUS, INCOME, MARITAL STATUS and # of DEPENDENTS UNDER THE AGE OF 18
**POPULATION and SAMPLE**

Gall, Borg and Gall (1996) offer the following definition of sampling:

“The process of selecting members of a research sample from a defined population, usually with the intent that the sample accurately represents that population (p.769)”.

The population for this study was all non-institutionalized adult residents of North Carolina. The North Carolina Behavioral Risk Factor Surveillance System Program staff conducted a total of 9,455 interviews in English and Spanish, as appropriate, during the 2003 survey period statewide. This was the largest number of interviews ever completed by the NC BRFSS. According to the NC State Center for Health Statistics (2003), At least 9,000 interviews were necessary to guarantee a minimum of 400 completed interviews used to produce local estimates for 5 counties, 9 multi-county regions and 4 Area Health Education Center (AHEC) regions. This method of over-sampling nearly doubled the number produced in 2002, with the combination yielding a total of 18 county/regional estimates, a more than sufficient amount to provide “a reasonable degree of precision (95% confidence interval +/- 5%) for estimating the prevalence of health-related conditions” (State Center for Health Statistics, 2003 p.2).
The sample for this study consisted of 959 NC BRFSS survey respondents who indicated by self-report that a Doctor had previously diagnosed them with diabetes. The large composition of this sample (N=959) was necessary in order to conduct statistical analysis using logistic regression, one of the major analytical methods used in this study.

**INSTRUMENTATION**

The BRFSS is a standardized random-digit-dialed (RDD) telephone survey of non-institutionalized adults age 18 and older in households with telephones. Operated by state health agencies in collaboration with the Centers for Disease Control & Prevention (CDC), the primary purpose of this surveillance system is to provide state-level data to estimate and monitor the prevalence of health risk behaviors and risk factors for disease and poor health among populations. Designed to collect data on actual behaviors, as opposed to attitudes and knowledge, the BRFSS was intended to be particularly functional for health education professionals in the planning, implementation, and evaluation of health promotion and disease prevention programs.

BRFSS is a monthly ongoing telephone survey analyzed on a calendar year basis. The questionnaire is comprised of three main components:
1) Core Questions

2) Optional Modules

3) State Added Questions

The Core Questions are funded by the CDC and required to be included in the questionnaire administered by all states. A section of the core questions referred to as the Fixed or Standard Core are asked every year, unlike questions included in the rotating core, which are asked every other year on a rotating basis. Public health related Emerging Core questions, are also required, but are typically asked for only one year. The Optional Modules are offered by the CDC each year and are included in the BRFSS questionnaire if requested and sponsored by state programs or agencies. The State-Added questions are developed and sponsored by state programs or agencies and are developed or borrowed from previous BRFSS questions or other health surveys. The following table provides a categorical depiction of the 2003 NC BRFSS survey topics.
### TABLE 6. *Survey Topics on the 2003 NC BRFSS Survey*

<table>
<thead>
<tr>
<th>Core Sections</th>
<th>Optional Modules</th>
<th>State-Added NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Status</td>
<td>Diabetes</td>
<td>Arthritis</td>
</tr>
<tr>
<td>Health Care Access</td>
<td>Influenza</td>
<td>Disability &amp; Aging</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Heart Attack &amp; Stroke</td>
<td>Tobacco Tax</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Cardiovascular Disease</td>
<td>Diabetes Screening</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Tobacco Indicators</td>
<td>Weight Loss Products</td>
</tr>
<tr>
<td>Weight Control</td>
<td>Other Tobacco Products</td>
<td>Violence</td>
</tr>
<tr>
<td>Asthma</td>
<td>Binge Drinking</td>
<td></td>
</tr>
<tr>
<td>Immunization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tobacco/ Alcohol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arthritis/ Disability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veteran’s Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV/AIDS</td>
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</table>

**Validity and Reliability**

Established in the early 1980’s by the CDC, the BRFSS is the longest running and largest telephone survey in the world with 266,346 interviews conducted in 2003 Nationwide, including all 50 states, the
District of Columbia and three U.S. territories. The NC BRFSS is revised annually, with changes implemented each year beginning in January. Because professional and policy use of BRFSS data depends heavily on the validity and reliability of the data collected, the following statements have been offered by the CDC in reference to assessment of survey instrument reliability and validity in the BRFSS Operational and Users Guide (Appendix B).

**TABLE 7. Validity and Reliability of BRFSS**

<table>
<thead>
<tr>
<th>TERM</th>
<th>DEFINITION IN CONTEXT OF BRFSS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VALIDITY</strong></td>
<td>“The degree to which survey questions actually measure what they intend to measure (p.109)”</td>
</tr>
<tr>
<td><strong>RELIABILITY</strong></td>
<td>“A survey instrument is reliable when it consistently provides the same data; a measure of the extent to which observations of a study are repeatable, or produce the same answers. Reliability refers to the degree to which a person will give the same answer to a question if asked twice” (p. 108).</td>
</tr>
</tbody>
</table>

Validity of this survey instrument has been assessed and established over the years by comparing results among surveys that ask similar questions of comparable populations. The following findings provide support for validation of this instrument:
1) Comparison of estimates derived from the BRFSS matched positively with derivatives from in-person or observational surveys

2) Comparisons of responses matched positively with derivatives from medical records for the population.

Furthermore, the potential for bias due to refusal to participate is minimal, based on response rates achieved during previous BRFSS projects.

Assessment of the reliability of the instrument and interview process is continuously assessed and addressed as needed during the annual revision of the BRFSS. Wording of questions is a particular area that undergoes continuous scrutiny and modification as experts realize the importance of considering the respondents’ perception and interpretation of the question. Additionally, procedural differences such as the interviewers’ tone of voice when asking the questions affect reliability. A question is reliable if it evokes consistent responses, which has been the case during evaluation of the BRFSS questionnaire.

