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**PERCEPTIONS AND ATTITUDES OF DIETETIC PROGRAM EDUCATORS
REGARDING USE OF DISTANCE EDUCATION AND COMPUTER-BASED
SIMULATIONS IN DIETETICS EDUCATION**

A Thesis Presented

by

KIRSTEN M. SCHLEIN

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE

September 2011

Nutrition

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ABSTRACT

PERCEPTIONS AND ATTITUDES OF DIETETIC PROGRAM DIRECTORS REGARDING DISTANCE EDUCATION AND COMPUTER-BASED SIMULATIONS

SEPTEMBER 2011

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Distance education (DE) can address barriers to training nutrition professionals by offering a convenient, flexible and efficient way of learning. One particularly valuable teaching tool in DE is the use of computer-based simulations (CBS). CBS stimulates confidence building, acquisition of new knowledge, exposure to new and challenging patient cases in a safe learning environment, development of communication and critical thinking skills, and the cultivation of sensitivity towards patient needs. Despite the benefits, there is a lack of research examining dietetic educator's perceptions of and experience with CBS. Goals of this study were to determine: 1) whether dietetic program educators were open to the idea of using CBS and how these responses varied in relation to different factors, and 2) dietetic program educators' perceptions of the benefits and barriers of using CBS. Secondary data analyses were conducted on a 15-item survey developed by the American Dietetic Association (ADA). Surveys contained two qualitative questions and 13 quantitative questions related to CBS. Surveys were e-mailed via the ADA listserv to 535 program directors, including Dietetic Internship Programs (DI), Coordinated Programs in Dietetics (CP), Didactic Programs in Dietetics (DPD), and the Dietetic Technician Programs (DT). A total of 165 individuals responded to the

survey. The majority of respondents were open to the use of CBS (n=117) and a small number were not open (n=24). Respondents open to CBS were more likely to 1) not prefer face-to-face communication with their students and colleagues 2) currently be using online case studies and simulations 3) be using standardized patients in supervised practice 4) believe that dietetics education needs alternatives to traditional supervised practice such as CBS 5) believe that they have IT and financial support from their administration 6) have medical simulation laboratories available for dietetics students 7) believe that they had the technological skills needed to use CBS. Educators commented on the potential for CBS to address the shortage of preceptors and facilities available for supervised practice, in addition to enhancing and expediting learning in various settings. Perceived barriers, included the idea that technology impedes learning and a concern about the resources needed to implement CBS. Understanding the perspectives and practices of education program directors is a crucial component of furthering the process of incorporating CBS into nutrition education. This is exciting new terrain for nutrition education and moving forward with research in both distance education and CBS will be beneficial to enhancing nutrition and dietetics education in DE, traditional classroom settings and in supervised practice.

TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	iii
ABSTRACT.....	iv
LIST OF TABLES.....	viii
CHAPTER	
1. INTRODUCTION	1
1.1 Nutritional Problems in the United States	1
1.2 Addressing Health Problems via Nutrition Education: History of Training Opportunities in Nutrition and Dietetics	2
2. NUTRITION EDUCATION FOR HEALTH PROFESSIONALS	5
2.1 Challenges in Training Nutrition/Public Health Professionals	5
2.1.1 Geographic Isolation.....	6
2.1.2 Time and Financial Constraints	8
2.1.3 Diversity.....	9
3. DISTANCE EDUCATION FOR DIETITIANS AND HEALTH PROFESSIONALS	11
3.1 Addressing Barriers to Training Health Professionals through Distance Education	11
3.2 History and Methods of Delivery	13
3.3 Distance Education Today	15
3.4 Characteristics of Online Learners.....	16
3.5 Challenges of Distance Education for Students and Faculty	18
3.6 Traditional Education Compared to Online Education.....	22
3.7 Advantages of Distance Education for Students and Faculty	24
4. SIMULATIONS IN DISTANCE EDUCATION	29
4.1 Background and History in Healthcare Education.....	29
5. DISTANCE EDUCATION FOR TRAINING NUTRITION PROFESSIONALS	46
5.1 Background.....	46
5.2 Availability of Courses/Programs.....	50
5.3 Simulations in Nutrition Education	54
5.4 Summary: Gaps in the Literature.....	58

6. PURPOSE OF THE CURRENT STUDY	60
6.1 Research Questions	61
7. MATERIALS AND METHODS.....	62
7.1 Subjects and Data Collection	62
7.2 Statistical Analysis.....	64
8. RESULTS	68
8.1 Characteristics of the Study Sample	68
8.2 Rating Responses to Question #7: Openness to the Use of Technology to Replace or Supplement Supervised Practice in dietetic education	69
8.3 Openness vs. Use of Technology in Education Practice.....	69
8.4 Openness vs. Current Use of Role Playing, Standardized Patients and Patient Simulators	70
8.5 Openness vs. Belief that Changes Are Needed in Dietetics Education	70
8.6 Openness vs. Availability of Technological, Educational and Financial Resources.....	71
8.7 Openness vs. Characteristics of the Study Sample	71
8.8 Perceived Benefits and Barrier of Using Computer-Based Simulations	72
9. DISCUSSION.....	74
9.1 Limitations	82
9.2 Future Research	84
APPENDICES	
A. TABLES 1-8	88
B. INITIAL PROPOSED SURVEY.....	101
C. E-MAIL: INVITATION TO PARTICIPATE.....	111
D. CONSENT FORM FOR PARTICIPATION IN A RESEARCH STUDY.....	112
E. AMERICAN DIETETIC ASSOCIATION SURVEY	115
F. CODING KEY.....	120
REFERENCES	121

LIST OF TABLES

Table	Page
1. Summary of all survey items	88
2. Characteristics of the study sample.....	92
3. Openness vs. use of technology in education	93
4. Openness vs. current use of role playing, standardized patients and simulators	94
5. Openness vs. belief that changes are needed in dietetics education	95
6. Openness vs. availability of technological, educational and financial resources	96
7. Openness vs. survey respondent characteristics	97
8. Perceived benefits and barriers as stated by survey respondents.....	99

CHAPTER 1

INTRODUCTION

1.1 Nutritional Problems in the United States

The increased rate of obesity over the last 20 years is a significant health concern facing adults, adolescents and children in the United States. Results from the most recent National Health and Nutrition Examination Survey (NHANES) indicates that approximately 66% of adults in the United States are overweight or obese (Centers for Disease Control and Prevention (CDC), 2008). Obesity rates have also doubled among children and tripled among adolescents since 1980. The Surgeon General has identified this drastic rise in the prevalence of obesity and overweight as a national epidemic (American Dietetic Association (ADA), 2010). The consequences of obesity include coronary heart disease, type 2 diabetes, various cancers, hypertension, dyslipidemia, stroke, liver and gallbladder disease, sleep apnea and respiratory problems, osteoarthritis and gynecological problems (CDC, 2009 National Institutes of Health (NIH), 2009). There are numerous factors that play a role in overweight and obesity including energy imbalance, behavioral issues, metabolism, environmental factors, and genetics (CDC, 2009; NIH, 2009, ADA; 2011).

The high rates of overweight, obesity and related health problems have tremendous economic consequences for the U.S. health-care system. Direct medical costs include diagnostic, treatment and preventive services. Direct costs are associated with morbidity and mortality, which include lost income from absenteeism, decreased productivity and

the loss of future income associated with premature death due to overweight and obesity (CDC, 2009).

1.2 Addressing Health Problems via Nutrition Education: History of Training Opportunities in Nutrition and Dietetics

Nutrition education is necessary to address obesity and diet-related health problems in the United States. For example, using Registered Dietitians (RD) to provide nutrition education is an effective method of providing nutrition information and modifying dietary behavior. Evidence-based outcomes from a wealth of research have shown the positive impact of medical nutrition therapy, whether delivery occurs through individual or group nutrition counseling (Franz et al., 1995; Gaetke et al., 2006; Holmes et al., 2005; Arcand et al., 2005; Welty et al., 2007). The impact of community nutrition education is also well documented as effective in modifying behavior and improving health outcomes (Devine et al. 2006; Qian et al. 2007)

RDs play a key role in delivering nutrition education to individuals and communities, including health-care, business and industry, community/public health, government agencies, education, research and private practice. RDs have met academic and experience requirements established by the ADA's credentialing agency. They have a minimum of a bachelor's degree, have completed a dietetic internship program, and have passes a professional level certification exam. Coordinated programs are also available, which provide the required dietetics coursework and at least 1200 hours of supervised

practice within an academic program leading to a bachelor's or graduate degree. (ADA, 2009).

There are currently 226 Didactic Programs in Dietetics (DPD) and 244 Dietetic Internships (DI) and 50 dietetic technician (DT) programs in the United States (ADA, 2011). Master's and doctoral programs with a variety of concentrations, including public health and sports nutrition also exist, which do not necessarily lead to RD credentialing. The Commission on Dietetic Registration (CDR) regulates specialty certifications and licenses for RDs, DTs, and Registered Dietetic Technicians (DTRs). Examples of specialty certifications that can be obtained are in renal, pediatric, gerontological and oncology nutrition. Another route is the dietetic technician (DT) training, which requires an associate's degree and 450 hours of supervised practice and passing a professional certification exam to become registered (ADA, 2011).

The Commission on Accreditation for Dietetics Education (CADE) is ADA's accrediting agency for educational programs that train RDs and other nutrition professionals.

Universities across the United States have accredited nutrition education programs. The coordinated program (CP) in dietetics is one route of training. The didactic program in dietetics (DPD) requires Bachelor's or graduate level coursework, which occurs prior to the supervised practice (ADA, 2011).

The ADA is the world's largest organization of food and nutrition professionals. The organization has 70,000 members, 75% of whom are RDs with the remaining 25%

consisting of DTs, DTRS, consultants, educators, researchers and students. ADA was established in 1917 by a small group of women who worked to conserve food and improve the public's health during World War I. Today, the ADA works to improve the nation's health and advance the field of dietetics through research, advocacy and education (ADA, 2009).

CHAPTER 2

NUTRITION EDUCATION FOR HEALTH PROFESSIONALS

2.1 Challenges in Training Nutrition/Public Health Professionals

One of the main challenges in addressing nutritional problems through education is ensuring that there is an adequate number of qualified health professionals to deliver the information effectively to the target audience. It is crucial that these professionals have advanced degrees and specialty certifications, in order to address the wide array of diet and nutrition-related issues facing today's public. Ample opportunities must also exist for engagement in continuing education on a regular basis in order to remain current on changes in information (Tatum et al., 2008). This training is not only essential to provide optimal care, but RDs, Licensed Dietitians (LD) and DTRs are required to earn professional education units (CPEU) to maintain their professional status. For example, an RD must accrue 75 hours of CPE credits every five years to maintain registration and licensure status. DTRs are also required to complete 50 CPEUs every 5 years (ADA, 2009). In addition to the field of nutrition and dietetics, the field of public health is facing similar challenges.

Public health nutrition is one example of an area that does not currently have an adequate number of trained professionals and faculty. In addition, existing professionals sometimes lack needed skills to successfully implement public health programs (Dodds et al., 2003). It is imperative that this situation improves in order to address the increasing number of people in the United States with diet related illness. In order for this issue to be

addressed, it is important to understand the factors that impede this training. These issues include geographic isolation, time constraints, financial limitations and recruiting and retaining a diverse body of professionals.

2.1.1 Geographic Isolation

Health professionals in rural areas face unique continuing education challenges, including the lack of availability and access to course options (Jukkala et al., 2008). Research in the field of nutrition and dietetics is somewhat limited when examining these issues.

Therefore, examining data from a range of health-care disciplines can be valuable to infer information regarding nutrition professionals and suggest future research.

A study by Tatum et al. (2008), examined the perceived need for graduate-level clinical nutrition education in a sample of 1,166 RDs. The sample consisted of 1,000 RDs randomly selected from a list provided by the Commission on Dietetic Registration. The remainder of the RDs (n=166) was students enrolled in an academic health center. A survey was used to assess reasons for pursuing and not pursuing an advanced degree. The authors discovered that more RDs without graduate degrees worked in rural settings, which is important because 40% of respondents claimed to not have had access to a graduate program (Tatum et al., 2008). Findings such as these are telling because health-care professionals are expected to have a multitude of skills and stay current on information (Jukkala et al., 2008).

Recruiting and retaining health-care professionals in rural settings is crucial in maintaining the integrity of health-care systems in these areas. Barriers to accessing continuing education along with professional isolation can create challenges. Curran et al. (2006) examined rural health-care professionals' perceived barriers in engaging in continuing education. Online surveys were completed by 237 individuals at licensing and professional regulatory bodies and professional organizations. In addition, key informant interviews were conducted with representatives at continuing professional education institutions. The results of the study revealed that geographic isolation was the most frequently cited barrier to effective delivery of continuing education (Curran, Fleet & Kirby, 2006). Institutions offering relevant courses simply may not be available, necessitating lengthy travel time to access these opportunities. This barrier is oftentimes compounded by rough geographic terrain and issues related to weather (Jukkala et al., 2008).

The perceived barriers to continuing education for rural and remote nurses in Canada were also discussed in a study by Penz et al. (2007). Barriers in accessing education are further compounded with rural health professionals, because education is not available due to geographic isolation (Penz et al., 2007). In another study by Zahner and Gredig (2005), a cross-sectional survey was used to obtain data from 424 public health nurses located in local health departments in Wisconsin. Improving availability of and access to training were identified as the most critical issues. The authors suggested strategies to address these issues, which included increased use of distance technologies.

2.1.2 Time and Financial Constraints

Meeting continuing education needs can be difficult for all professionals, whether they live in a rural or urban setting. Attending events and professional conferences can be time consuming, inconvenient, and expensive, particularly for those who are working full time and have families (Wallner et al., 2007). If traveling to workshops, classes and conferences to meet continuing education needs is not possible, educational opportunities offered in the workplace is another option. It is difficult, however, for some health professionals to take advantage of workplace opportunities, as rural health centers often have staff shortages and inadequate funding (Penz et al., 2007). Despite these limitations, rural health departments are expected to provide a wide array of services for patients (Rosenblatt, Casey & Richardson, 2002), and health-care practitioners are expected to continuously update their knowledge and skills to provide the most competent care (Penz et al., 2007).

Issues related to time constraints are a common thread emerging in studies of nutrition and other health professionals struggling to stay informed about current health topics (Tatum et al., 2008; Wallner et al., 2007; Skipper & Lewis, 2006; Delaney & Piscopo, 2004). Meeting the need for well trained nutrition professionals has proven to be problematic, as many experience time constraints, making it difficult to attend workshops, classes and conferences (Wallner et al., 2007). While many RDs see the advantages of pursuing an advanced degree, financial issues, time constraints and lack of workplace support are recurring issues (Skipper & Lewis, 2006).

One timely issue is food safety and the risk of foodborne illness to meet the needs of at-risk populations. Foodborne diseases cause 48 million illnesses, 128,000 hospitalizations, and 3,000 deaths in the United States each year (CDC, 2011). With ongoing threats to food safety it is crucial that health-care professionals are well trained and remain current on this topic information. Health-care professionals are often not sufficiently equipped to educate patients on food safety issues (Tatum et al., 2008)

Full-time jobs and family responsibilities add to perceived barriers for nurses interested in pursuing an advanced degree, which were explored in a study by Delaney and Piscopo (2004). The sample consisted of 101 registered nurses in Connecticut. The majority of the participants were female, married with one or two children, and with a mean age of 42.5 years. The results of the study found that the participants perceived time, work, family and money as the most frequently stated barriers in returning to school (Delaney & Piscopo, 2004).