**DATA COLLECTION PROCEDURES**

The 2003 NC BRFSS questionnaire was comprised of 179 questions with several new topics introduced in the State Added Section (Appendix C). All NC BRFSS interviews were conducted using a probability sample of non-institutionalized adults 18 year of age and
older in households with telephones using the Computer Assisted Telephone Interviewing (CATI) system. Although BRFSS data were weighted, supplementary weights were developed for the “non-coverage” factor, which compensated for households with no telephones (approximately 5% of the population) and for differences between characteristics of the state population and the sample. Further weighting was designated for each respondent to ensure that the state population corresponds with the weighted proportion and weighted number of respondents by sex, age, and race. The CATI system facilitated data entry completion during the interview process.

The NC BRFSS questionnaire included a script for interviewers to follow that introduced the interviewer as a representative of the state health department and the Centers for Disease Control and Prevention (Appendix D). The interviewer further explained the purpose of the call, and verified the number of adult men and women in the house before selecting the most appropriate resident to respond before beginning the survey. The CDC core sections, optional modules and state added questions are asked with demographic data (i.e., age, gender, race, education, employment status, income, marital status and number of dependents) collected in the CDC core section. The core portion of the questionnaire, which takes approximately 10 minute to complete, is always asked first, followed by optional modules and finally, state-added questions. This ordering, per CDC guidelines, ensures comparability
across states and extends the interview time to an average total of 15-20 minutes for completion.

Diabetes status was determined by the response to core question 4.1: “Have you ever been told by a doctor that you have diabetes?”

Possible response choices for this question were:

<p>| | |</p>
<table>
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<th></th>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>YES</td>
</tr>
<tr>
<td>2</td>
<td>YES, but female told only during pregnancy</td>
</tr>
<tr>
<td>3</td>
<td>NO</td>
</tr>
<tr>
<td>7</td>
<td>Don’t Know/ Not Sure</td>
</tr>
<tr>
<td>8</td>
<td>Refused</td>
</tr>
</tbody>
</table>

In the early years of the BRFSS administration, answers were coded “yes” or “no”, until 1993 when interviewers were asked to code gestational diabetes as “no”. This changed quickly when in 1994, gestational diabetes assumed a separate code as seen presently, resulting in the choices listed above. For the purposes of this analysis and scope of this study, gestational diabetes was not a qualifying answer for inclusion in the sample; thus, only “YES” responses were considered diabetes status determinants. Additionally, due to the fact that weighted data were used, respondents who reported, “don’t know” or refused to answer the question were excluded in all calculations. A detailed description of the survey methods is available in the BRFSS Operational and Users Guide (Appendix B).
DESCRIPTION OF VARIABLES

Section 14.1 of the core section of the BRFSS was used to compile personal, situational and environmental characteristics of respondents in order to create a profile of respondents. The characteristics included for the purposes of this investigation were: age, gender, race, education, employment status, income, marital status, and care for minor dependents. These independent variables allowed the researcher to draw inferences as to whether there was a relationship between the respective variables and preventive care maintenance and/or self-management practices occurring as a result of successful transfer of learning.

The dependent variables used for this study to explore the presence or absence of diabetes self-management practices and preventive care maintenance respectively were found within the Core and Optional Diabetes Modules of the BRFSS questionnaire:

**Diabetes Self-Management Practices:**
- Frequency of glucose self-monitoring
- Frequency of self-foot examinations
- Frequency of exercise or physical activity

**Preventive Care Maintenance**
- Test for HbA1c
- Dilated eye examination.

In research questions 1-5, the dependent variables listed above were ascertained based on responses from the following survey questions:
Research Question 1

Optional Module 1: Diabetes Q1.4: About how often do you check your blood for glucose or sugar? Include times when checked by a family member or friend, but do not include times when checked by a health professional.

1 _ _ Times per day
2 _ _ Times per week
3 _ _ Times per month
4 _ _ Times per year
8 8 8 Never
7 7 7 Don’t know/ Not Sure
9 9 9 Refused

Research Question 2

Optional Module 1: Diabetes Q1.5: About how often do you check your feet for any sores or irritations? Include times when checked by a friend or family member, but do not include times when checked by a health professional.

1 _ _ Times per day
2 _ _ Times per week
3 _ _ Times per month
4 _ _ Times per year
8 8 8 Never
5 5 5 No feet
7 7 7 Don’t know/ Not Sure
9 9 9 Refused
Research Question 3

CDC Core Section 3: Exercise Q3.1: During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?

1  Yes
2  No
7  Don’t know/ Not Sure
9  Refused

Research Question 4

Optional Module 1: Diabetes Q1.9: A test for hemoglobin “A one C” measures the average level of blood sugar over the past three months. About how many times in the past 12 months has a doctor, nurse, or other health professional checked you for hemoglobin “A one C”?

_ _ Number of times
8 8 None
9 8 Never heard of hemoglobin “A one C’ test
7 7 Don’t know/ Not Sure
9 9 Refused

Research Question 5

Optional Module 1: Diabetes Q1.10: When was the last time you had an eye exam in which the pupils were dilated? This would have made you temporarily sensitive to bright light.

1  Within the past month (anytime less than 1 month ago)
2  Within the past year (1 month but less than 12 months ago)
3  Within the past 2 years (1 year but less than 2 years ago)
4  2 or more years ago
Furthermore, all aforementioned dependent variables associated with diabetes self-management and preventive care maintenance were measured for differences when controlled for the following independent variables: age, gender, race, education, employment status, income, marital status, and number of dependent children.