2.1.3 Diversity

As the need for training new health professionals increases, there are other issues to address concerning the under-representation of ethnically diverse students. The need for ethnic diversity within the field of nutrition and dietetics has been acknowledged (Felton et al., 2008). Other health professions, including nursing, are facing similar issues, as Latino, Asian and African Americans are severely under-represented (Amaro, Abriam-Yago & Yoder, 2006).

This diversity imbalance could potentially lead to further disparities for certain ethnic groups, as many minority patients may prefer to receive care from practitioners who share the same racial or ethnic background (Felton et al., 2008). Therefore, it is important to attract and retain students from a range of ethnic and racial backgrounds and understand the barriers and needs specific to certain groups of people (Amaro et al., 2006).

Studies within the field of nursing education have highlighted the perceived barriers students from various ethnic backgrounds have faced when pursuing their education. Amaro et al. (2006) conducted a qualitative research study to examine the challenges that ethnically diverse nursing students experienced in completing their degree. An open-ended questionnaire was used to interview Latino, Portuguese, Asian and African-American students (female n=14, male n=3) who had recently graduated from a nursing program. Perceived barriers by these professionals and students included lack of finances, insufficient time, and family responsibilities. Additional challenges for students from some ethnic backgrounds relate to language barriers, as school-work becomes more time consuming when English is not the student's native language. Issues of discrimination and lack of ethnic role models in education were also discussed by nursing students (Amaro et al., 2006).

CHAPTER 3

DISTANCE EDUCATION FOR DIETITIANS AND HEALTH PROFESSIONALS

3.1 Addressing Barriers to Training Health Professionals through Distance Education

Distance education can address the range of barriers discussed in the previous chapters—including geographic isolation; time, financial constraints, and staff shortages; and lack of ethnic diversity—by offering a convenient, flexible and efficient way of learning.

Distance education is defined by the National Center for Education Statistics (NCES) as “a formal education process in which the student and instructor are not in the same place” (NCES, 2007, p.12). The United States Distance Learning Association (USDLA) defines distance education as “the acquisition of knowledge and skills through mediated information and instruction” (USDLA, 2005, p.7). Hybrid, or blended learning, is defined by the NCES as a “combination of online and in-class instruction with reduced in-class seat time for students” (NCES 2007, p.12). This type of learning may occur in a synchronous or asynchronous manner, delivered by audio, computer technologies or video. Synchronous learning is live communication that occurs between an instructor and student with the use of oral and/or visual communications (USDLA, 2005). This method encourages interactivity, spontaneity and immediate reinforcement of ideas.

Asynchronous learning can use videoconferencing, audio response systems that allow for oral communication, or technology that allows exchange of both data and voice (USDLA, 2009). The definition of distance education also includes correspondence learning, which

involves either written communication and/or the use of additional technology (NCES, 2007).

Distance learning provides opportunities for students who are not able to attend traditional classes due to family responsibilities, full time jobs and geographical isolation (Young & Lewis, 2008; Atack & Rankin, 2002; Billings, Connors & Skiba, 2001). The use of distance education can reach diverse audiences all over the world (Conceição, 2006), which helps address the under-representation of racially and ethnically diverse populations in allied health fields.

Online classes can expand access to a wider array of courses for students with disabilities as well. An increase in the availability of advanced technology allows students with virtually any disability access to telecommunication technologies and computers (Carlson et al., 2001, Klemes et al., 2006) For example, technology is available that can provide text displays in conjunction with synchronized auditory output, which is beneficial for students with learning disabilities who have print-related learning problems (Klemes et al., 2006).

Online learning can be an effective tool for addressing the barriers that many professionals face (Wallner et al., 2007), providing increased flexibility and more efficient use of time, while allowing the student to work at his/her own pace (Piercy & Lee, 2006; Young, 2006). It is an attractive option for many health professionals who need to be kept continuously updated on skills and knowledge in their field.

One particularly valuable teaching tool in distance learning is the computer-based simulation, which can greatly enhance the distance education experience. Simulation is “the technique of imitating the behaviour of some situation or process whether economic, military, mechanical, by means of a suitably analogous situation or apparatus, especially for the purpose of study or personnel training” (Oxford English Dictionary, 2009). Simulations can be used in a variety of disciplines, to model human or natural systems to gain a deeper understanding of a situation and to practice new skills. They provide a model of a real-life or hypothetical situations, for the purpose of practice and exposure to new situations (Encyclopedia of Computer Science, 2000). It can provide the student with opportunities to actively engage in their learning, allowing them to respond to a changing situation that resembles a real-life situation (Berge, 2002). This type of educational strategy can greatly enhance online learning in a range of disciplines and will be discussed in more detail in later chapters.

3.2 History and Methods of Delivery

Emergence of the internet altered the definition of distance education, causing many to believe that this type of learning was a new phenomenon. However, this method of education has existed in the United States for over 120 years. Distance education began in the form of correspondence courses in the late nineteenth century with the use of postal mail. The development of communication media in the mid-twentieth century led to the development of educational radio and television programs. Iowa State University

launched the first education television program in 1934, followed by the Public Broadcasting Service (PBS), which launched educational television programming in 1964 (USDLA, 2005).

In 1971, the British Open University was established, which began with the goal of providing education to those who did not have the opportunity to attend classes on campus (Open University, 2009). In 1993, Jones International University was established as the first online accredited university. Two years later, the term “distance learning” was coined by Chris Dede, professor of learning technologies at Harvard University. In 1996, e-learning, which utilized predominantly Internet and computer-based technologies, was established due to the newly widespread use of the World Wide Web (USDLA, 2005).

Various forms of instructional media are available to develop an online course. Learning can occur in a synchronous and/or asynchronous manner. Asynchronous learning is communication that does not occur in real-time. An online classroom based on this method would utilize print and electronic materials and discussion boards where students respond to the instructor and each other. Other modes of communication include recorded audio and video, print correspondence and instructional television. Asynchronous learning supports more opportunity for reflective thinking, encourages more flexibility, and may allow more time for response than synchronous learning methods. (USDLA, 2005).

Overall, distance education has proven to be valuable in education and continues to evolve with its growing popularity and the use of more advanced technology. To gain a

sense of where distance education is headed in the future, it is worthwhile to examine where this method of education stands today. This analysis can help to guide future development of distance education programs in nutrition and dietetics curriculum.

3.3 Distance Education Today

The National Center for Education Statistics (NCES), conducted a survey in 2008 to examine the state of distance education in degree-granting post-secondary institutions during the 2006-07 academic year. Survey data indicated that of the 4,200 two-year and four-year institutions participating, 61% offered online courses and 35% offered hybrid courses. Thirty-two percent of the institutions reported offering a degree or certificate program that could be completed solely through distance education. Asynchronous technologies were the most widely used method for delivery, with 75% of institutions using this method to a large extent (NCES, 2008).

Over the last few years, online enrollments have been increasing at a rate greater than overall higher education enrollments. The 2010 Sloan Survey of Online Learning, which surveyed 2,500 colleges and universities in the United States, shows that in 2009, over 5.6 million students were taking at least one online course. In addition, nearly two-thirds of for-profit institutions report that online learning is an important component of their long-term strategy (Allen & Seaman, 2010). Academic leaders are expecting that these numbers will continue to increase. Changing economic times are likely to cause an increase in online enrollments as well. Three-quarters of institutions surveyed reported that the economic downturn has increased the demand for online programs (Allen &

Seaman, 2010). Programs that accommodate working adults may also see an increase in enrollments, as some may wish to advance their degrees during high rates of unemployment. Those who are unemployed may turn to education due to a lack of available jobs. High fuel prices may also result in potential students who are more likely to choose online learning (Allen & Seaman, 2010).

Distance education is growing in popularity for several other reasons as well. Educational institutions are motivated to meet students' needs for more flexible schedules and to provide increased access to education opportunities. The overarching desire to increase enrollments and profits is a strong motivator to meet students' needs (NCES, 2008; Allen & Seaman, 2010). When examining distance education, it is important to look at the characteristics of the students who are enrolling in distance education courses.

3.4 Characteristics of Online Learners

A student's perspective about distance education will affect his/her success and satisfaction level with an online course. For instance, non-traditional students, who are older and may be living off campus tend to have a higher level of satisfaction and success with online courses than traditional classes and tend to see greater advantages to this type of learning (Navarro & Shoemaker, 1999; Miller, Cohen & Beffa-Negrini, 2001; Buckley, 2003). Miller, Cohen & Beffa-Negrini (2001) compared the academic achievement of 35 undergraduate students in an online introductory nutrition course to 434 students taking the same course in a traditional large-class lecture. Achievement was measured with the use of pretest and posttest questionnaires, in addition to a final course

grade. There were no significant differences in knowledge scores between the two groups; however, older students taking the online course had higher overall final course grades than younger students in the online course and the students in the lecture format (Miller, Cohen & Beffa-Negrini, 2001). The authors propose that this may be due to the fact that distance education tends to be more satisfying and more effective for students who are motivated, self-directed and capable of studying independently, which are often characteristics found in older students. Students who take responsibility for their learning also tend to be more successful (Richardson and Newby, 2006).

Another study by Sahin and Shelley (2008) highlighted some of the other factors that affect student satisfaction and success in distance learning. Online surveys were obtained from 195 undergraduate students in an online education course. The authors concluded that previous experience with computer technology was an important component of student satisfaction with an online course. In addition, students' perceptions that distance education was a flexible and useful method of learning were also linked to their level of course satisfaction (Sahin & Shelley, 2008).

Examining intentions to use online courses is also valuable in understanding online learners. This issue was addressed in a study by Tung and Chang (2008), which looked at nursing students' perceptions regarding online courses. The sample consisted of 228 nursing students who had previously taken an online course. Questionnaires were administered, which contained items related to computer anxiety and self-efficacy, in addition to perceived financial costs and information quality of online courses. The

results of the study suggest that anxiety surrounding computer technology had a negative effect on intentions to take an online course, while self-efficacy had a positive effect. Perceived usefulness, ease of use and cost efficiency were all factors that positively impacted a student's decision to enroll in an online course. While examining these characteristics is important, it is also worthwhile to look at the specific challenges that students and faculty face in online learning in order to create effective courses that address these barriers.

3.5 Challenges of Distance Education for Students and Faculty

An example of a challenge faced by students taking online courses, is that they are not able to participate in on-campus multicultural programs, recreational activities or student organizations. Students may therefore report feelings of isolation and desire a greater sense of community. Some online students also face challenges in accessing library materials, although the availability of electronic journals is becoming more widespread (Piercy & Lee, 2006). Muilenberg and Berge (2005) examined these and other barriers through a factor analysis study involving 1,056 students. The results of this study indicated that the most frequently cited barrier for students was a lack of social interaction. The authors concluded that the degree and quality of social interaction in the online environment determined in part the effectiveness of the course in terms of learning and satisfaction (Muilenberg & Berge, 2005).

Other studies have found technological issues to be the most problematic for students. For instance, a study by Song et al. (2004), was designed to gain insight into students' perceptions of online learning. Seventy-six graduate students taking online courses were surveyed about their perceived barriers regarding the courses. Technical problems were the most frequently cited challenge, reported by 58% of respondents. (Song et al., 2004).

Technological challenges, lack of computer access and insufficient computer skills have also been reported by nurses engaged in continuing education (Sweeney et al., 2008; Atack & Rankin, 2002). According to Sweeney et al. (2008), Registered Nurses are expected to have a level of computer proficiency, but many fall short on basic skills. Nurses have reported their lack of familiarity with computers and experience with the internet as challenges to engaging in online education. However, after the initial hesitation to take online courses is overcome, these courses are often found to be effective and enjoyable (Sweeney et al., 2008).

Challenges are also faced by instructors of online courses. Young (2006) conducted a study to examine student perceptions of effective web-based teaching. Surveys were sent to 199 online students who had recently completed a summer course online. Effective communication with instructors was identified as an important component of a positive learning experience for students. Communication demands on instructors are noteworthy, as the volume of e-mails alone can become overwhelming. In addition to answering e-mail, instructors must monitor other aspects of the course. For example, many online classrooms use discussion boards for communication, where students can interact with

each other and the instructor. This component is often time consuming, as these discussions require constant monitoring and response (Young, 2006). Students in this study also identified the need for instructors to show concern for their learning and adapt to student needs. Online instructors face specific challenges in this arena, as they must design the course more thoroughly in advance and adhere to stricter schedules, than traditional classroom-based teachers who have more flexibility in adjusting course content, assignments and schedules as the course evolves (Young, 2006).

Furthermore, instructors may not be adequately trained to teach online. It is imperative that faculty understand how to modify their traditional classroom curriculum to meet the needs of online learners. Furthermore, faculty may have difficulty developing close relationships with online students. However, they can positively contribute to the online student's experience by using appropriate teaching techniques. Numerous teaching techniques and strategies are available to create an engaging online class environment that encourages critical thinking and creativity. For example, courses are enhanced when students are actively engaged in online discussions, drawing from their professional experiences (Halstead and Coudret, 2000). To facilitate this, instructors can serve as facilitators, moving students through an online discussion, highlighting key concepts and keeping students on topic. Effective teaching also involves using a combination of communication modes such as conferences, e-mail, listserv and discussion boards. In addition, information should be accessible and presented in interesting ways, such as using graphics to portray concepts (Halstead and Coudret, 2000). The student population, program focus area, and the amount of the instructor's previous online experience are all

factors that should be accounted for when developing a program and selecting online teachers. (Richardson & Newby, 2006).

Carbone (2010) conducted a descriptive study to assess instructors' experiences in the online classroom, looking particularly at teaching practices and available resources used. The goal of the research was to help determine best practices in the online environment and address encountered barriers. A convenience sample of thirteen females and eight male online instructors at the University of Massachusetts Amherst were interviewed. The Kolb Learning Style Inventory was used to develop the questions concerning instructors' perceptions regarding the needs of their students and the Trainer Type Inventory was used to assess instructors' teaching styles. Results showed that 82% of participants had no online teaching experience prior to teaching for the first time. They had an average of 14.7 years of teaching experience and 5.2 years of online teaching experience. The main teaching styles identified were Coaches (41%), who act as facilitators and encourage class participation and Directors (35%), who tend to take charge and give directions. Participants also reported the need for technical training, such as how to effectively design a course, teaching strategies and knowledge regarding who to consult for guidance.

Studies such as this are valuable in determining best practices in teaching to address the challenges that faculty encounter in the online environment and ultimately provide a meaningful and effective online environment. It is crucial that online instructors know how to effectively design, teach, manage and evaluate their online courses.

Shea (2007) examined the potential barriers online faculty members face, which may negatively impact willingness to engage in this type of instruction. Survey data from 386 instructors teaching online in 36 colleges were examined. The most commonly reported disadvantages to teaching online were inadequate compensation for the increased time needed for course development (n=296), revision (n=307) and teaching (n=300). While often cited, these issues were not reported to prevent faculty from teaching online.

Overall, there are several barriers that both students and faculty can encounter in the online environment. Some of these barriers, such as creating an engaging classroom environment, developing positive student/faculty relationships and employing effective teaching techniques are issues that may be encountered in traditional education as well. One important question is whether online education is as effective traditional classroom-based education in terms of learning outcomes.

3.6 Traditional Education Compared to Online Education

While there are potential barriers for both faculty and students in the online environment, numerous studies have highlighted the fact that distance education is comparable to or surpasses traditional classroom-based education in terms of learning outcomes and student satisfaction (Beffa-Negrini et al. (2007); Buckley (2003); Shanley et al. (2004). For example, Shanley et al. (2004) examined the differences between students taking an online course in food safety and those taking the same course in a traditional classroom setting. The 50 food service workers participating in the study took the United States

national food safety examination after completing the course. A bivariate analysis of the test scores showed no differences between the method of delivery of the course.

Distance learning has been shown to be as effective as traditional learning in other subject areas as well. For instance, Buckley (2003) found that nursing students were able to complete online coursework as successfully as those in the traditional setting. Fifty-eight nursing students in a health and nutrition class were divided into three groups categorized by type of instructional format. The first group (n=24) was exposed to a traditional lecture format, the second group (n=23) had a web-enhanced format, and the third group (n=11) followed a strictly web-based format. No differences were found in examination scores or course grades between the three groups. However, perceptions about the learning experience differed between those taking online courses and those in the traditional classroom setting. Students who were older and lived far from school were more inclined to be satisfied with the web-based format, as it allowed greater convenience and flexibility (Buckley, 2003).

Another study by Leasure et al. (2000) also supported equivalency between traditional and distance learning. In this study, student outcomes of an undergraduate nursing course using distance learning were compared to one in the traditional classroom-based setting. There were no significant differences between the two groups in terms of exam scores or course grades.

These studies have clearly shown that it is possible to have online education that is as effective as traditional education. This research supports equivalency between these two teaching methods, while they may be executed in varying ways. While equivalency is certainly important, it is also worthwhile to examine the numerous benefits of online learning for both faculty and students and some of the advantages that online learning offers over traditional educational methods.

3.7 Advantages of Distance Education for Students and Faculty

Online teaching offers numerous advantages to faculty, including increased flexibility and convenience in providing instruction (Arbaugh, 2000) and increased and higher quality interactions with students and positive outcomes in student knowledge gains (Kashy et al., 2000). Rockwell et al. (1999) surveyed 207 faculty teaching courses at a university about their perceived benefits of teaching online. Forty percent viewed online teaching as an incentive for favorably affecting their annual evaluations and promotion/tenure needs, although 30% identified online teaching as an obstacle to meeting these needs.

Faculty who teach online are also often motivated by intrinsic or personal rewards. Online instruction may allow for different opportunities that are somewhat limited in the traditional classroom setting. For example, instructors are given the opportunity to extend their reach beyond the confines of the institution and have access to a wider range of students. Faculty may also be motivated by reduced travel time and greater flexibility

with their work hours. Faculty also reported satisfaction in engaging in a different type of teaching and in developing and applying new online teaching techniques (Rockwell et al., 1999).

A study by Conceição (2006) examined the online teaching experiences of ten faculty in a range of disciplines including nursing, accounting and library science. To meet the study criteria, the study participants had to have some experience teaching fully online courses, had to be actively teaching in a computer-mediated environment in higher education, and have interest in distance education. The sample included a range of experience teaching online, from 2 to 16 years. A theme that emerged from the study was that there were many rewards related to this type of teaching. Participants commented on the satisfaction and excitement in delivering material and engaging in a new way of delivering instruction. They found satisfaction in facilitating the online discussions and felt that students were able to learn from one another in a unique way, as the discussion format allowed for more reflective thinking and writing than in the traditional classroom setting. While online teaching was found to be more time consuming than traditional teaching, participants enjoyed getting to know the students (Conceição, 2006).

In this study, participants also felt that it was advantageous to have access to a wider range of students, allowing for a diverse classroom that allowed for a gratifying experience for instructors. They also commented on the fact that they were able to learn a lot from their students, due to the diverse student body and in-depth discussions. In particular, one group that is well represented in the online classroom is

working professionals. This group, which may not ordinarily be able to attend traditional classes, was noted by study participants to make meaningful contributions to the classroom with their experience in the field (Conceição, 2006).

There are numerous advantages for students as well. Several studies with nursing and allied health students indicate that they are satisfied with the online learning experience, reporting convenience and ease of access as reasons for choosing this format over a traditional classroom setting (Gerkin et al., 2009; Farrell et al., 2007; Atack, 2002). The advantages of online courses were also highlighted by Farrell and colleagues (2007). In this study, an online survey was utilized to assess nursing students' (n=166) perspectives after completing an on-line unit of an undergraduate course in clinical communication. Many students reported having a positive response to the course, stating that the online unit had the advantage of allowing them to study any time (85%), allowed flexibility to better pace their work (80%), and encouraged critical thinking (80%).

A similar study by Hannay and Newvine (2006) surveyed 217 part-time students enrolled in an online course, to evaluate the reasoning behind choosing distance learning and their perceptions about the quality of their education. A majority of students (88%) believed that distance learning was advantageous in allowing them to balance other commitments besides their education, including family issues, childcare and long hours at work.

Twenty percent indicated that they chose online learning because it allowed them to take classes that were not widely available in the traditional classroom setting. Over half of the students (57%) believed that they learned more using the distance learning approach

as compared to the traditional classroom setting and over two-thirds, (69%) generally preferred learning in the online classroom.

Ali and colleagues (2004) highlighted some of the student benefits of online learning in a study describing 20 graduate nursing students' experiences with online learning. Data were collected by either interview or web-based survey and then analyzed by content analysis to identify key points regarding students' perceptions. By examining students' responses, it became evident that there were opportunities available in the online environment that may not have been possible in a traditional classroom setting. For example, the use of asynchronous discussions and chats were well regarded by the students because they allowed time for reflection and preparation of responses. Students also perceived a sense of equality in this environment, suggesting that the nature of the online environment provided less opportunity for some personalities to dominate the discussions and for others to avoid participation. Because students viewed the online environment as public and permanent, they also reported giving their discussion posts more thought, as opposed to the effort they might put in to a discussion in the traditional classroom setting.

As noted earlier, while some studies have revealed student and faculty concerns regarding interactions in the online classroom (Muilenberg & Berge, 2005; Young, 2006) distance learning can actually increase student-peer interaction and overall participation through the use of discussion boards and other tools (Rochester & Pradel, 2008; Hay et al., 2004). These interactions can be more meaningful than in the traditional classroom

and collaboration with classmates in online classrooms can help to develop team-building skills (Kim et al., 2005).

When examining the challenges and advantages of distance education for students and faculty, it is useful to further analyze the variety of technologies and teaching techniques that are available for incorporation into distance education courses. As distance education evolves, the ways in which teaching and learning occur has become more varied.

Learning Management Systems, such as Blackboard, Desire2Learn, and Moodle, have become available where students can take exams, engage in discussion, access files and submit assignments. A *Wiki* is an interactive site that students can use to construct web pages.. *Blogs* are also available for individual or group work, which can also be used for course assignments. Other technology involving the use of audio and video can enhance the way lecture material is delivered (Center for Instructional Development and Distance Education, University of Pittsburgh, 2010).

As discussed earlier, computer-based simulations are a valuable teaching technique and component to the online learning environment. To further analyze the benefits of using this approach in distance education and in particular for the health-care field, it is worthwhile to examine the ways in which simulations are used to today.

CHAPTER 4

SIMULATIONS IN DISTANCE EDUCATION

4.1 Background and History in Healthcare Education

As the healthcare environment becomes more complex, demand is increasing for adaptable and resourceful students. In keeping with advances in new technologies, simulations are being used more often for training healthcare professionals. (Morrison et al., 2009; Boynton et al., 2007; Feingold, Calaluce & Kallen, 2004). As use of distance education becomes more widespread in healthcare education, simulations are one way of promoting an interactive environment for students, which can help facilitate meaningful learning and skill development (Morrison et al. 2009).

The problem-based learning approach used with simulations is focused on active learning, with an emphasis on clinical situations as the avenue for development. This approach is a challenging and motivating way for students to acquire new skills (Colliver, 2000). It can be valuable in enhancing health professionals' decision-making and problem-solving skills. Problem-based learning used specifically within the framework of simulations can help to facilitate the development of these skills.

There has been a heightened interest in methods of improving the training of health practitioners for several reasons. Medical errors are found to cause approximately 98,000 deaths per year in the United States (Institute of Medicine (IOM), 1999) and there is a

growing interest in effective ways to train health professionals. The benefits of using simulations to enhance skills and develop new knowledge in a range of disciplines are well documented (Rogers et al., 2000; Snyder, Fitzloff, Fiedler & Lambke, 2000; Weller, Wilson & Robinson, 2003).

Distance education and the use of simulations are proven techniques to create more competent students (Morrison, Scarcello, Thibeault & Walker, 2009). Simulations provide a safe learning environment that allows practitioners to enhance skills and test new clinical procedures before encountering patients and without putting them at risk (Morrison et al., 2009; Bond & Spillane, 2002; IOM, 1999).

Many simulations used in health-care training depict “patients” who can exhibit symptoms of a condition or disease and respond to treatment accordingly. Simulators were originally used in the medical field and were models of human patients used to analyze the effects of various diseases (Meller, 1997). There are several approaches to simulation-based education used in the medicine and other healthcare fields today. For example, computer-driven full-length mannequins are often used in training students to handle complex clinical situations. These mannequins involve high fidelity visual, touch cues, and audio tools that are integrated with computers and are able to replicate a clinical setting such as ultrasounds or various surgeries. Standardized patients (SP) are also often used as a way to simulate clinical scenarios. SP are defined as “a patient with-or an actor trained to portray-a particular condition, which can be used as a teaching “tool...” (Medical Dictionary, 2011).

While the use of SP provides some benefits as compared to the use of training with real patients, the use of virtual patients (VP) in computer-based simulations may have several advantages over SP (Stevens et al., 2006). Recent developments in simulation-based training involve screen-based computer simulators that allow for interaction to train and assess clinical knowledge and decision making, such as problem-based learning and physical diagnosis (Ziv, Wolpe, Small & Glick, 2003).

The use of VP has distinct advantages in computer-based simulations. Interacting with VP allows students to practice skills and gain knowledge in a secure and safe learning environment, while allowing for repetition and exposure to feedback. For example, VP can help address important issues in training medical students, such as communication and interpersonal skills; these areas are often overlooked in the medical curriculum. The use of VP also offers the possibility of creating a limitless range of clinical scenarios that could be difficult with the use of SP, such as with infants, children and variations in gender, ethnicity and cultural characteristics (Stevens et al., 2006; Hubal, Kizakevich, Guinn, Merino & West, 2000).

VP can be used at any time by the student and may be incorporated into a curriculum with flexibility. This is an advantage over the use of SP, which often require that a student and observing instructor be present at the same time and can only be done with one student at a time. Therefore, VP offer a more efficient use of time and could also limit costs associated with training SP. In addition, VP offer greater standardization than

SP, allowing for more consistent student training (Hubal, Kizakevich, Guinn, Merino & West, 2000). VP can also be more easily tailored than SP to meet individual learning styles and accommodate student progress. In a study by Stevens and colleagues (2006), students commented on the lack of constructive feedback available to guide the SP process, and stated that the use of virtual scenarios, which provide timely, non-judgmental feedback for the student, could be an effective educational tool.

As use of VP become more common, researchers have become increasingly interested in how students experience these interactions and the drawbacks to using this education method. Important questions remain regarding whether students respond on an emotional level to these patients, whether VP are an adequate substitute for human interactions or if perhaps they could be used as a supplementation to actual patient interactions. Some students have reported that during VP interactions they find it difficult to respond as if they were dealing with a real patient, which proves problematic when considering the goals of using this method. VP are also programmed to respond to a set number of questions, with a limited number of answers, which students have also found to be frustrating and unrealistic (Bearman, 2003; Triola et al., 2006). Despite these limitations, VP have noteworthy advantages, although it is likely that they would not be an adequate replacement for human interaction.

There is also the important issue of how the design of the VP affects the experience of the student and what skill sets will be addressed (Bearman et al., 2003). For example, in medical education there are two types of VP typically used; one that is based on problem-

solving and another focusing on a narrative. The problem-solving approach focuses on clinical reasoning and diagnosis, where a student would collect information and then diagnose the patient. These programs are typically easier to create and manage because templates are often preexisting, therefore reducing time and cost. The narrative VP can be more expensive and time consuming because they must be individually designed. These scenarios have a personal story, which emphasizes practicing interpersonal communication, rather than information gathering and diagnosis (Bearman et al., 2003).

An example of a real-time computer simulation program that has been used for academic purposes is Second Life, a 3D virtual world offering free voice and text chat. Second Life is available without cost and is the largest user-created virtual community available on the internet that is used for socializing, learning and research (Second Life, 2011; Jennings and Collins, 2007). Second Life is increasingly being used for academic purposes. For example, the University of Houston Health and Human Performance Department has a virtual campus on Second Life. There are several “meeting” areas set up for virtual classroom discussions, class information posted for students, as well as interactive health exhibits for visitors (University of Houston, 2011). The most recent statistics show there are more than 150 colleges in the U.S. and 13 other countries that have a presence in Second Life (Foster, 2008). Many Universities, including Stanford and Harvard teach classes in Second Life for credit (Cisco Systems, 2008).

Although limited in use by the dietetics field, simulations are common practice in other health-care fields such as medicine, nursing, pharmacy and dentistry. Examining the use

of simulations in a range of disciplines, including nursing, dentistry and public health, could provide valuable insight into understanding how simulations can benefit nutrition and dietetics education.

Several studies by Zary et al. (2006), (2009) examined the development of VP, which was flexible enough for use in a range of disciplines. The program served as a template, which could be modified for a specific discipline. These studies found that both faculty and students were able to learn a simulation program with ease. This information is useful when analyzing the feasibility of implementing a computer-based simulation into a dietetics curriculum.

The Web-based Simulation of Patients (Web-SP) project was developed to incorporate VP into medicine and healthcare education curriculum. One goal of the project was to create a VP program that could be managed primarily by instructors, without the assistance of a professional programmer. Another aim was to create software that was flexible enough to be incorporated into a range of healthcare disciplines (Zary, Johnson, Boberg & Fors, 2006). The VP were designed to reflect realistic patient scenarios. For example, a student would have access to the following information when working with a VP: patient introduction, patient interview, physical examination, labs and X-rays, diagnosis, therapy and feedback. The student would then be instructed to collect information from the first four sections, provide a diagnosis and develop a therapy or intervention.

The program allowed for repetitive practice of skills, posing no risk for the patient or student. This system also enabled students to engage in practice regardless of physical location or time of day, enhancing its flexibility. The program has the capability to create situations that students would not encounter often, such as patients with rare conditions or diseases (Zary et al, 2006).

Results indicated that it was possible to provide a common ground for creating and managing a VP program for the range of disciplines, and teachers were able to create patient cases without any type of technical support. The students also responded positively to the program on course evaluations. This type of program is not routinely used in the field of nutrition and dietetics and a study such as this is helpful to determine whether a VP program would be feasible within nutrition and dietetics. Indeed, the time of the study, Web-SP was currently in use or being implemented in six different health fields in ten universities worldwide (Zary et al., 2006). Therefore, it's feasible to suggest that the VP program could be adapted for dietetics students for the purpose of practicing counseling skills. The positive outcome of these studies shows that there is value in using these strategies to train healthcare professionals.