**DATA ANALYSIS**

Respondents were identified and assigned subgroups for comparative analysis purposes based upon previous participation in a planned diabetes self-management education program. This was determined based upon the response given to question 3.12 in the Optional Module for Diabetes, which asked, “Have you ever taken a course or class in how to manage your diabetes yourself?” YES and NO responses, respectively, were used for analysis of differences in diabetes self-management practices and preventive care maintenance between groups of NC residents who had previously participated in diabetes self-management education and those who had not ever attended such a planned program, considered non-participants. To further investigate transfer of learning in diabetes education, differences were analyzed for each dependent variable between groups and controlled for effects of independent variables.
The respective independent variables and corresponding values that were used to profile the participants and infer relationships are listed below and were recategorized as needed for sufficient analysis:

**Age:**
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65+

**Gender:**
- Male
- Female

**Race:**
- White (Non-Hispanic)
- Black (Non-Hispanic)
- American Indian
- Hispanic
- Other Non-Hispanic

**Education:**
- 8th Grade or less
- Some High School (Grade 9-11)
- H.S. Graduate or GED
- Some College or Post Secondary Education
- College Graduate

**Employment Status:**
- Employed for Wages
- Self-Employed
- Out of Work > 1 year
- Out of Work < 1 year
- Homemaker
- Student
- Retired
- Unable to Work
Household Income:
- Less than $10,000
- $10k - 14,999
- $15k - 19,999
- $20k - 24,999
- $25k – 34,999
- $35k – 49,999
- $50k – 74,999
- Greater than $75,000

Marital Status:
- Married
- Divorced or Separated
- Widowed
- Never Married

Number of dependent children under the age of 18 cared for in household:
N=___

Previous Participation in a Diabetes Education Program:
YES or NO

In addition to the use of tables to illustrate descriptive statistics, this researcher analyzed data using SAS and the SUDAAN software, which is designed for the analysis of complex sample designs such as those, used in BRFSS surveys. SUDAAN is specifically designed to analyze BRFSS data without the biased point estimates, inappropriate standard errors and confidence intervals, and misleading tests of significance that often result from use of standard statistical software packages in the analysis of sample survey data (Graubard and Korn, 1996).
Cross tabulation analysis and descriptive statistics were used to organize and summarize the relationships that existed in preventive care maintenance and self-management practices for respondents in NC with diabetes who had previously participated in a diabetes self-management education course when compared to those who had never had any formal diabetes education. Statistical inference is further drawn based upon the fact that the BRFSS data were collected from a sample of individuals who were randomly selected and assumed to be representative of a larger population: non-institutionalized residents of NC age 18 and older in households with telephones. To determine whether there was actually a difference between the two groups, the following null hypotheses were formulated and assert that no difference would be found between the descriptive statistics compared in the study for participants and non-participants:

**Hypothesis 1:** There will be no significant difference in the practice of glucose self-monitoring for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education.

**Hypothesis 2:** There will be no significant difference in the practice of self-foot examinations for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when
compared to those who have never had any formal diabetes education.

**Hypothesis 3:** There will be no significant difference in exercise or physical activity for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education.

**Hypothesis 4:** There will be no significant difference in the rate at which respondents in NC with diabetes who have previously participated in a diabetes self-management education course tend to have glycosylated hemoglobin (HbA1c) tested when compared to those who have never had any formal diabetes education.

**Hypothesis 5:** There will be no significant difference in the rate at which respondents in NC with diabetes who have previously participated in a diabetes self-management education course tend to have a dilated eye examination when compared to those who have never had any formal diabetes education.

A t-test was used to identify the differences between the means of the two groups for null hypotheses 1, 2 and 4. A chi-square test of independence was used to explore the presence of a relationship or association for the dependent variables named in null hypotheses 3 and 5 based on previous participation in a diabetes self-management education class. Chi-Square analyses tests the null hypothesis that the
prevalence of diabetes is the same for between groups, in this case participants and non-participants. Linear regression analyses attempt to explain a relationship between two variables with a straight line fit to the data. Logistic regression is typically used to predict a dependent variable on the basis of independents and to determine the percent of variance in the dependent variable explained by the independents. For the purposes of this research, both linear and logistic regression analyses were utilized to assess null hypotheses 1-5 based on whether the respective dependent variables yielded data that were categorical or continuous.

All respective measures were analyzed at the .05 level of significance.
CHAPTER FOUR
Presentation of Findings

The purpose of this study was to investigate transfer of learning in diabetes education. Accordingly, this research investigation was designed to explore preventive care maintenance and diabetes self-management practices based on previous participation in a planned diabetes self-management course or class. Hypotheses were formed to (1) determine whether there was a significant difference in diabetes self-management practices (glucose self-monitoring, self-foot exams, and exercise) for non-institutionalized adult residents of NC who had previously participated in a course or class in diabetes self-management when compared to those who had not ever had any type of formal diabetes education before; (2) determine whether there was a significant difference in preventive care maintenance (HbA1C test and dilated eye exam) between the groups based on previous participation; and finally (3) to determine whether differences exited for diabetes self-management practices and preventive care maintenance between the two groups of participants and non-participants based on previous involvement in a diabetes education course or class when controlled for age, gender, race, education, household income, employment status, marital status and number of children under age 18 in the household.
In this chapter, the findings relative to each of the questions are presented and followed by related discussion. The findings were arranged to provide a profile of the participants by socio-demographic characteristics.

**Profile of Respondents in Study**

Of the 9,441 NC residents who participated in the 2003 BRFSS survey, nearly 10% reported having non-gestational doctor diagnosed diabetes. Those 959 respondents comprised the sample for this research investigation (N=959). Demographics are presented according to number of respondents per variable. Detailed illustrations are provided in Tables 8-16 respectively.