A similar study was conducted in 2009 by Zary and colleagues who looked specifically at the factors of most importance for self-assessment when using Web-SP in dentistry.

Twenty-four VP were created based on paper-based cases that were used in the curriculum of a dentistry course. The subjects included students enrolled in a comprehensive dentistry course, which focused on diagnostics and therapy planning. The first group had 68 students and the second group, which took the course the following

year, had 53 students. Participants had unlimited access to the VP from the start of the course until the final exam. The VP varied in that some provided self-assessment feedback, while some did not. This information was made clear to the students before accessing a case study.

The authors examined the importance of the built-in feedback component of Web-SP by analyzing whether the student encounters with VP with feedback were higher than the VP that contained no feedback. The authors speculated that students might not completely utilize the feedback, since obtaining this information for each case study was time consuming. Upon completion of the course, students were also given a questionnaire to evaluate their acceptance of the program.

Results of the study indicated that both groups found the system easy to use and the overall opinions were favorable, with median score of 5 on a scale of 1-6, in terms of favorable views and acceptance of the program. Students agreed that the program was engaging, fun and easy to use. Participants also indicated that the cases presented were realistic and instructive. Of the VP that students used, 71% had feedback. Only 29% of VP selected contained no feedback, which indicates that students viewed the feedback mechanism as helpful (Zary et al., 2009). This study highlights an important aspect of simulations; they are well received by students and that they did indeed perceive them as realistic.

Overall, these two studies indicate that it is possible to implement a user-friendly virtual patient program that is well received by students and faculty. A positive feature of this program is that the patients can be modified by faculty without extensive technical assistance. This allows for greater flexibility for faculty, who can tailor the programs to their individual disciplines and classes. The students also benefit from this type of exposure by having exposure to patient scenarios in a safe environment without risk to themselves or their patients. The benefits of the VP program are applicable to the education of nutrition and dietetics students as well. A dietetics student could perhaps benefit from exposure to VP cases prior or during a dietetic internship. The flexibility and feasibility of the program may also be appealing to dietetic internship directors and instructors who are interested in this educational tool.

Two recent studies in the field of nursing also show that VP can be successfully used to enhance education. VP are also of interest in this field since nursing students and practicing nurses may lack exposure to certain clinical situations or skills and simulations have been found to effectively address these shortcomings. For example, Sanders et al. (2007) found that students significantly improved their knowledge and comfort level after completing an educational program consisting of two virtual patients. The program allowed students to interact with one preterm infant VP and another with Downs Syndrome. Ninety-four students completed the program, and were given pre-knowledge and post-knowledge tests, and a usability scale assessment was administered upon completion. The results indicated that changes in perceived comfort and knowledge gains were significant in post tests as compared to baseline for both the preterm infant VP

($p < .0001$) and the Downs Syndrome VP ($p < .0001$). While this suggests that the program was effective, the study lacked a control group, which doesn't allow for comparison to methods of teaching other than computer-based simulations.

Another nursing study by Triola and colleagues (2006) examined the use of VP in comparison to SP to enhance the clinical skills of health-care providers. Fifty-five participants were randomly assigned to take a traditional workshop using either SP ($n=32$) or VP ($n=23$). The VP were developed based on an existing educational program that utilized SP. These SP allowed students to interact with patients and practice skills regarding the treatment of individuals suffering from the psychosocial consequences of traumatic events. At baseline, there were no significant differences between the two groups in terms of comfort level and preparedness in caring for these patients. Upon completion of the workshops, both groups scored similarly in terms of perceived effectiveness, performance and diagnostic ability. However, participants in the VP group had increased ability to correctly diagnose the sub-diagnostic distress phase of the assessment and this difference approached significance ($p=.054$). The VP group also reported increased confidence in their ability to care for and treat these disorders. With the VP, the students can progress from less intimidating environments where errors have fewer consequences, to more realistic situations where stakes are higher. This progression allows learners to use case studies with more ease and gain increased insight into how their clinical skills are improving as they move into more complex scenarios. The authors also commented on the fact that data collection with VP was more efficient than with the SP.

Several studies regarding the use of computer-based simulations in dentistry curriculum show that they not only enhance clinical skills, but also build communication skills.

Computer-based simulations have been used in dental educational curriculum since the 1980s, and have proven effective in enhancing the education of students (Boynton et al., 2007; Clancy et al., 1990; Abbey, 2003).

Similar to other health-care disciplines, dental students may only have access to a defined patient pool, which limits the development of certain clinical skills. They also need practice interacting with patients and practicing new skills without posing a risk to the patient. Several studies show that simulations can effectively address these issues. For example, Boynton et al. (2007) examined an internet-based instructional tool that offered dental students a virtual simulation of pediatric dentistry to develop their behavior management knowledge. The tool designed for the study was a “virtual” seven-year-old child who was going to the dentistry clinic for surgery. The students were able to interact with the virtual patient, make treatment decisions, and receive “reactions” from the patient and feedback from the system regarding the decisions made. The effectiveness of the program was evaluated using two classes of dental students. The control group of 109 only had access to the traditional behavior management courses, which consisted of two lectures. The other class with 98, was exposed to the two lectures and also had access to the simulation. Both groups completed an examination with an objective section and open-ended question portion as well, which assessed behavior management knowledge. The simulation group performed significantly better in both parts of the examination

(objective section: $p=.028$; open-ended section: $p=.012$). The treatment group also evaluated the simulation and indicated that it was a valuable addition to the curriculum.

Sanders et al. (2007) demonstrated that a VP could be used to prepare dental students to provide adequate care for children with developmental disabilities. Fifty-one dental students participated in the study, which involved a VP with Downs Syndrome. The purpose of the program was to increase students' knowledge concerning the health issues that often present in patients with Downs Syndrome and to increase their comfort level in working with patients with development disabilities. Students were given a pretest and post-test of knowledge, in addition to a usability scale that asked them to rate their reactions to the program. Results indicated that gains in knowledge were significant and that there was a significant decrease in perceived difficulty concerning working with patients with developmental disabilities at posttest compared to baseline. Students also rated the program as easy to use and a valuable addition to their learning. Although this study was limited by the lack of a control group and a no assessment concerning the quality of interactions between dentist and patient, it highlights the usefulness of this teaching strategy with at-risk populations, such as those with disabilities. Overall, computer-based simulations may help to improve knowledge and communication skills, particularly when students have limited access to a range of patients with differing needs (Sanders et al, 2007).

These dentistry studies show that computer-based simulations are useful for enhancing communication skills and cultivating patient sensitivity, which are also valuable skills for nutrition and dietetics students to acquire. This type of training may be particularly useful for undergraduate students in nutrition who are preparing for their dietetic internship, or for students already enrolled in an internship program. This population is likely to have the least exposure to a range of patients. It seems imperative that students cultivate sensitivity towards patients with a range of needs and work to eliminate bias. Exposing students to some type of cultural competency training has been proven to be effective and have positive results (Crosson et al. 2004, Webb & Sergison 2003).

Other types of simulation tools have also been effective in enhancing health-care education. For example, nursing educators have been seeking ways to encourage critical thinking and enhance skills throughout the training process, while posing no risk to patients in the process (Morrison et al., 2009). Simulated surgical lab sessions have been helpful in addressing these issues. A study by Morrison et al. (2009) gave a convenience sample of 33 students in the first year of a distance education practical nursing program access to simulated surgical lab sessions, which they had not previously encountered in their placements. All of the students felt that the simulations provided an opportunity to apply knowledge and practice skills in a safe manner and that it helped them to feel more confident in their ability to work in a real clinical environment. Pre- and post-test administered to assess knowledge acquisition indicated that student knowledge regarding the surgical scenarios increased significantly ($p < .05$). Limitations of the study included the use of a convenience sample, a small study sample and the lack of control group. This

information is still useful to nutrition and dietetics students, however, because both undergraduate and graduate curriculums involve classes that have a laboratory component. Perhaps laboratory simulations could be incorporated into distance education courses in this field.

Results from these nursing studies highlight some of the benefits of using computer-based simulations in training students. The rationale for increased use of simulations for training applies to the fields of nutrition and dietetics as well. Students are often not adequately prepared to work with patients and could benefit from additional exposure to different case scenarios. Like nursing, students in nutrition could also benefit from the acquisition of new knowledge, development of critical thinking skills, and increased confidence in working with patients. It appears that the use of computer-based simulations is an effective way to accomplish this in a safe learning environment.

The benefits of another type of simulation were seen in a study by Spinello and Fischbach (2004), who developed and pilot tested an online community simulation for an undergraduate health behavior course. The study was based on the idea that problem-based learning (PBL) is often overlooked in the field of public health and could potentially be a useful instructional method. The study involved a semester-long web-based simulation of a hypothetical U.S. community, which was encountering a growing number of tuberculosis cases. Twenty-eight students collaborated online to access information that had been provided to them by the instructor. Throughout the semester, the instructor could change the environment and continuously provide updated

information. Students had virtual inboxes, where they would locate newspaper clippings, phone messages and memos. A virtual conference room also provided a mode of communication where students could asynchronously communicate with each other.

The pilot study included four groups of six to eight students each. Two groups were randomly assigned to the simulation, the other two were assigned to the traditional course, where they developed a community health education project. Upon completing the simulation, the groups provided their interventions and results in written reports. Twenty-two students completed surveys, which included Likert scale questions, intended to evaluate student feedback on the simulation. In addition, focus groups were held with the students, which allowed those in the simulation group to discuss the problems they encountered during the course and make suggestions for improvement. All of the students in the simulation group rated the experience as a 1-3 on a ten-point scale, with 1= “strongly agree,” in terms of whether or not they felt the simulation was more motivating than the traditional project. All of the simulation students also strongly agreed, with a rating of 1 or 2, that the simulation was more interesting than writing a paper and prefer this method of learning. Students in the simulation group reported that the ability to see outcomes as a result of their interventions was a valuable component of the project ($p=0.13$). Students in the simulation group also felt the experience was as interesting ($p=0.37$) and motivating ($p=0.19$) as a traditional classroom setting, although these data were not statistically significant. The final course scores showed no significant differences between the two groups ($p=0.64$); however, students in the simulation group commented positively on the realistic portrayal of a community, the flexibility of being

able to work on the problem without face-to-face meetings and the opportunity to acquire new skills, such as the ability to apply health behavior theories to real-life scenarios.

This study by Spinello and Fischbach (2004) provides useful information when considering the value of simulations in nutrition and dietetics education. Students and professionals could benefit from several aspects of this type of simulation, including gaining practice in collaboration with others in an online environment and gaining problem-solving skills. In addition, it is worth noting that students in the public health class that participated in the simulation preferred it more than traditional assignments, such as writing a paper. This increased interest and engagement in learning would undoubtedly be of benefit to students in nutrition and dietetics as well.

These studies that examine the use of computer-based simulations in nursing, dentistry and public health are helpful in determining the usefulness of incorporating this educational approach into nutrition and dietetics curriculum. One shortcoming in most of these studies is that simulation-based training is not compared to other educational methods and the challenges of using these programs are not thoroughly discussed. An important factor to consider is cost, which could potentially be a barrier to using simulation training. It is also crucial that the programs are user-friendly, with limited technological issues (Zary et al., 2006). As noted earlier, VP, which are commonly used in simulation-based training, also have limitations. Students may view these interactions as unrealistic and frustrating (Bearman, 2003), which may also be an issue for other types of simulations as well.

Overall, the studies examined in the literature have revealed numerous benefits of using computer-based simulations in medicine, dentistry and nursing, particularly VP, which can be applied to educating nutrition and dietetics professionals. Chief among these benefits are an increase in confidence, the acquisition of new knowledge, exposure to new and challenging patient cases in a safe learning environment, the development of communication and critical thinking skills, and the cultivation of sensitivity towards patient needs.

In summary, distance education is growing in popularity with numerous benefits for both students and instructors. This method of education has been successful in addressing some of the challenge of training health professionals in a range of disciplines.

Advancements in the types of technologies available, such as computer-based simulations can contribute positively to this type of education. The field of nutrition is one example of a discipline that is benefiting from the increased use of distance education and computer-based simulations.

CHAPTER 5

DISTANCE EDUCATION FOR TRAINING NUTRITION PROFESSIONALS

5.1 Background

Numerous studies have reported on the effectiveness of online education in training nutrition professionals and providing increased opportunities for continuing education (Atack & Rankin, 2003; Upton, 2005; Buckley, 2003; Shanley et al., 2004; Young & Lewis, 2008). For instance, a study using a quasi-experimental design compared a cohort of nutrition and dietetics students taking an online health psychology/sociology course (n=31) and a cohort instructed through a traditional lecture setting (n=36). The traditional lecture group included all students recruited for the course over two successive years. Outcomes of interest were measured based on performance and engagement in class, written assignments, exams and evaluation forms given to students throughout the duration of the course. The results revealed no differences in performance between the online class and traditional class (Upton, 2005).

Another study by Laraia et al. (2008) evaluated outcomes in a pilot Professional Practice Program in Nutrition (PPPN), which used distance education to deliver a master's degree in public health nutrition. The program was intended for public health practitioners who wanted to develop new skills while remaining employed (Dodds et al., 2003). The program was assessed in terms of student satisfaction, retention and learning, in addition to adequacy of support services and was delivered using both online and traditional classes, as well as videoconferencing. This study examined ten students using in-depth

interviews and an analysis of course grades. Findings of this study revealed that public health nutritionists could be trained effectively through distance education. Graduates of the program discussed the benefits of this method of delivery, including increased flexibility without having to relocate and the ability to stay with current employment. Similar to studies by Farrell and colleagues (2007) and Hannay & Newvine (2006), students valued the flexibility of the program, particularly in the context of work and family commitments. In terms of learning outcomes, students discussed job achievements and increased confidence after completing the program. Although the sample size was limited, it is noteworthy that no differences in overall GPA were seen between groups and all participants performed similarly in their online and face-to-face classes (Laraia et al., 2008).

Online delivery of food safety courses for dietitians and nurses has also been effective in enhancing skills and knowledge. Wallner et al. (2007) conducted a study to determine the effectiveness of an eight-week online food safety class offered to nutrition and health professionals. Subjects included 140 RDs, DTs, nurses and Extension educators. Pre- and post-questionnaires and a course evaluation were administered to students who successfully completed the class to determine changes in knowledge. Results indicated that knowledge scores increased significantly for each of the eight modules ($p < 0.001$). In addition, participants provided a favorable review of the course and believed that the course objectives were met. For example, 99% of participants stated that they had an understanding of the pathogens that affect high-risk groups and 97% indicated they were prepared to recognize risky food safety behaviors and provide recommendations. In

addition, 95% felt that the course was a convenient way to earn continuing education credits.