Nine hundred fifty adult respondents reported their age; 1% were younger than 24, 3% of the respondents were between the ages of 25 and 34, and almost 45% were 65 years of age or older (Table 8). Five hundred eighty-six (61%) of the respondents were female, while only 386 (39%) were male (Table 9). Non-Hispanic White Americans made up the majority of the sample (62%), followed by 291 Non-Hispanic Black Americans (31%), 30 American Indians (3%), 11 Hispanic respondents (1%) and finally, 24 respondents (3%) were classified as Other Non-Hispanic minorities (Table 10). Each of the following demographic groups were originally operationalized with more response options; however, due to the low number or lack of responses in certain categories, they were recoded for statistical analysis and yielded the following frequency distributions. There
were 128 respondents (13%) who had an 8th grade education or less, 175 (18%) had received some high school education, 292 (32%) obtained a high school diploma or GED, 202 (21%) pursued some form of college or post-secondary education and 154 (16%) possessed a college degree (Table 11). Two hundred forty-one (25%) of the respondents were employed for wages, 35 (4%) were self-employed, 32 (3%) were unemployed seeking employment, 41 (4%) were self-proclaimed homemakers, five (<1%) were considered students, 178 (19%) were unable to work and 422 of the respondents (44%) were retired (Table 12). Less than $15,000 is earned by 330 (32%) of the respondents, 177 (26%) make $15,000-$24,999 annually; 95 (14%) report annual earnings of $25,000-$34,999, 85 (12%) earn between $35,000-$49,999, 63 (9%) earn between $50,000 and $74,000 and 48 (7%) of the respondents, report earnings in excess of $75,000 (Table 13). Of the respondents, 115 (18%) were married, 193 (31%) were divorced or separated, 245 (39%) had been widowed and 76 (12%) had never been married before (Table 14). Seven hundred and sixty-four (80%) of the respondents in the sample reported that they were not responsible for the care of any children under the age of 18 in the home, 104 (11%) indicated responsibility for one child, 55 (6%) indicated the same for two children, 29 respondents (3%) cared for three or four children and only one respondent indicated responsibility for the care of 5 children in the home (Table 15).
When asked about previous participation in a planned diabetes self-management education program, 471 (55%) of the respondents indicated that they had previously taken a course of this nature, while 483 (45%) of the respondents denied ever participating in any type of formal diabetes education (Table 16). This particular variable was used to explore evidence of successful or positive learning transfer based upon differences in preventive care maintenance and diabetes self-management practices for respondents who had previously participated in a diabetes self-management course when compared to those who had not ever had formal diabetes education.

**TABLE 8. Distribution of Respondents by Age**

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
<td>N</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>18-24</td>
<td>7</td>
<td>1</td>
<td>59</td>
</tr>
<tr>
<td>25-34</td>
<td>27</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>35-44</td>
<td>91</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>45-54</td>
<td>160</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>55-64</td>
<td>239</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>65+</td>
<td>426</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>950</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 9. Distribution of Respondents by Gender**

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>368</td>
<td>39</td>
</tr>
<tr>
<td>Female</td>
<td>586</td>
<td>61</td>
</tr>
<tr>
<td>TOTAL</td>
<td>954</td>
<td>100</td>
</tr>
</tbody>
</table>
### TABLE 10. Distribution of Respondents by Race

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RACE</strong></td>
<td><strong>N</strong></td>
<td><strong>%</strong></td>
</tr>
<tr>
<td>White Non-Hispanic</td>
<td>596</td>
<td>62</td>
</tr>
<tr>
<td>Black Non-Hispanic</td>
<td>291</td>
<td>31</td>
</tr>
<tr>
<td>American Indian</td>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>Hispanic</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Other Non-Hispanic</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>952</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### TABLE 11. Distribution of Respondents by Education

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EDUCATION</strong></td>
<td><strong>N</strong></td>
<td><strong>%</strong></td>
<td><strong>X</strong></td>
</tr>
<tr>
<td>8th Grade or Less</td>
<td>128</td>
<td>13</td>
<td>12th Grade</td>
</tr>
<tr>
<td>Some H.S. (Grade 9-11)</td>
<td>175</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>H.S. Graduate of GED</td>
<td>292</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Some College Education</td>
<td>202</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>College Graduate</td>
<td>154</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>951</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 12. Distribution of Respondents by Employment Status

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EMPLOYMENT STATUS</strong></td>
<td><strong>N</strong></td>
<td><strong>%</strong></td>
</tr>
<tr>
<td>Employed for Wages</td>
<td>241</td>
<td>25</td>
</tr>
<tr>
<td>Self-Employed</td>
<td>35</td>
<td>4</td>
</tr>
<tr>
<td>Out of Work &gt;1 Year</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>Out of Work &lt; 1 Year</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Homemaker</td>
<td>41</td>
<td>4</td>
</tr>
<tr>
<td>Student</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Retired</td>
<td>422</td>
<td>44</td>
</tr>
<tr>
<td>Unable to Work</td>
<td>178</td>
<td>19</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>954</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
### TABLE 13. Distribution of Respondents by Household Income

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOUSEHOLD INCOME</td>
<td>N</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Less than $10,000</td>
<td>115</td>
<td>16</td>
<td>$28,000</td>
</tr>
<tr>
<td>$10K- 14,999</td>
<td>115</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>$15k- 19,999</td>
<td>95</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>$20k- 24,999</td>
<td>82</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>$25k-34,999</td>
<td>95</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>$35k- 49,999</td>
<td>85</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>$50k-74,999</td>
<td>63</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Greater than $75,000</td>
<td>48</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>698</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 14. Distribution of Respondents by Marital Status

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARITAL STATUS</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Married</td>
<td>115</td>
<td>18</td>
</tr>
<tr>
<td>Divorced or Separated</td>
<td>193</td>
<td>31</td>
</tr>
<tr>
<td>Widowed</td>
<td>245</td>
<td>39</td>
</tr>
<tr>
<td>Never married</td>
<td>76</td>
<td>12</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>952</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

### TABLE 15 Distribution of Respondents by Number of Minors Cared for in the Home

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td># Children Under Age 18</td>
<td>N</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>764</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>104</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>55</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>953</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>
Table 16. Distribution of Respondents by Previous Diabetes Self-Management Education

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>FREQUENCY</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous DSME</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>YES</td>
<td>471</td>
<td>49</td>
</tr>
<tr>
<td>NO</td>
<td>483</td>
<td>51</td>
</tr>
<tr>
<td>TOTAL</td>
<td>954</td>
<td>100</td>
</tr>
</tbody>
</table>

**HYPOTHESES**

The research questions and conceptual framework that guided this study resulted in five hypotheses concerning differences in preventive care maintenance and diabetes self-management practices based upon previous participation in a diabetes education course or class. The first three research hypotheses examined self-management practice differences in glucose self-monitoring, self-foot examination, and physical activity or exercise based upon previous diabetes education, while hypotheses four and five focused on preventive care maintenance indicators such as HbA1C test and dilated eye examination during the past 12 months based upon previous participation in some form of formal diabetes education. Finally, with previous diabetes self-management included in each model, the independent variables were controlled for in the analysis of each of the aforementioned preventive care maintenance and diabetes self-management practices (dependent variables) to account for extraneous influences of those variables on the desired health outcomes and determine more accurately if
significant differences existed based solely on previous participation in a planned diabetes education program. All null hypotheses were either rejected or accepted at the .05 level of significance.

**Research Question 1:**

Is there a significant difference in the practice of glucose self-monitoring for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education?

**Null Hypothesis:**

There will be no significant difference in the practice of glucose self-monitoring for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education.

**Findings: REJECT H0 ACCEPT Ha**

At the alpha=.05 level, there was a significant difference (p-value=0.0152) in the frequency of glucose self-monitoring (GSM) for NC residents with diabetes who had previously participated in a diabetes self-management education course when compared to those who had never had any formal diabetes education. Respondents who had previously participated in a diabetes education course or class for self-management reported practicing GSM an average of 10.12 times per
week, compared to an average of 8.15 times per week for those who had not previously participated in such a course. Moreover, when controlling for AGE, SEX, RACE, EDUCATION, INCOME, EMPLOYMENT STATUS, MARITAL STATUS, and NUMBER OF DEPENDENT CHILDREN UNDER THE AGE OF 18, the relationship remained statistically significant. That is, the respondents who had previously participated in a planned diabetes education program practiced GSM more frequently (averaging 10.12 checks per week) than those who had not ever had any formal diabetes education (averaging 8.03 checks per week). All of the variables retained their statistical significance with the exception of EMPLOYMENT (p-value=.0001): Employed for wages, Unemployed for more than one year and Student. Data were analyzed using a linear regression analysis and a t-test with a confidence level of 95%. Table 17 provides an illustrative summary of the findings.

**TABLE 17. Differences in Glucose Self-Monitoring Frequency Overall and by Previous Diabetes Self-Management Education**

<table>
<thead>
<tr>
<th>GSM Frequency</th>
<th>N</th>
<th>X</th>
<th>P</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous DSME</td>
<td>0.0152</td>
<td>2.43*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>453</td>
<td>10.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>412</td>
<td>8.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVERALL</td>
<td>865</td>
<td>9.29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Research Question 2:**

Is there a significant difference in the practice of self-foot examinations for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education?

**Null Hypothesis:**

There will be no significant difference in the practice of self-foot examinations for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education.

**Findings: REJECT H₀  ACCEPT Hₐ**

At the alpha=.05 level, there was marginal difference (p-value=0.0547) in the frequency of self-foot examinations performed by NC residents with diabetes who had previously participated in a diabetes self-management education course when compared to those who had never had any formal diabetes education. Moreover, respondents who had previously participated in a planned diabetes education course for self-management reported practicing self-foot examinations an average of 6.86 times per week compared to 5.95 times per week for those who had never had any
formal diabetes education. Moreover, when controlling for AGE, SEX, RACE, EDUCATION, INCOME, EMPLOYMENT STATUS, MARITAL STATUS, and NUMBER OF DEPENDENT CHILDREN UNDER THE AGE OF 18, the results remained significantly different between the groups (p-value=0.0115) for all variables with the exception of AGE (p-value= 0.0382): 18-24 and 55-64. The respondents who had previously participated in a planned diabetes education program practiced self-foot examinations more frequently (averaging 6.85 foot checks per week) than those who had not ever received formal diabetes education (averaging 5.56 checks per week). Data were analyzed using a linear regression analysis and a t-test with a confidence level of 95%. Table 18 provides an illustrative summary of the findings.

**TABLE 18.** Differences in Self-Foot Examination Frequency Overall and by Previous Diabetes Self-Management Education

<table>
<thead>
<tr>
<th>Self-Foot Exam Frequency</th>
<th>N</th>
<th>X</th>
<th>p</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Previous DSME</strong></td>
<td></td>
<td></td>
<td>0.0547</td>
<td>1.92*</td>
</tr>
<tr>
<td>YES</td>
<td>464</td>
<td>6.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>465</td>
<td>5.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OVERALL</strong></td>
<td>929</td>
<td>6.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Research Question 3:**

Is there a significant difference in exercise or physical activity for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education?
Null Hypothesis:

There is no significant difference in exercise or physical activity for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education.

Findings:  REJECT H₀  ACCEPT Hₐ

At the alpha=.05 level, there was a significant difference (p-value=0.0491) in exercise and physical activity between respondents who had previously participated in a diabetes self-management course and those who had not ever had any formal diabetes education. Of the respondents, 69% of those who had previous diabetes education reported involvement in some form of exercise or physical activity in the last 30 days, compared to 60% for those who had not ever participated in a formal diabetes education program. However, when controlling for AGE, SEX, RACE, EDUCATION, INCOME, EMPLOYMENT STATUS, MARITAL STATUS, and NUMBER OF DEPENDENT CHILDREN UNDER THE AGE OF 18, the significance of the statistical relationship did not hold true. That is, the researcher found that there was no difference (p-value=0.00) in participation in physical activity or exercise within the last 30 days between the respondents who had previously participated in a planned diabetes education program and those who had not ever had any formal diabetes education. This finding was consistent for all variables except
EDUCATION (p-value = .0064): Grade 12 or GED and EMPLOYMENT (p-value = 0.0172): Employed for Wages and Unemployed for more than one year. Data were analyzed using a chi-square test of independence and a logistic regression analysis with a confidence level of 95%. Table 19 provides an illustrative summary of the findings.

**TABLE 19. Differences in Exercise and/or Physical Activity Frequency Overall and by Previous Diabetes Self-Management Education**

<table>
<thead>
<tr>
<th>Exercise/Physical Activity</th>
<th>N</th>
<th>$X^2$</th>
<th>Conditional Marginal Contrast</th>
<th>p</th>
<th>DOF</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous DSME</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>471</td>
<td>3.89</td>
<td>-0.09</td>
<td>0.0491</td>
<td>1</td>
<td>-1.97*</td>
</tr>
<tr>
<td>NO</td>
<td>483</td>
<td>0.69</td>
<td>0.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVERALL</td>
<td>954</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Research Question 4:**

Is there a significant difference in the rate at which Glycosylated Hemoglobin (HbA1c) is tested for respondents in NC with diabetes who have previously participated in a diabetes self-management education course when compared to those who have never had any formal diabetes education?