Computer-based instruction is also effective and well-received for the purpose of training dietetic students. For example, The Student Training, Education and Practice for Dietetics (STEP-DIET) CD-ROM was developed in the United Kingdom to prepare dietetic students for the practical training component of their undergraduate degree. The program was designed to address the difficulty that many dietetic students face when transitioning from an academic environment to a clinical setting. A study by Herriot, Bishop & Truby (2004) examined the program in terms of student perceptions and its effectiveness as a teaching tool, through the use of questionnaires and focus groups involving 41 dietetic students. The majority of students (n=29) agreed or strongly agreed that the program prepared them for practical dietetic training and felt that they were taught the more practical aspects of dietetics in a way that would not have been possible in a traditional lecture setting. Similar to studies in other allied health professions, advantages from the students' perspectives included the flexibility this type of learning offered and the interactive nature of the program. While the overall response was positive, students were somewhat reluctant to accept this method of teaching over traditional lectures, as only a minority of the students (n=10), preferred using the program as a substitute for the traditional lectures. The remainder (n=30) stated that they would have preferred to use the program in conjunction with a traditional lecture format. The authors suggested that the hesitation may be due in part to the students' lack of experience with the technology and training that is needed to ensure maximum benefits in terms of gaining confidence and

additional skills regarding the dietetic internship and computer literacy (Herriot, Bishop & Truby, 2004).

A study by Laraia et al. (2008) also highlighted the fact that web-based learning is an effective method of training health professionals. This study compared web-based and in-person training for Child Care Health Consultants (CCHCs). The purpose of the training was to educate these professionals about childhood overweight in child care centers. The study examined whether web-based training was as cost-effective and time efficient as in-person training. A randomized controlled trial was conducted with 50 CCHCs, who were divided into an in-person group (n=16), a web-based group (n=17), and a control group (n=17). Effectiveness of the training was measured by a multiple choice test of nutrition knowledge related to childhood overweight. The test was administered pre-and post-training to assess change in knowledge. No significant changes were found in knowledge scores when comparing the in-person and web-based groups. However, both training groups did improve significantly ($p < .0001$) as compared to the control group. Based on this small study, the authors concluded that the, the web-based training was equally effective and may be a more cost and time efficient option as compared to face-to-face training.

In summary, this research shows that online education is certainly of value in nutrition education. It has proven to be equally effective as traditional education, provides additional opportunities for continuing education, helps nutrition professionals stay current on important topics, in addition to being a convenient and time efficient method

of education. It is clearly beneficial to continue increasing training opportunities for nutrition professionals and to improve existing courses and programs. Therefore, it is important to examine the courses and programs that are available today and the goals that they strive to achieve.

5.2 Availability of Courses/Programs

The number of dietetics courses offered online and the number of students taking these courses continues to increase due to technological advances, as well as heightened interest among faculty, students and university administrations. For example, a study by Benton-King, Webb & Holmes (2005) examined the availability of undergraduate distance education in dietetics and possibilities for obtaining a degree in dietetics solely using web-based learning. A survey was sent to 279 directors of undergraduate programs accredited by the Commission on Accreditation for Dietetics Education to determine the current state of dietetics education online and potential future use of web-base learning in this field. Results of this study revealed that 32% of undergraduate programs accredited/approved by the Commission on Accreditation for Dietetics Education offered some form of distance education. Public institutions were more likely to offer distance education (40%) as opposed to private (10%), and public institutions with more than 20,000 students were more likely to offer dietetics distance education (50%) as compared to private institutions. The most common dietetic courses offered online were basic nutrition (31%), medical nutrition therapy (9%) and food service management (7%). A majority (93%) of these classes were instruction-based with no lab requirement. Most of

these courses were offered entirely via the internet (48%), followed by television, telephone, e-mail and internet combined with other technology (27%). Videotapes and audiotapes were also used as methods of delivery (16%), in addition to correspondence and independent study (7%). The study also indicated that 28% of institutions were in the process of planning a dietetic distance education course and 82% of these were public institutions. Of the directors surveyed, 76% stated that they had been part of a workshop, presentation or discussion group related to distance education, indicating that there is in fact an interest in this type of learning.

Despite a growing number of distance education programs, institutions that offer a fully online undergraduate degree in dietetics are very limited. Kansas State University offers the largest online bachelors degree in dietetics in the U.S. (D Canter, Kansas State University, Head and Graduate Program Director, Department of Hospitality Management and Dietetics. Personal Communication, September 10, 2009). Possible reasons for the limited number of dietetic degree programs available online include lack of resources, technology, technical support and faculty time constraints (Benton-King, Webb & Holmes, (2005). While this study looked particularly at undergraduate programs, similar limitations may also exist for graduate degrees as well.

Some Universities are working together in order to address these limitations. A collaborative effort among 11 Universities has helped to create a 36-credit online graduate degree program in Dietetics, available through the Great Plains Interactive Distance Education Alliance (GP-IDEA, 2009). Applicants must be an RD or have met

the academic and supervised practice requirements of the ADA and be ready to take the national credentialing exam.

Benton-King and colleagues (2005) found that directors of nutrition undergraduate programs were concerned about using distance education in their departments. The main concern was that distance education did not uphold the same standards as courses offered on campus. The authors concluded that more research is needed to determine nutrition professionals' specific concerns and perceived challenges regarding distance learning. (Benton-King, Webb & Holmes, 2005).

Possibilities also exist for completing a Master's program completely through distance learning. In 2007, the University of Massachusetts at Amherst developed the first online Master of Public Health in Nutrition program. The program was designed for working healthcare professionals and the first cohort of students enrolled in 2008 (University of Massachusetts, 2011). This program contains the same course load as the traditional program, with a total of 44 credits and is accredited by the Council on Education for Public Health. To date, 64 students are enrolled in the program and approximately 20 students are enrolled in each nutrition course (E. Carbone, Graduate Program Director, University of Massachusetts Amherst, Department of Nutrition. Personal Communication, July 2011). This is one example of a successful program that was developed to offer working professionals the opportunity to obtain an advanced degree.

Achieving a Master's in nutrition is also possible via web-based courses. For example, the University of Bridgeport in Connecticut offers an accredited Master's program in human nutrition, with a 31-credit curriculum. While onsite students complete a research project or thesis, online students are required to pass a comprehensive examination upon completion of coursework in order to graduate (University of Bridgeport, 2009). Another example is Eastern Michigan University, which offers an online Master of Science (M.S.) in nutrition with a 30 credit thesis option and 36 credit non-thesis option (Eastern Michigan University, 2011). East Carolina University also has an online M.S. in nutrition and dietetics, with a 33 credit curriculum and a thesis or non-thesis option. While it is possible to complete the degree fully online, some of the program options require some face-to-face instruction (East Carolina University, 2011).

In addition to undergraduate and graduate coursework, there are also certificate programs available online and numerous opportunities for engaging in continuing education through distance learning. For example, Simmons College in Massachusetts offers a Certificate in Sports Nutrition, a 12 credit program delivered completely online (Simmons, 2009). Colorado State University, Washington State University and Ohio State University have collaborated and developed a fully online food safety course that provides six credits of continuing education credits for health professionals (Ohio State University, 2011).

It is clear that online education is becoming more prevalent in training nutrition and public health professionals. While distance education is expanding in this field and has

proven to be successful, the field would benefit from an increased number of programs similar to other allied healthcare fields. In addition, there is always room for improvement in terms of how these courses are developed and executed. Furthermore, general issues in training nutrition and public health professionals could potentially be effectively addressed with distance education and educational methods utilizing technology. Computer-based simulation is an example of one type of training that could be of great benefit to distance education courses and also in other settings such as supervised practice and classroom-based education.

5.3 Simulations in Nutrition Education

The use of simulations in nutrition education is currently of great interest to the Commission on Accreditation for Dietetics Education Nutrition (U. Chung, Executive Director, Commission on Accreditation for Dietetics Education. Personal Communication, June 29, 2009). While there are limited studies regarding the use of simulations in nutrition, this type of educational approach could be used to address some of the challenges related to training students, including the lack of confidence and necessary skills students may have after completing a dietetic internship (Short & Chittooran, 2004); the need for more training and practice in order to utilize counseling skills effectively (Short & Chittooran, 2004; Story et al., 2002, Horaceck et al., 2007); the need for cost-efficient methods to develop counseling and problem-solving skills (Turner et al., 2000); and the need for students to have more opportunities for training and for practicing learned skills (Short & Chittooran, 2004).

Suggestions to improve students' counseling abilities have centered on the gaps between academic training and actual experience in the field (Short & Chittooran, 2004).

Therefore, educational methods that address this gap, such as the use of simulations, may be of benefit to the field of dietetics. Simulations afford dietetic students and interns the opportunity to gain experience, develop confidence, and develop behavior change strategies and communication skills (Henry et al., 2009; Beshgetoor & Wade, 2007).

As noted earlier in the discussion of medical education, one of the unique features of simulations is the ability to use standardized patients (SP). For example, a study conducted by Henry et al. (2009) examined simulations involving nutrition-based standardized patient (SP) sessions for dietetic interns. Ten female dietetic interns with a mean age of 25 were given the opportunity to practice counseling skills with two SP sessions regarding diabetes and hypertension. The program was evaluated using qualitative methods based on information obtained from focus groups with the dietetic interns two months after completing the program. Results of the study revealed that all participants felt that the SP provided a positive learning experience, enabling them to gain confidence in counseling and gain additional awareness of the patient perspective. In addition, the SP process allowed the dietetic interns to explore these issues in a safe and effective manner. One notable limitation of the study is that it contained only ten subjects. Additional studies with a larger sample size would be useful in determining the effectiveness of using SP in dietetic internships.

While computer-based simulations have not historically been used in dietetics education (Gregoire & Nettles, 1994), a growing body of research suggests their increased use as an effective method of education in the field (Turner et al., 2000; Litchfield et al., 2000). A study by Turner et al. (2000) examined the impact of computer simulations on the education of 108 dietetic interns from eight different programs. Fifty-six interns used the Care Planning Simulation System (CPSS) and 52 used the Nutrition Care Planning Tutorial (NCPT), a non-simulation based computer program, during their orientation. Both groups were evaluated during one of their dietetic internship rotations. The CPSS was designed to focus on data collection, interpretation, and the formation of a nutrition care plan for a new hospitalized patient. Simulations of three patient cases were developed for the study and users had access to all patient medical records and information, which allowed them to work through the entire process of developing a care plan. The NCPT focused on information about data collection, interpretation and care plan development with multiple choice questions offered upon completion of a topic and no virtual patient interaction. The authors found that there were no distinct differences between the two groups, but regression analysis revealed that the rate of improvement in terms of skill enhancement was greatest for the simulation group, potentially indicating that the simulations allowed the students to grasp techniques and procedures at a quicker rate. While the findings of the study do not necessarily mean that simulations are more effective than other computer programs, the authors note the high level of receptiveness by the students. The authors call attention to the need for a larger-scale study to more fully examine the potential impact on learning outcomes. The results provide promising information about computer-based simulations, but it is clear that more research is

needed to determine how this teaching technique can best be used to enhance dietetics education. Overall, it appears that computer simulations can offer variation in practice experiences for students and interns in dietetics. This educational approach also has the potential to offer complex case scenarios to students and interns in remote areas, who may otherwise not have access to training and professional development.

Another study by Litchfield and colleagues (2000) examined an interactive simulation that was included as part of a distance education project intended to enhance the experience of eight students participating in the dietetic internship at Iowa State University who had little or no previous work experience in the field. The program was based upon the assumption that interactive communication technology can improve dietetics education by addressing lifelong learning skills, technological aptitude and overall competency in the field. The simulation component, in particular, enabled students to engage in realistic professional practice experiences. The program allowed them to practice using critical thinking skills by offering opportunities to conduct a nutrition assessment, plan an intervention, and receive feedback about the process. In addition to simulations, the distance education project included internet chat rooms and bulletin boards.

Success of this project was evaluated using results of quizzes taken throughout the internship, surveys regarding attitudes towards technology, and exit interviews. The groups' comfort with the internet improved significantly by the end of the internship ($p=.010$) and exit interviews reflected positive attitudes towards the use of online

instruction in the internship. The mean scores of quizzes improved during the course, but only significantly in the renal module ($p=.001$). Other modules focused on nutrition support and pediatrics. The authors speculated that the quizzes may not be appropriate for this type of evaluation because they evaluated knowledge rather than professional competence and that future research should include additional measures. In addition, a larger sample size and inclusion of a control group that participated in another type of non-simulation based exercise would help to further clarify the effects of simulations on student learning.

5.4 Summary: Gaps in the Literature

A review of the literature in distance education within nutrition and allied health-care fields revealed several gaps; namely, the lack of in-depth research examining dietetic educator's perceptions of and experience with computer-based simulations, insight into whether simulations are a feasible and effective education tool in the nutrition field, and how and to what extent other online teaching tools can be used to enhance entry level and continuing education opportunities. These gaps warrant attention, as increased use of these teaching strategies has great potential. The benefits of using computer-based simulations in training health professionals, is well documented in medicine, nursing and dentistry; however, research regarding this method of education in nutrition is lacking. The studies that do exist in nutrition and allied health-care fields often have important limitations, such as a lack of control group for the purpose of comparing simulation-based education to more traditional forms of education. An important first step in

addressing these issues is to assess the knowledge, attitudes and perceptions of nutrition and dietetic program directors regarding use of computer-based simulations. This assessment could help to determine whether it is feasible, practical and useful to begin incorporating additional teaching strategies such as simulations into nutrition education curriculums. Determining what populations and what settings would most benefit from computer-based simulations would also be helpful and this could largely be assessed from the perspectives of these dietetic program directors. There is also value in evaluating the directors' overall attitudes and perspectives regarding distance education. The field of nutrition could benefit from the expansion of distance education opportunities, which would help to address the issues of access, time constraints and other barriers to continuing education, as well as the overall lack of highly training professionals with advanced degrees and specialized skills. Since directors of dietetic programs are largely responsible for developing curriculum, assessing their attitudes could be helpful in moving forward in this respect. Results from this comprehensive literature review reveal a paucity of data addressing these issues.

CHAPTER 6

PURPOSE OF THE CURRENT STUDY

Distance education is an effective way to train nutrition professionals. This method successfully addresses the barriers that professionals face when seeking educational opportunities. More extensive use of distance education could prove valuable to nutrition and dietetics, yet additional research is needed in order to move forward. Computer-based simulations are an effective educational approach and could be used more extensively in distance education. While simulations are more frequently used in health-care disciplines such as medicine, nursing and dentistry, they are not yet widely used in nutrition education. In order to determine whether computer-based simulations could be successfully incorporated into more nutrition education programs, it is important to assess how directors of nutrition programs and educators feel about distance education and computer-based simulations and whether they are open to the idea of using this approach.

The main objectives of the current study are to:

- 1) determine whether dietetic program educators are open to the idea of using computer-based simulations as an educational strategy and how these responses vary in relation to difference factors.
- 2) Determine dietetic program educators' perceptions of the benefits to using computer-based simulations.
- 3) Determine dietetic program educators' perceptions of the barriers to using computer-based simulations.

The research results related to these objectives will lead to greater knowledge and understanding about the use of computer-based simulations and distance education among this population, which can help to guide the use of these teaching strategies in the field. This investigation has the potential to help determine how computer-based simulations would be received by this population. This information would also be helpful in the development and implementation of computer-based simulations into nutrition and dietetics curriculum. To meet these objectives, the current study was guided by the following three research questions:

6.1 Research Questions

1. Are dietetic program educators' open to the idea of using computer-based simulations?

1a.

- Current use of and perspectives on technology in education
- Current use of role playing, standardized patients and simulators
- Belief that changes are needed in dietetics education
- Availability of technological, educational and financial resources
- Characteristics of the survey sample

2. What do dietetic program directors perceive as the benefits of using computer-based simulations?

3. What do dietetic program directors perceive as the barriers to using computer-based simulations?

CHAPTER 7

MATERIALS AND METHODS

7.1 Subjects and Data Collection

The research project began with the development of 28-item survey that assessed dietetic program directors and educators' attitudes towards and experience with computer-based simulations and distance education. This survey can be seen in appendix B. The planned methods were to send out a four-part online questionnaire administered through Survey Monkey to members of the Dietetic Educators of Practitioners (DEP) listserv from the American Dietetic Association. The survey contained the following components:

- 1) demographic questions
- 2) questions about computer and internet experience
- 3) questions related to attitudes/perceptions about opportunities with regards to distance education and computer-based simulations
- 4) inquiry into attitudes/perceptions about barriers to using distance education and computer-based simulations

The invitation to participate would have included a four minute video clip entitled "Second Life and Public Health," created by the University of Michigan's Health Sciences Libraries. The video highlights some of the possibilities of using computer-based simulations for educational purposes. This would have provided those without knowledge about simulations an opportunity to have a more concrete idea of the education method prior to answering the questions. This clip can be found on YouTube at

<http://www.youtube.com/watch?v=7wDI5suE2Uo>. The survey would have been pilot tested and should have ideally taken 15 minutes to complete. Permission to contact these individuals was in the process of being obtained and the human subjects approval was obtained from the University of Massachusetts, Amherst. An informed consent form would also have been included in the invitation.

The research project changed after learning that the ADA had a similar study underway. After this discovery, it was decided that a secondary analysis of the survey data would be conducted. In May 2010, The Education Committee of the ADA surveyed four groups with specific interests in dietetics education to assess perceptions and attitudes toward computer-based simulations and technology: 1) dietetic education program directors, 2) students in dietetic education programs, 3) allied health organizations, and 4) allied health educators. Each group received a different survey with questions tailored accordingly. The focus of this particular study was on the results of the survey of Dietetic Education Program Directors.

Survey questions were initially drafted through a series of brainstorming sessions among several members of the ADA Education Committee. The questions were not formally pilot tested; however, the full Committee was asked to comment on the draft questions, and changes were made in response to feedback received. The final 15-item survey (see appendix E) contained two qualitative questions and 13 quantitative questions (seven of which had an “other” response or space to allow for additional comments). Two questions in the survey asked respondents what areas of dietetics education they were

currently using technology in and another open-ended question asked them to describe simulations they were currently using. One question asked what areas of education they thought simulations should be used in and another asked how many hours of supervised practice could be replaced with computer technology. There were also two Likert-type style questions with multiple components, which assessed attitudes towards dietetics education today, in addition to perspectives and experience with technology. Seven questions assessed the characteristics of the survey sample.

The surveys were sent via e-mail to 535 program directors representing all of the program types including Dietetic Internship Programs (DI), Coordinated Programs in Dietetics (CP), Didactic Programs in Dietetics (DPD), and the Dietetic Technician Programs (DT). The survey was sent from the CADE (Education Team) mailbox to each program director's email address on file. Data were collected via Survey Monkey, a free online survey software and questionnaire tool. Participation was voluntary; no incentives were provided. The Committee sent out the survey once and did not send a follow up notification to non-respondents.

7.2 Statistical Analysis

All statistical analyses were carried out using SAS 9.2 for Windows (SAS Institute Inc., Cary, NC, 2009). Statistical significance was assessed using an alpha level of 0.05 unless otherwise noted. Descriptive statistics (e.g. frequencies and percentages, or means and standard deviations) were calculated for all survey items. The main outcome of interest

was respondents' opinion about replacing one or more supervised-practice experiences with technologies that do not require person-to-person contact. Because this outcome of interest was asked as a single open-ended question (Survey Monkey Question #7), the focus of the analysis had to be based on this question in order to derive any significant results. While other questions in the survey provided some additional insight, all bi-variate analyses were conducted based on the responses to question #7, which asked: "What is your opinion of replacing one or more supervised-practice experienced with technologies that don't require person-to-person contact (e.g. computer-based simulations)?"

In order to assess relationships between the main outcome and other survey items, responses were coded and categorized. Three raters (the lead researcher, thesis advisor, and an individual unrelated to the research project), blinded to each other's responses, reviewed each of the open-ended responses and determined whether the survey respondent was open to the idea of using technologies to replace or supplement supervised practice in dietetics education. The raters coded each response into one of five categories: 1) disagree (meaning that the raters felt the respondent did not think that simulations could be useful); 2) agree; 3) not sure (the respondent was unsure about his/her opinion or did not express an opinion that raters could code); 4) agree, if used to supplement and/or enhance education but not replace; and 5) agree, but with stipulations. For example, if a respondent seemed to agree that simulations could be useful, but only under certain conditions (such as if the quality was high and/or if it was well designed and carefully tested), then the response would be coded as "5"). Other responses that

were initially coded as a “5” were those that indicated a respondent could see advantages and disadvantages to the use of computer-based simulations. For instance, some respondents felt that face-to-face interaction could not be replaced by a simulation, but thought they could potentially be useful for building clinical knowledge and developing computer skills. Others felt that there were advantages to incorporating these tools into supervised practice or traditional education, but the number of hours needed to be limited. Still, others indicated that simulations were more appropriate for some settings, such as dietetics education, but not for supervised practice.

Due to the small number of findings in some of the response categories, a collapsed three-level variable was created to describe whether: 1) the respondent gave a favorable response (i.e., they were open to the use of some kind of technology to replace or supplement supervised practice in dietetics education); 2) the respondent gave an unfavorable response (i.e., they did not want technologies like computer-based simulations used in dietetic education under any circumstances); or 3) the respondent did not provide enough information to be placed in either category.

To assess agreement between the raters, an intraclass correlation coefficient (ICC) was calculated using PROC MIXED in SAS. The ICC ranges between 0 and 1 and provides an idea of how much agreement there is in the scores given by the raters. The ICC can result in a negative value; however, in most cases the value is almost always greater than zero. An ICC close to 1 indicates that there is little variation between the scores given to each item by the raters. Landis and Koch (1977) provided the following interpretation of

observer agreement for categorical data: values < 0 = no agreement, $0 - 0.20$ = slight agreement; $0.21 - 0.40$ = fair agreement, $0.41 - 0.60$ = moderate agreement, $0.61 - 0.80$ = substantial agreement, and $0.81 - 1.0$ = almost perfect agreement.

The median score was used to summarize the responses of the three raters. Differences between the first and main outcome variable (open to use of technologies to replace or supplement supervised practice in dietetic education) with regards to categorical variables were examined using Chi-square tests. The Cochran Armitage test for trend was used to examine associations between ordinal variables. This test is used in categorical data analysis, when the aim is to test for association between variables and determine underlying trends. Due to the small cell sizes for many of the comparisons, exact p-values are reported. The other two outcome variables (perceived benefits and barriers of using computer-based simulations) did not require statistical analysis, but were assessed with descriptive statistics and qualitative data. These variables were examined through the use of open questions and assessed using qualitative methods. A content analysis was conducted and recurrent themes were identified.

CHAPTER 8

RESULTS

8.1 Characteristics of the Study Sample

A total of 165 individuals responded to the ADA survey. Characteristics of the study sample are presented in Table 2. Respondents were directors of four different types of programs; CP, DPD, DI and DT, with more than half (55.2%) holding the title of dietetic internship program director. The other respondents were directors of didactic programs in dietetics (27.6%), directors of coordinated programs (9.2%), and directors of dietetic technician programs (8%). In terms of experience in their current position, 35% held their title 1-5 years, 25% for 5-10 years, 19% for 10-15 years, and 18% for 16 years or more. Concerning their total years in the nutrition profession 76% have been working in the field for 16 or more years, 12% for 10-15 years, 8 % for 5-10 years and 3% for 1-5 years. Respondents also varied in terms of their route to becoming an RD. Forty-two percent (42%) completed a didactic program and internship, 21% completed a coordinated program, 18% completed graduate level training and 10% completed an AP4 program. Nine percent (9%) responded “other” for this question with no further explanation.

Respondents were also asked questions about their location and type of program. Seventy-two percent (72%) of programs were in urban locations, 26% in rural locations and 5 % were distance education programs. Twenty-seven percent (27%) reported working in a private institution, 58% in a public institution, and 14% in a state-assisted institution. In terms of the facility in which their program was located, 16% were

hospital-based, 6% of programs were within a government entity, 1% were corporate-based, and 4% were identified as “other.”

8.2 Rating Responses to Question #7: Open to the Use of Technology to Replace or Supplement Supervised Practice in dietetic education

An intraclass correlation coefficient (ICC) was calculated between the three raters for the dichotomous outcome variable: “open to the use of technology to replace or supplement supervised practice in dietetic education” (*openness*, for short). The ICC and corresponding 95% confidence interval were 0.822 (0.720, 0.948). This large ICC value indicates almost perfect agreement among the three raters.

8.3 Openness vs. Use of Technology in Education Practice

Table 3 provides a comparison of questions relating to the use of technology in education practice with the outcome variable “openness.” Significant associations were found between openness and preference for communicating with students ($p=0.002$), openness and respondent’s preference for communicating with their colleagues ($p=0.0076$), openness and whether or not the respondent used online simulations in their teachings ($p=0.0397$), openness and whether or not the institution was currently using online case studies in their teaching ($p=0.0077$). No other significant associations were found related to the use of technology in nutrition education practice. Ninety-one percent of respondents stated that they prefer to communicate with students using e-mail and 83% said that they prefer to communicate with colleagues using e-mail. In terms of using

technology in education, 24% reported using online simulations and 32% stated they were using online case studies in their teaching.

8.4 Openness vs. Current Use of Role Playing, Standardized Patients and Patient Simulators

Table 4 provides a comparison of questions relating to use current use of role-playing, standardized patients and patient simulators with the outcome variable openness. There was a significant association ($p=0.0387$) between openness and use of standardized patients for supervised practice. No other significant associations were found related to the use of these teaching strategies. Twenty-four percent of respondents reported using standardized patients for supervised practice, however; only 2% stated that they used patient simulators such as SimMan and SimBaby. The most frequently used teaching tool in this category was role playing (79%).

8.5 Openness vs. Belief that Changes are Needed in Dietetics Education

Table 5 provides a comparison of questions relating to feelings about dietetics education with the outcome variable “openness.” A significant positive association was found between openness and feelings about and need for alternatives to current supervised practices in dietetics education ($p<0.0001$) and openness and the respondent’s feelings about the need for different options, such as simulated education, within supervised dietetics education practices ($p<0.0001$). Eighty-two percent of respondents agreed/strongly agreed that dietetics education needs some different options within supervised practice hours, such as simulated education.

8.6 Openness vs. Availability of Technological, Educational and Financial Resources

Table 6 provides a comparison of questions related to feelings about availability of resources with the outcome variable “openness.” A significant positive association was found between openness and the respondent’s feelings about their administration’s ability to provide financial support to purchase technology for instruction ($p < 0.0001$), openness and whether the respondent felt that their institution has support staff to assure that their technology runs properly ($p = 0.0264$), openness and whether or not the respondent had a support staff to help utilize technology in educationally sound methods ($p = 0.0029$). An association was also found between openness and the availability of medical-simulation laboratories for use by dietetic students ($p = 0.0296$). Forty-five percent of respondents agreed/strongly agreed that their institution provides financial support to purchase technology for instruction. Seventy-six percent of respondents agreed/strongly agreed that they have IT support staff available to ensure that technology runs properly. Thirty-one percent stated that they have medical-simulation laboratories available at their institution that are potentially available for use by dietetics students and 8% reported that medical-simulations exist at their institution and are actually used by their students.

8.7 Openness vs. Characteristics of the Study Sample

Table 7 provides a comparison of questions relating respondent or institutional characteristics with the outcome variable “openness.” A significant positive association

was found between openness and technological skills needed to implement new technology within a course or supervised practice ($p=0.0011$). No other significant associations with demographic characteristics were found. Sixty percent of respondents agreed/strongly agreed that they have the technological skills needed to implement new technology within their course or supervised practice.

8.8 Perceived Benefits and Barriers of Using Computer-Based Simulations

Perceived benefits and barriers of using computer-based simulations can be assessed from responses to question number 7, which asked, “What is your opinion of replacing one or more supervised-practice experiences with technologies that don’t require person-to-person contact (e.g. computer-based simulations)? The majority of respondents were open to computer-based simulations ($n=117$) and a small number disagreed ($n=24$) (when responses were coded by three raters, as discussed earlier). While many responders simply stated whether they agreed or disagreed, some stated specific perceived benefits and barriers of this teaching method. The prevailing stated perceived benefit was in regard to opportunities in the dietetic internship setting. Respondents commented on the benefit of using this strategy for supervised practice. Several other comments did not pertain to a specific setting, but indicated that they perceived some benefit to the use of CBS in nutrition education. The perceived barriers to CBA had a range of responses, including opposition to technology for training students in a supervised setting. The majority of these comments were with regards to the lack of interpersonal skills that some students have and the need for more person-to-person interaction. Other comments

touched on concerns about resources to support this teaching strategy. The responses to this question can be seen in Table 8.

CHAPTER 9

DISCUSSION

The results of this analysis provide some insight into the current and future role of technology and computer-based simulation in dietetics education. Understanding the perspectives and current practices of education program directors is a crucial component of furthering this process. There are several issues that the ADA was interested in learning about, which are addressed in this analysis. First, a main goal of conducting this research is to encourage increased options for dietetic educators, such as implementing simulations, case studies and other teaching tools to assist with education as the demand for preceptors increases. The goal is not to replace traditional education with technology, but rather supplement some of the hours required for supervised practice. (However, this topic was not accurately assessed in the survey with question number seven, when respondents were asked about replacement and supplementation in the same question).

One overarching conclusion that can be drawn from the significant results of this analysis is that educators who are currently using and comfortable with technology in various forms, are more open to the idea of supplementing traditional education with computer-based simulations. This includes those who do not prefer communicating with students and colleagues face-to-face, but rather utilize alternate means of communication such as e-mail or text messaging.

The significant association between openness and preference for communicating with students indicates that survey respondents who were open to CBS were more likely to use

technology to communicate with their students. A similar association found between openness and respondent's preference for communicating with their colleagues indicates that respondents open to the use of technologies to replace or supplement supervised dietetic education practices were more likely to prefer technology to communicate with their colleagues as compared to respondents who indicated that they were not open to the use of technology.

On a similar note, the significant association between openness and whether or not the respondent used online simulations in their teachings indicates that respondents open to the use of technology were more likely to be currently using online simulations in their teaching than respondents not open to technology. A similar association between openness and whether or not the institution was currently using online case studies in their teaching indicates that survey respondents who indicated they were open to technology were more likely to be at an institution currently using online simulations in its teachings than those respondents who were not open to the use of technology.

Furthermore, the positive correlation between being open to computer-based simulations and report of having the technological skills needed to implement new technology within courses or supervised practices emphasizes the connection between experience with technology and being open to education methods utilizing technology. This association indicates that respondents open to the use of computer-based simulations were more likely to strongly agree or agree that they possess the necessary technological skills than those respondents not open to technology. Thirty-eight percent of respondents said

they were neutral, disagreed or strongly disagreed that they had these technological skills. This lack of ability or confidence related to technological skills is a barrier to using computer-based simulations or other technology in dietetics education. In order for these teaching methods to be successfully used into dietetics education, educators must be trained and also feel confident that they can use them successfully. When considering the future of computer-based simulations in dietetics education, the issue of training educators is certainly an issue that warrants further attention.