**Null Hypothesis:**

There will be no significant difference in the rate at which Glycosylated Hemoglobin (HbA1c) is tested for respondents in NC with diabetes who had previously participated in a diabetes self-
management education program when compared to those who had never had any formal diabetes education.

**Findings: FAIL TO REJECT H₀**

At the alpha=.05 level, no significant differences were found (p value=1), therefore the researcher must fail to reject Ho. The average rate at which Glycosylated Hemoglobin (HbA1c) was tested for respondent in NC with diabetes who had previously participated in a diabetes self-management education course or class when compared to those who had never had any formal diabetes education was identical at 3.06 per year. Furthermore, when controlling for AGE, SEX, RACE, EDUCATION, INCOME, EMPLOYMENT STATUS, MARITAL STATUS, and NUMBER OF DEPENDENT CHILDREN UNDER THE AGE OF 18, the researcher found that there still was no difference (p-value=0.9539) in the rate at which HbA1c was tested between the respondents who had previously participated in a diabetes education course and those who had not ever had any formal diabetes education. The results remained the same for all control variables except AGE (p-value=0.0346): 45-54. Data were analyzed using a linear regression analysis and a t-test with a confidence level of 95%. Table 20 provides an illustrative summary of the findings.
TABLE 20. Differences in HbA1c Testing Overall and by Previous Diabetes Self-Management Education

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>X</th>
<th>P</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous DSME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>399</td>
<td>3.06</td>
<td>1.0</td>
<td>0.00 (NS)</td>
</tr>
<tr>
<td>NO</td>
<td>357</td>
<td>3.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVERALL</td>
<td>756</td>
<td>3.06</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Research Question 5:

Is there a significant difference in the rate at which respondents in NC with diabetes who had previously participated in a diabetes self-management education course tend to receive dilated eye examinations when compared to those had never had any formal diabetes education?

Null Hypothesis:

There is no significant difference in the rate at which respondents in NC with diabetes who had previously participated in a diabetes self-management education course tend to receive dilated eye examinations when compared to those had never had any formal diabetes education.

Findings: REJECT $H_0$ ACCEPT $H_a$

There was a significant difference ($p$ value= 0.0129) in the rate at which respondents in NC with diabetes who had previously participated in a
diabetes self-management education course received dilated eye examinations when compared to those who had never had any formal diabetes education. Three hundred eighty-one (80%) of the respondents with previous diabetes education had received a dilated eye examination within the past 12 months compared to 327 (70%) of the respondents who had not had any formal diabetes education. The difference of 10% between groups based on previous diabetes education is significant according to the results of a Chi Square test of independence (Table 21). The \(X^2\) value (6.18) and the p-value (.0129) indicate that differences do exist in the rate at which dilated eye examinations are received based on previous diabetes education, thus the alternative is accepted that there is an association between previous diabetes education and receiving a dilated eye examination during the standard recommended time frame of one year.

Moreover, when controlling for AGE, SEX, RACE, EDUCATION, INCOME, EMPLOYMENT STATUS, MARITAL STATUS, and NUMBER OF DEPENDENT CHILDREN UNDER THE AGE OF 18, the researcher found that the 15% difference in the length of time since receiving a dilated eye exam between the groups was indeed significant (p-value= 0.0041) and that 84% of the respondents who had previously participated in a planned diabetes education program had received a dilated eye exam within the last 12 months, compared to 68% who had not ever received any formal diabetes education). The results remained significantly different for all control variables except EMPLOYMENT (p-value= 0.0235): Employed for Wages and
Homemaker. Logistic regression analysis was utilized in addition to a Chi-Square test of independence. Table 21 provides an illustrative summary of the findings.

**TABLE 21. Differences in Dilated Eye Examinations Overall and by Previous Diabetes Self-Management Education**

<table>
<thead>
<tr>
<th>Dilated Eye Exam</th>
<th>N</th>
<th>X²</th>
<th>Conditional Marginal Contrast</th>
<th>p</th>
<th>DOF</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous DSME</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>381</td>
<td>6.18</td>
<td>-0.10</td>
<td>0.0129</td>
<td>1</td>
<td>-2.49*</td>
</tr>
<tr>
<td>NO</td>
<td>327</td>
<td>0.80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVERALL</td>
<td>708</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SUMMARY**

This study, overall, revealed that transfer of learning, indeed, took place as a result of diabetes self-management education efforts in NC, for those who chose to participate. This was evidenced by the overall tendency for those who had done so to practice self-management and preventive care maintenance behaviors more often than their non-participant counterparts.

The final chapter will draw from the literature review and offer a conclusive synopsis of the findings, as well as implications for practice and recommendations for further inquiry.
CHAPTER FIVE

CONCLUSIONS, IMPLICATIONS and RECOMMENDATIONS

This chapter provides a summary of the research investigation, along with conclusions, implications and recommendations for future research in transfer of learning and diabetes education.

The ultimate aim of teaching is transfer of learning, or the effective application by program participants of what is learned as a result of attending an educational program (Silberman 1990; Kemerer, 1991; Killion and Kaylor, 1991; Broad and Newstrom, 1992). The end result is often not the case; leaving adult learners and health professionals frustrated and discouraged about the effectiveness of participation in a planned education course or class. In the programming process, health professionals assume the role of a change agent as they educate, facilitate and strategically plan for action and are very instrumental in influencing behavioral intentions, attitudes, knowledge and ultimately, the application of learned diabetes self-management practices.