There are several ways that the ADA could address this issue as the goal of supplementing education with technological strategies is pursued. First, the level and expectancies of technology required for teaching in nutrition and dietetics should be raised. Statistics clearly show that technology is becoming increasingly more pervasive in society and is taking a more prominent role in many settings, including education. The 2010 Nielsen Media Industry Fact Sheet reveals current trends in technology use within the U.S. In terms of the internet, there are 195 million active users and 57.7% of U.S. adults have two or more computers. In addition, 12.9% of U.S. adults had purchased a laptop computer in the past 12 months. Technology use via mobile phones has also increased. Eighteen percent of mobile devices are Smartphones, up 13% from 2008 (Nielsen, 2010). The percent of posted websites increased approximately 6,500-fold between 1993 and 1996 and the percent of the U.S. population using the Internet increased approximately 6-fold between 1995 and 1999 (Bucar et al., 1999). This trend exists within the education realm as well. The 2008 NCES survey found that of 4,200 two-year and four-year institutions, 61% offered online courses and 35% offered hybrid

courses (NCES, 2008). Furthermore, online enrollments have been increasing at a rate greater than overall higher education enrollments. In 2010, over 5.6 million students were taking at least one online course. Academic leaders are expecting that these numbers will continue to increase (Allen & Seaman, 2010). In terms of computer-based simulations in education, numerous studies have shown that these programs can be successfully incorporated into the classroom setting and supervised practice within many health-care disciplines, including dietetics (Boynton et al., 2007; Clancy et al., 1990; Sanders 2007, Zary et al., 2009; Turner et al., 2000; Henry et al., 2009).

The trend towards greater use of technology within education is not only beneficial, but inevitable. How dietetic educators and program directors can meet technological expectations is an issue worth exploring. One method of doing this is by working with other health disciplines where online simulations have been used more widely. Marilyn Laskowski-Sachnoff, head of the ADA simulations workgroup states that, “We would hope to collaborate with allied health organizations/colleges/universities currently using simulations to train future practitioners” (e-mail correspondence, 2011). The ADA would also like to be able to offer resources to assist program directors with this process. They would like to provide resources for educators, such as a website with computer-based simulations. According to Ellen Shanley, Dietetics Director of Allied Health Sciences at the University of Connecticut, there is an effort to obtain funding from the ADA Board of Directors to advance the use of these technologies in dietetics education (e-mail correspondence, 2011). This funding could partially be directed toward training directors and educators to become more technologically proficient.

Furthermore, those directors or educators in dietetics education who are more experienced and comfortable with technology could serve as ambassadors during this process. Not only should dietetics professionals collaborate with allied health professionals, but there should be enhanced communication within the field of dietetics. Perhaps a conference could be held where dietetics educators have the opportunity to share ideas, collaborate and receive training. Courses in the classroom setting or online could also be made available to those who require additional training. Offering continuing education courses with a focus on computer-based simulations and distance education may be beneficial as well.

Another significant result from this research study supports the idea of supplementing dietetics education with computer-based training. The results demonstrate that there is a correlation between openness to the idea of computer-based simulations and the belief that dietetics education needs alternatives to traditional supervised practice and that dietetics education needs some different options within supervised practice hours, such as simulated education. Seventy-percent respondents agreed or strongly agreed that dietetics education needs alternatives to traditional supervised practice. Eighty-two percent of respondents agreed or strongly agreed that dietetics education needs some different options within supervised practice hours to complement supervised practice hours, such as simulation education. There was also an association between openness and use of standardized patients for supervised practice indicating that individuals who were open to the use of technologies to replace or supplement supervised dietetic education practices

were more likely to be currently using standardized patients for supervised practice than respondents who were not open to technology. These data also support the idea that dietetic educators are looking beyond traditional educational methods and may be more likely to embrace new technological strategies.

Through conducting the survey, the ADA was attempting to address the need for alternatives in nutrition and dietetics education. This population is clearly ready for some type of change in dietetics education. The introduction and advancement of computer-based teaching tools within programs comes at an opportune time. Even those who are not technologically savvy or may have been resistant to this type education in the past, may now be more open to exploring these methods. The association between openness to technology and the respondent's feelings about their administration's ability to provide financial support to purchase technology for instruction implies that those respondents who were open to the use of technology were more likely to strongly agree or agree that their administration provided financial support for purchasing technology for instruction versus those who were not open to technology. The association between openness and whether the respondent felt that their institution had IT support staff to ensure that technology runs properly, indicates that respondents open to the use of technologies were more likely to strongly agree or agree that they have an IT support system that can ensure technology runs properly as compared to those respondents not open to technology. The association found between openness and the availability of medical-simulation laboratories for use by dietetic students indicates that respondents open to the use of

computer-based simulations were more likely to be at institutions that offered students access to medical-simulations than those respondents not open to technology.

These associations are logical, as those who do not have the support of their administration will be burdened in terms of cost and time spent. It is important that this component is addressed prior to introducing computer-based teaching tools into a dietetics program. In addition, those with potential access to medical-simulation laboratories for use by dietetic students should pursue these opportunities. These laboratories would clearly be great assets for any dietetics program attempting to supplement their programs. This resource could supplement traditional classroom-based education or supplement hours required for supervised practice, by giving students hands-on experience in different areas, depending on what the laboratories provide. The results of the survey show that some institutions have these laboratories available, but are not currently in use by dietetics program. It would be interesting to know how many could potentially have access if they attempted to collaborate with other departments that house these laboratories. It is unclear from the survey results how many institutions are currently using medical simulation laboratories in their programs. However, 31% reported that these labs are potentially available for use by dietetics students. Of the other 65% who reported that these labs are not available, it would be interesting to know how many have labs available in their institution and have attempted to utilize the facilities. Perhaps this number would increase if there were an effort to collaborate with medical schools and other allied health science departments.

In addition to understanding these connections, it is also important to examine the specific comments that respondents made on question number 7, to gain insight into their perceptions regarding benefits and barriers to this educational method. Comments on the barriers and benefits as perceived by respondents can be seen in Table 8. The comments that elucidated specific benefits were mostly in the area of supervised practice. Educators are experiencing obstacles in the dietetic internship setting, including a shortage of preceptors and facilities, in addition to students who they feel are not well prepared coming out of an academic setting. They seem to view computer-based simulations as a method of alleviating the burden of preceptor and facility shortages. In addition, technology is seen as a way to help prepare students to real-life situations and also offer experiences and information to students that they may otherwise not receive. The use of computer-based simulations was not necessarily emphasized in the responses and this is an area that should be further explored. Due to some of the limitations of the survey, which are discussed below, educators may not have the awareness about the use of CBS in distance education.

There were two common themes that emerged from the specific comments related to perceived barriers. One is that some educators are concerned about utilizing technology to train students, because they are concerned that technology, in various forms, has already crippled students' communication skills. There is also a concern that the institutions using CBS will not have financial resources and support staff to successfully use this technology.

9.1 Limitations

This survey was a beginning to increase understanding of dietetics educators' and directors' perspectives regarding use of technology, including computer-based simulations for nutrition education. These data provided some insight into how this group of professionals feels about the current state of educational practices and their desire for and openness toward change in dietetics education. Understanding this population's perspectives on and experience with technology and simulations could be instrumental in utilizing this teaching strategy more widely in the dietetic education and potentially improving distance education, in addition to supervised practice and classroom-based education.

There were several limitations to this study. The most fundamental limitation is that the main variable of interest (how educators view computer-based simulations), was addressed as a single open-ended question (Question #7). Another major limitation is the fact that this question asks the respondents opinion about "replacing or supplementing" supervised practice with technologies. Replacing and supplementing are clearly two different issues and should have been assessed separately. It's evident from the responses that those who were open to computer-based technologies were not interested in replacing supervised practice, but rather were open to the idea of supplementing supervised practice with technology. The ADA is also not necessarily interested in replacing one particular aspect of traditional education with CBS, but would like to see education supplemented with other teaching strategies such as CBS. The phrasing of the

question seemed to evoke a strong response in some of the respondents, who were naturally opposed to the idea of replacing all traditional education methods with technology. This prevented those respondents who may have been open to supplementation from offering their perspectives on computer-based simulations.

A more accurate representation of the respondents' attitudes and perceptions towards computer-based simulations could have been obtained with multiple quantitative questions, in addition to open-ended questions to examine responses in more depth. This would have provided a better understanding of the respondents' perspectives and allowed for a more accurate analysis. More data would also have made it possible for a more in-depth analysis, with bi- and multivariate analysis using several questions.

Another limitation of the study is revealed in the response to question number four, which asks respondents to describe the type of simulations they are currently using in their program. It is clear from some of the responses that there were misunderstandings about what type of technology classifies as a computer-based simulation. Some responses addressed technology they were using in their programs, but not necessarily simulations. For example, responses included Blackboard, online exams and quizzes, blogs, Facebook and computer-based practice tests for the RD exam, all of which do not classify as a computer-based simulation. This misinterpretation of the question presents a dilemma when analyzing the questions that followed in the survey. If the respondent was not clear about what types of technology classified as simulations, then their perceptions and experience with them may not have been accurately assessed.

Finally, another general limitation of the survey is the types and quantity of questions that were asked. While there were numerous questions that assessed attitudes towards technology, there were no questions that assessed distance education specifically. This seems like an important topic to evaluate when examining the use of computer-based simulations. Information regarding this populations' perspectives on distance education would have been valuable, as research on this area is lacking. Also, computer-based simulations are beneficial in the context of distance education and it would have been useful to evaluate these topics in conjunction. In addition, almost half of the questions asked were with regards to the characteristics of the respondents. While this information is important, it seems that additional questions focusing more on the topic of interest would have been of value.

9.2 Future Research

There is certainly opportunity for additional research in this area. Computer-based simulations are of interest to the ADA and according to the survey results, the majority of educators are also interested in how they can be used to supplement nutrition education. This research was the first known study that examined the perspectives of dietetic program directors regarding their perspectives on computer-based simulations and other types of technology. Furthermore, it appears to be the first study to also survey their perspectives on where dietetics education stands today.

However, due to the major limitations of this study, it was not entirely successful in achieving its intended purpose. Therefore, one suggestion for future research would be a follow-up on this study. Perhaps a survey with more specific and well-crafted questions could be sent to a random selection of the initial survey sample. The follow-up survey should include additional information on computer-based simulations and perhaps a link to a video that provides examples of how computer-based simulations can be used in healthcare education. This approach would allow for a more accurate assessment, as some of the misunderstandings about what this technology encompasses would be addressed.

The proposed survey ideally would include multiple quantitative questions, in addition to open-ended questions, which would address their perspectives on computer-based technology and distance education, to examine this issue in more depth. In addition, the term “replacement” should be used carefully in the survey, as this was clearly an issue of contention. The survey could potentially focus on supplementation; educators are hesitant in replacing a component of online education, traditional education, or supervised practice with technology. However, there are situations in which replacement would be appropriate and this could be presented in the survey. For example, DI directors may find that they have difficulty securing a site or preceptor in a particular area. Rather than not having this experience at all for their interns, a rotation could be completely covered by CBS to provide the interns with some exposure. Therefore this experience would be “replaced” by CBS. Overall, ADA and many educators are interested in how technology

can enhance education and also alleviate some of the obstacles faced by supervised practice settings.

Another suggestion for future research would be to focus specifically on nutrition educators and distance education. The initial goal of this research was to not only survey educators on their perspectives on computer-based simulations, but to also gain insight into their views on and experience with distance education. Distance education is also being more commonly used in nutrition education and more research in this area would be helpful. Research mentioned earlier highlights some of the ways in which simulations could be beneficial to distance education courses. Research that examines these two topics in conjunction would be useful in moving forward with both educational strategies. Furthermore, additional research that evaluates programs currently using online teaching strategies would also be beneficial.

Finally, based on the results of this survey, educators clearly have concerns about supervised practice today. The majority of perceived benefits of computer-based simulations were in relation to the dietetic internship. While the initial study did not set out to address this issue specifically, it appears that there is certainly room for additional research in this area. A survey or focus group that examines computer-based simulations or other technology in the context of supervised practice would be of value. Perhaps these teaching strategies could actually alleviate some of the burdens faced by internship directors, such as preceptor and facility shortages. There is currently a shortage of

available internship spots for the number of students applying and acceptance into a program has become incredibly competitive (ADA, 2011).

In addition to more surveys, research on the programs currently using simulations in their classrooms or internships would also be of value to evaluate their effectiveness in terms of learning outcomes, student and faculty satisfaction and efficiency in terms of research. This is exciting new terrain for nutrition education and moving forward with research in both distance education and computer-based technologies will be beneficial.

APPENDIX A

TABLES 1-8

Table 1: Summary of Survey Items (continued on next few pages)

Question	Response	N	%
What type of program do you oversee as Program Director?	<i>Coordinated Program</i>	15	9.20
	<i>Didactic Program in Dietetics</i>	45	27.61
	<i>Dietetic Internship Program</i>	90	55.21
	<i>Dietetic Technician Program</i>	13	7.98
For <u>supervised practice</u>, what areas of dietetics education are you currently using technology?	<i>Clinical</i>	90	55.21
	<i>Management</i>	67	41.10
	<i>Foodservice</i>	71	43.56
	<i>Community</i>	76	46.63
	<i>Other (open-ended)</i>	24	14.72
For <u>didactic education</u>, what areas of dietetics education are you currently using technology?	<i>Clinical</i>	115	70.55
	<i>Management</i>	81	49.69
	<i>Foodservice</i>	83	50.92
	<i>Community</i>	94	57.67
	<i>Other (open-ended)</i>	22	13.50
	<i>None</i>	3	1.84
Dietetics education needs alternatives to traditional supervised practice	<i>Strongly Agree</i>	52	31.90
	<i>Agree</i>	63	38.65
	<i>Neutral</i>	20	12.27
	<i>Disagree</i>	21	12.88
	<i>Strongly Disagree</i>	6	3.68
Dietetics education needs some different options within supervised practice hours to complement the supervised practice hours, such as simulated education	<i>Strongly Agree</i>	60	36.81
	<i>Agree</i>	73	44.79
	<i>Neutral</i>	12	7.36
	<i>Disagree</i>	9	5.52
	<i>Strongly Disagree</i>	7	4.29
Our administration provides financial support to purchase technology for instruction	<i>Strongly Agree</i>	17	10.43
	<i>Agree</i>	57	34.97
	<i>Neutral</i>	41	25.15
	<i>Disagree</i>	32	19.63
	<i>Strongly Disagree</i>	13	7.98