Diabetes self-management and preventive care maintenance practices reduce the risk of diabetes related complications such as heart disease, stroke, renal failure, retinopathy, neuropathy, lower limb amputations and circulatory problems. The Health Belief Model is a framework that is based on the understanding that a person will engage in a health related behavior change or positive health action in order to avoid a negative health
consequences based on perceptions of susceptibility, severity, cues to action, self-efficacy and a need for the perceived benefits of implementing a positive health related action to outweigh the perceived barriers. This framework, influenced by the theories of Kurt Lewin, for stimulating positive health actions and behaviors is universally respected and utilized commonly by health professionals in the design of curricula for health behavior change.

This research study investigated transfer of learning in diabetes education by examining the differences that existed in preventive care maintenance and self-management care practices for non-institutionalized adults age 18 and older in NC who had previously taken a diabetes education course or class when compared to those who had not ever had any formal diabetes education. The preventive care maintenance and self-management practices that were explored were: glucose self-monitoring, self-foot examinations, exercise/physical activity, test for glycosylated hemoglobin (HbA1c) and dilated eye examination. Overall, the findings suggest that with the exception of exercise/physical activity and glycosylated hemoglobin test (HbA1c), respondents who had previously participated in a planned diabetes education class or course, tended to practice self-management and preventive care maintenance behaviors more often or frequently than those who had not ever participated in such a course.
Conclusions:

Research in ‘transfer of learning’ is scarce. Although a plethora of studies examining the effects of knowledge, attitudes, behaviors, and even metabolic outcomes following a diabetes education intervention exist, few specifically address the presence, impact and implications of transfer of learning in the literature.

The conclusions drawn from each null hypothesis are declared individually hereafter, followed by a synthesis of the discussion of the results collectively.

**Conclusion 1:** NC residents with diabetes who participate in diabetes self-management education courses tend to check their blood sugar, more often than those who do not.

**Conclusion 2:** NC residents with diabetes who participate in diabetes self-management education courses tend to check their feet more often than those who do not.

**Conclusion 3:** NC residents with diabetes who participate in diabetes self-management education courses tend to partake in non-work related exercise and/or physical activity more often than those who do not.
**Conclusion 4:** NC residents with diabetes who participate in diabetes self-management education courses tend have their Glycosylated hemoglobin (HbA1c) tested at the same rate as those who do not.

**Conclusion 5:** NC residents with diabetes who participate in diabetes self-management education courses tend to receive dilated eye exams more often than those who do not.

In this investigation of transfer of learning in diabetes self-management education, the respondents were specifically asked about participation in a course or class on diabetes management, which implies that individualized patient education was not considered in the survey design or analysis. The literature supports this approach to assessing the effects of diabetes education. In a study that examined glucose self-monitoring and knowledge within study circles, it was concluded that the group setting promoted learning, evidenced by increased metabolic control and diabetes self-management practices (Sarkadi, 1998).

With the exception of conclusion 4 that assessed the association of glycosylated hemoglobin testing with previous diabetes education, the results of the other respective hypothesis tests indicated that there was a significant difference in the practice of glucose self monitoring, self-foot examinations, exercise/physical activity, and dilated eye examinations for non-institutionalized North Carolina residents age 18 and older with diabetes who had participated in a diabetes self-management education
program when compared to those who had not ever received any formal diabetes education. This was quite expected and is supported by the current literature which consistently cites improvements in diabetes self-care techniques in the experimental groups that receive education. Jiang, in an experimental study designed to assess the function and effect of diabetes education programs, determined that the programs not only resulted in an improvement of diabetes self-care techniques, but positive metabolic outcomes as well (1999). Similar studies indicate the same association of education and positive behavioral outcomes (Krier, Grayson and Byrd, 1999; Bloomgarden, 1987; Ridgeway, et al., 1999).

Glycosylated hemoglobin testing is done at the discretion of the physician, is recommended to occur 2-4 times per year and has recently been emphasized and promoted amongst practicing clinicians as a way to achieve optimal diabetes care management for patients (Anderson, 2000). From a preventive care maintenance standpoint, education in a diabetes self-management education program is focused on empowerment as opposed to compliance. This approach teaches the learner about what tests should be ordered, how often and what the result mean.

Since the results of the hypothesis test indicate that people who had previously participated in a diabetes education class had HbA1c tests at the same rate on average as people who had not ever taken a course in diabetes self-management, it is safe to speculate that physicians and clinicians are
being proactive and consistent in ordering this particular clinical laboratory test regularly for patients and that having HbA1c tested is not associated with previous diabetes education. This result is reassuring, as it suggests that physicians are paying close attention to this preventive care maintenance procedure, thus striving for optimal long-term diabetes care management for their patients.

Contrary to the abovementioned findings relative to HbA1c testing, the data suggest that there is, indeed, an association with previous diabetes education and the practice of the remaining self-management behaviors (glucose self-monitoring, self-feet checks, exercise/physical activity, and dilated eye exams) referred to in conclusions 1, 2, 3 and 5. This lends credence to the notion that successful transfer of learning is occurring in association with participation in a planned diabetes self-management education program. In general, the data support and suggest that adults in NC with diabetes who have previously participated in a diabetes education course or class tend to practice glucose self-monitoring and self-foot checks more frequently than those who have not. Additionally, those who have previously attended a planned diabetes education course or class tend to participate in some form of non-work related exercise or physical activity and receive dilated eye examinations more frequently than those who have not ever received any formal diabetes education. When controlled for age, gender, race, education, income, employment status, marital status and number of dependent children under the age of 18, the conclusions of
significant difference remained consistent for all four of the aforementioned self-management practices, except for exercise/physical activity, in which case education and employment status held stronger associations than previous diabetes education in the practice of the self-management and preventive care maintenance behaviors. The procedure of controlling for the socio-demographic variables was employed for each hypothesis by logistic or linear regression analysis as appropriate.

The results of this study are consistent with Lopez-Ovejero’s findings (1992) and ultimate assertion that education remains the most important factor in obtaining control over diabetes. The tendency for diabetes education program participants to practice self-management behaviors more frequently than their non-participating counterparts is supported by the research conducted by Assal, Jacquemet & Morel (1997) which further implies that these individuals are less likely to experience diabetes related health complications and more likely to experience a higher quality of life, rendering participants overall healthier people.

On the surface, it would appear that obtaining an understanding of why people choose not to participate in a health education intervention would be a key element in the quest of heath professionals to increase involvement in planned education programs. However, the opposite is implied based upon the research initiated by Hochbaum, (1974) which investigated why adults chose to participate and focused on perceptions of
disease risk and perceived benefits of action. This later contributed to Caffarella’s model of interactive learning which considers enhancers and barriers for transfer of learning (1994).

According to Henly (2002), the development of diabetes self-management skills requires active involvement in the learning process. In line with Boone’s assumptions for the evaluation and accountability sub processes of planned adult education interventions (1985), this research is supported based upon the following premises: Although the exact format, components and delivery methods for the educational interventions experienced by respondents is unknown, it is safe to assume that the framework for the programming design and implementation was derived from and/or covered basic standards of care components for diabetes self-management found in the curriculum developed by and for health care professionals in North Carolina (Appendix A).

**Implications for Practice**

For a person living with diabetes, “diabetes education should begin with the diagnosis of the disease and should continue throughout the rest of the patients’ life” (Legget-Frazier, 2000 p.9). This study examined transfer of learning in diabetes education by investigating differences in self-management and preventive care practices or behaviors for North Carolinians who reported previous participation in a diabetes education course or class when compared to those who had never had any formal type
of diabetes education. It is anticipated that the results of this investigation will provide funding agencies, health professionals and policy makers with encouragement and assurance that planned education programs appear to be somewhat successful and associated with the practice of preventive care maintenance and self-management techniques for participants.

Grantors or funding agencies appreciate data that support the educational interventions that have been implemented throughout the state with financial backing and typically continue to invest in new or existing programs based on reported outcomes as criteria for success. With the recent changes in Medicaid and Medicare that allow diabetes education services to be reimbursable expenses, it is even more important to demonstrate that education is associated with positive behavior change in the practice of diabetes self-management and preventive care maintenance. As hospital utilization cost continue to rise, it is increasingly imperative that self-management and preventive care maintenance techniques not only be taught, but also practiced so as to reduce the risk for serious complications associated with diabetes that are otherwise preventable (Assal, Jacquemet & Morel, 1997).

As stated by Brill (1993), the more a person knows about the disease or condition, the more equipped, prepared and likely he or she will be able to improve the overall state of physical health and wellness. In light of this, health professionals should be even further validated and respected as the impact of their efforts to not only educate people, but change lives, becomes
evident through research studies such as this that show support for the efforts of health professionals (physician’s, nurses, health educators, pharmacists, nutritionists, etc) and adult educators who function as change agents in the programming process (Boone, 1985).

As a result of the high disease prevalence for diabetes in the state, this study particularly focused on North Carolina residents and sought to investigate the differences in desired preventive care and self-management practices based on previous participation in a diabetes education class. Policy makers would be particularly served by the results of this research study as debates continue about health care appropriations, new legislation about prescription medication costs and mortality rates attributable to preventable complications of this chronic disease. The emphasis is and should continue to be education, however, with data that support and suggest that diabetes education is associated with preventive care and self-management practices, it can be argued that monies should continue to be made available for programs that can continue to impact the diabetes prevalence rates for North Carolina, reduce diabetes related complications and mortality rates.

Use of the Behavioral Risk Factor Surveillance System survey (BRFSS) substantiates the strength of the association between education and application in health behavior, as results of the survey are commonly used to direct and support policy change at the federal and state levels, respectively (Centers for Disease Control and Prevention, 2003).
Accordingly, the contributions of the findings of this research investigation contribute considerably to the body of knowledge concerning diabetes education and adult learning, though further investigation is needed to explain other variables that may influence or impact the transfer of learning in diabetes education. As mentioned in the introduction, this research investigation was not intended to draw predictive or causative conclusions, but rather explore differences in the expected and desired behavioral outcomes and determine if those differences were associated with previous participation or lack thereof, in a class or course on diabetes self-management.

**Recommendations for Further Research**

The respondents in this study consisted of non-institutionalized adult residents of North Carolina over 18 years of age in households with a telephone. Based on the findings of this research study and the current literature that exist on transfer of learning, the following recommendations for future research and inquiry are presented:

1. It is suggested that a study be conducted to determine if there is a correlation between diabetes self-management /preventive care maintenance practices and the reported number of classes or courses taken in diabetes education

2. Longitudinal research should be conducted to determine how long respondents maintained the reported diabetes self-management and care preventive care practices that were
acquired through participation in a diabetes education course or class. It is also a point of interest to know if these practices decreased, heightened or remained constant over an extended period of time.

3. Utilizing the Health Belief Model as a framework, a qualitative investigation of motivating factors that influence participation in a diabetes education course or class should be explored. Conversely, it would also beneficial to know and understand barriers or reasons why people would choose not to participate in an educational program of this sort.

4. A cross regional comparison study should be conducted to examine diabetes prevalence and complications across North Carolina.

5. An examination of transfer of learning with a significantly larger sample size should be pursued to determine predictors of transfer of learning in diabetes education.

6. Examine transfer of learning before, during and after a planned diabetes education program, course or class designed using Caffarella’s Interactive Program Planning Model to identify factors that function as barriers or reinforcers for successful learning transfer.
7. Examine diabetes education curriculum designs and delivery methods in an effort to ascertain the most effective way to prepare for and facilitate teaching that translates into learning.
REFERENCES


State Center for Health Statistics (2002). Hospitalization, Costs, Discharges for Diabetes Related Complication in NC.


APPENDIX A:  
Diabetes Self-Management Education Curriculum

APPENDIX B:  
BRFSS Operational and User’s Guide

APPENDIX C:  
BRFSS Questionnaire 2003

APPENDIX D:  
BRFSS Interviewer’s Script  
(Begins on Page 3)

APPENDIX E:  
Letter of Exempt Status Regulatory Compliance IRB

APPENDIX F:  
Diabetes in North Carolina:  
A Summary Report-2002