We have IT support staff to assure that our technology runs properly	<i>Strongly Agree</i>	41	25.15
	<i>Agree</i>	83	50.92
	<i>Neutral</i>	18	11.04
	<i>Disagree</i>	11	6.75
	<i>Strongly Disagree</i>	8	4.91
We have support staff to help us use technology in educationally-sound methods	<i>Strongly Agree</i>	37	22.70
	<i>Agree</i>	67	41.10
	<i>Neutral</i>	26	15.95
	<i>Disagree</i>	19	11.66
	<i>Strongly Disagree</i>	11	6.75
I feel that I have the technological skills necessary to implement new technology within my course or supervised practice	<i>Strongly Agree</i>	28	17.18
	<i>Agree</i>	70	42.94
	<i>Neutral</i>	31	19.02
	<i>Disagree</i>	23	14.11
	<i>Strongly Disagree</i>	8	4.91
Medical-simulation laboratories exist at our institution and are used by our program	<i>Yes</i>	13	7.98
	<i>No</i>	148	90.80
Medical-simulation laboratories exist at our institution, but are not used in our program	<i>Yes</i>	60	36.81
	<i>No</i>	97	59.51
Medical-simulation laboratories are potentially available for use by dietetics students	<i>Yes</i>	51	31.29
	<i>No</i>	106	65.03
I prefer to communicate with my students using text messaging	<i>Yes</i>	17	10.43
	<i>No</i>	143	87.73
prefer to communicate with my colleagues using text messaging	<i>Yes</i>	6	3.68
	<i>No</i>	154	94.48
I prefer to communicate with my students using e-mail	<i>Yes</i>	148	90.80
	<i>No</i>	12	7.36
I prefer to communicate with colleagues using e-mail	<i>Yes</i>	144	88.34
	<i>No</i>	15	9.20
I prefer face-to face communication and do not use technology with my students	<i>Yes</i>	18	11.04
	<i>No</i>	135	82.82
I prefer face-to-face communication and do not use technology with my colleagues	<i>Yes</i>	17	10.43
	<i>No</i>	135	82.82
Students can evaluate preceptors online	<i>Yes</i>	54	33.13
	<i>No</i>	95	58.28
Preceptors use an online grading system to evaluate students	<i>Yes</i>	27	16.56
	<i>No</i>	121	74.23
We use a computer-based scheduler to assign students to supervised practice rotations	<i>Yes</i>	11	6.75
	<i>No</i>	135	82.82
I currently use on-line simulations in my teaching	<i>Yes</i>	39	23.93
	<i>No</i>	119	73.01
We currently use role playing in our teaching	<i>Yes</i>	129	79.14
	<i>No</i>	32	19.63

We currently use standardized patients for supervised practice	<i>Yes</i>	39	23.93
	<i>No</i>	115	70.55
We currently use patient simulators (e.g., SimMan, SimBaby)	<i>Yes</i>	3	1.84
	<i>No</i>	153	93.87
We currently use on-line case studies in our teaching	<i>Yes</i>	52	31.90
	<i>No</i>	104	63.80
If you agree that simulations might in fact supplement or replace some supervised practice areas, what do you recommend?	<i>Clinical</i>	115	70.55
	<i>Management</i>	103	63.19
	<i>Foodservice</i>	89	54.60
	<i>Community</i>	96	58.90
	<i>Other</i>	25	15.43
	<i>Don't agree</i>	16	9.82
What do you think is a reasonable amount of hours that simulations maybe used in place of supervised practice hours for each segment that you checked above	<i>Clinical</i>	101	37.75
	<i>Management</i>	93	26.05
	<i>Food</i>	79	28.30
	<i>Community</i>	84	29.78
How many years have you been a program director?	<i>1-5 years</i>	57	34.97
	<i>5-10 years</i>	41	25.15
	<i>10-15 years</i>	31	19.02
	<i>16+ years</i>	30	18.40
How many years have you been in the profession?	<i>1-5 years</i>	4	2.45
	<i>5-10 years</i>	13	7.98
	<i>10-15 years</i>	20	12.27
	<i>16+ years</i>	124	76.07
What was your education route to becoming an RD?	<i>AP4</i>	17	10.43
	<i>Didactic Program/ Internship</i>	68	41.72
	<i>Coordinated Program</i>	35	21.47
	<i>Grad school + 6 mos. experience</i>	30	18.40
	<i>Bachelor's + 3 yr traineeship</i>	0	0
	<i>Other</i>	14	8.59
Which of the following best describes the location of your program	<i>Rural location</i>	43	26.38
	<i>Urban location</i>	118	72.39
	<i>Distance education</i>	8	4.91
Which of the following best describes your program?	<i>Private institution</i>	44	26.99
	<i>Public institution</i>	94	57.67
	<i>State-assisted institution</i>	23	14.11
Where does your program reside?	<i>College/university based</i>	125	76.69
	<i>Hospital based</i>	26	15.95
	<i>Corporate based</i>	2	1.23
	<i>Government (entity)</i>	10	6.13

	<i>Other</i>	7	4.29
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Table 2: Characteristics of the Study Sample

Survey Question	Response	N	%
What type of program do you oversee as Program Director? (n=163)	<i>Coordinated Program</i>	15	9.2
	<i>Didactic Program in Dietetics</i>	45	27.6
	<i>Dietetic Internship Program</i>	90	55.2
	<i>Dietetic Technician Program</i>	13	8.0
How many years have you been a program director? (n=159)	<i>1-5 years</i>	57	35.0
	<i>5-10 years</i>	41	25.2
	<i>10-15 years</i>	31	19.0
	<i>16+ years</i>	30	18.4
How many years have you been in the profession? (n=161)	<i>1-5 years</i>	4	2.5
	<i>5-10 years</i>	13	8.0
	<i>10-15 years</i>	20	12.3
	<i>16+ years</i>	124	76.1
What was your education route to becoming an RD? (n=164)	<i>AP4</i>	17	10.4
	<i>Didactic Program/ Internship</i>	68	41.8
	<i>Coordinated Program</i>	35	21.5
	<i>Grad school + 6 mos. experience</i>	30	18.4
	<i>Bachelor's + 3 yr Traineeship</i>	0	0
	<i>Other</i>	14	8.6
Which of the following best describes the location of your program? (n=169)	<i>Rural location</i>	43	26.4
	<i>Urban location</i>	118	72.4
	<i>Distance education</i>	8	4.9
Which of the following best describes your program? (n=161)	<i>Private institution</i>	44	27.0
	<i>Public institution</i>	94	57.7
	<i>State-assisted Institution</i>	23	14.1
Where does your program reside? (n=170)	<i>College/university</i>	125	76.7
	<i>Hospital based</i>	26	16.0
	<i>Corporate based</i>	2	1.2
	<i>Government (entity)</i>	10	6.1
	<i>Other</i>	7	4.3

Table 3: Openness vs. Use of Technology in Education

Survey Question	Response	Openness to the use of Technology (N=141)		P-value
		Disagree (N=117)	Agree (N=24)	
I prefer to communicate with my students using text	<i>Yes</i>	2 (8.3%)	13 (11.1%)	1.0000
	<i>No</i>	22 (86.7%)	104 (88.9%)	
I prefer to communicate with my colleagues using text messaging	<i>Yes</i>	0 (0%)	4 (2.8%)	1.0000
	<i>No</i>	24 (100.0%)	113 (96.6%)	
I prefer to communicate with my students using e-mail	<i>Yes</i>	20 (83.3%)	109 (94.0%)	0.0953
	<i>No</i>	4 (16.7%)	7 (6.0%)	
I prefer to communicate with colleagues using e-mail	<i>Yes</i>	20 (83.3%)	106 (91.4%)	0.2611
	<i>No</i>	4 (16.7%)	10 (8.6%)	
I prefer face-to-face communication and do not use technology with my students	<i>Yes</i>	8 (34.8%)	9 (8.1%)	0.0020*
	<i>No</i>	15 (65.2%)	102 (91.9%)	
I prefer face-to-face communication and do not use technology with my colleagues	<i>Yes</i>	7 (30.4%)	9 (8.2%)	0.0076*
	<i>No</i>	16 (69.6%)	101 (91.8%)	
Students can evaluate preceptors online	<i>Yes</i>	9 (39.1%)	39 (36.1%)	0.8144
	<i>No</i>	14 (60.9%)	69 (63.9%)	
Preceptors use an online grading system to evaluate students	<i>Yes</i>	3 (13.0%)	19 (17.6%)	0.7638
	<i>No</i>	20 (87.0%)	89 (82.4%)	
We use a computer-based scheduler to assign students to supervised practice rotations	<i>Yes</i>	0 (0%)	10 (9.3%)	0.2097
	<i>No</i>	22 (100%)	97 (90.7%)	
I currently use on-line simulations in my teaching	<i>Yes</i>	2 (8.3%)	33 (28.7%)	0.0397*
	<i>No</i>	22 (91.7%)	82 (71.3%)	
We currently use on-line case studies	<i>Yes</i>	2 (8.3%)	44 (38.6%)	0.0077*
	<i>No</i>	22 (91.7%)	70 (61.4%)	

* Indicates a statistically significant result (p=0.005)

¹ Cochran Armitage test for trend p-value

Table 4: Openness vs. Current use of role playing, standardized patients and patient simulators

Survey Question	Response	Openness to the use of Technology (N=141)		P-value
		Disagree (N = 24)	Agree (N = 117)	
We currently use role playing in our teaching	<i>Yes</i>	17 (70.8%)	96 (81.4%)	0.2698
	<i>No</i>	7 (29.2%)	22 (18.6%)	
We currently use standardized patients for supervised	<i>Yes</i>	2 (8.3%)	34 (30.1%)	0.0387*
	<i>No</i>	22 (91.7%)	79 (69.9%)	
We currently use patient simulators (e.g., SimMan, SimBaby)	<i>Yes</i>	0 (0.0%)	3 (2.6%)	0.0953
	<i>No</i>	24 (100.0%)	112 (97.4%)	

* Indicates a statistically significant result (p=0.005)

¹ Cochran Armitage test for trend p-value

Table 5: Openness vs. Belief that changes are needed in dietetics education

Survey Question	Response	Openness to the use of Technology (N=141)		P-value
		Disagree (N = 24)	Agree (N = 117)	
Dietetics education needs alternatives to traditional supervised practice	<i>Strongly Agree</i>	0 (0.0%)	46 (39.6%)	<0.0001* ¹
	<i>Agree</i>	6 (25.0%)	47 (40.2%)	
	<i>Neutral</i>	5 (20.8%)	11 (9.4%)	
	<i>Disagree</i>	9 (37.5%)	11 (9.4%)	
	<i>Strongly Disagree</i>	4 (16.7%)	2 (1.7%)	
Dietetics education needs some different options within supervised practice hours to complement the supervised practice hours, such as simulated education	<i>Strongly Agree</i>	0 (0.0%)	51 (43.6%)	<0.0001* ¹
	<i>Agree</i>	7 (30.4%)	56 (47.9%)	
	<i>Neutral</i>	5 (21.7%)	5 (4.3%)	
	<i>Disagree</i>	5 (21.7%)	4 (3.4%)	
	<i>Strongly Disagree</i>	6 (26.1%)	1 (0.8%)	

* Indicates a statistically significant result (p=0.005)

¹ Cochran Armitage test for trend p-value

Table 6: Openness vs. Availability of technological, educational and financial resources

Survey Question	Response	Openness to the use of Technology (N=141)		P-value
		Disagree (N = 24)	Agree (N = 117)	
Our administration provides financial support to purchase technology for instruction	<i>Strongly Agree</i>	1 (4.2%)	13 (11.2%)	< 0.0001* ¹
	<i>Agree</i>	1 (4.2%)	47 (40.5%)	
	<i>Neutral</i>	4 (16.7%)	33 (28.5%)	
	<i>Disagree</i>	12 (50.0%)	18 (15.5%)	
	<i>Strongly Disagree</i>	6 (25.0%)	5 (4.3%)	
We have IT support staff to assure that our technology runs properly	<i>Strongly Agree</i>	4 (16.7%)	31 (26.5%)	0.0264* ¹
	<i>Agree</i>	12 (50.0%)	62 (53.0%)	
	<i>Neutral</i>	0 (0.0%)	13 (11.1%)	
	<i>Disagree</i>	5 (20.8%)	6 (5.1%)	
	<i>Strongly Disagree</i>	3 (12.5%)	5 (4.3%)	
We have support staff to help us use technology in educationally-sound methods	<i>Strongly Agree</i>	1 (4.2%)	31 (26.7%)	0.0029* ¹
	<i>Agree</i>	9 (37.5%)	50 (43.1%)	
	<i>Neutral</i>	5 (20.8%)	17 (14.7%)	
	<i>Disagree</i>	6 (25.0%)	11 (9.5%)	
	<i>Strongly Disagree</i>	3 (12.5%)	7 (6.0%)	
Medical-simulation laboratories exist at our institution and are used by our program	<i>Yes</i>	1 (4.2%)	9 (7.7%)	1.000
	<i>No</i>	23 (95.8%)	108 (92.3%)	
Medical-simulation laboratories exist at our institution, but are not used in our program	<i>Yes</i>	6 (26.1%)	47 (40.9%)	0.2420
	<i>No</i>	17 (73.9%)	68 (59.1%)	
Medical-simulation laboratories are potentially available for use by dietetics	<i>Yes</i>	3 (12.5%)	41 (36.0%)	0.0296*
	<i>No</i>	21 (87.5%)	73 (64.0%)	

* Indicates a statistically significant result (p=0.005)

¹ Cochran Armitage test for trend p-value

Table 7: Openness vs. Survey respondent characteristics

Question	Response	Openness to the use of Technology (N=141)		P-value
		Disagree (N = 24)	Agree (N = 117)	
I feel that I have the technological skills necessary to implement new technology within my course or supervised practice	<i>Strongly Agree</i>	0 (0.0%)	23 (19.8%)	0.0011*1
	<i>Agree</i>	10 (41.7%)	53 (45.7%)	
	<i>Neutral</i>	4 (16.6%)	22 (19.0%)	
	<i>Disagree</i>	7 (29.2%)	15 (12.9%)	
	<i>Strongly Disagree</i>	3 (12.5%)	3 (2.6%)	
What type of program do you oversee as Program Director?	<i>Coordinated Program</i>	0 (0.0%)	13 (11.0%)	0.2352
	<i>Didactic Program in Dietetics</i>	6 (25.0%)	34 (28.8%)	
	<i>Dietetic Internship Program</i>	17 (70.8%)	62 (52.5%)	
	<i>Dietetic Technician Program</i>	1 (4.2%)	9 (7.6%)	
How many years have you been a program director?	<i>1-5 years</i>	6 (25.0%)	43 (37.4%)	0.1661 ¹
	<i>5-10 years</i>	7(29.2%)	28 (24.4%)	
	<i>10-15 years</i>	3 (12.5%)	25 (21.7%)	
	<i>16+ years</i>	8 (33.3%)	19 (16.5%)	
How many years have you been in the profession?	<i>1-5 years</i>	0 (0.0%)	3 (2.6%)	0.6458 ¹
	<i>5-10 years</i>	1 (4.2%)	10 (8.6%)	
	<i>10-15 years</i>	4 (16.7%)	11 (9.4%)	
	<i>16+ years</i>	19 (79.2%)	93 (79.5%)	
What was your education route to becoming an RD?	<i>AP4</i>	3 (12.5%)	13 (11.1%)	0.9073
	<i>Didactic Program/ Internship</i>	11 (45.8%)	51 (43.6%)	
	<i>Coordinated Program</i>	4 (16.7%)	26 (22.2%)	
	<i>Grad school + 6 mos. experience</i>	5 (20.8%)	18 (15.4%)	
	<i>Other</i>	1 (4.2%)	9 (7.7%)	
Which of the following best describes the location of your program?	<i>Rural location</i>	19 (79.2%)	77 (65.8%)	0.5960
	<i>Urban location</i>	4 (16.7%)	31 (26.5%)	
	<i>Distance education</i>	0 (0.0%)	4 (3.4%)	
	<i>Multiple</i>	1 (4.2%)	5 (4.3%)	
Which of the following best describes your program?	<i>Private institution</i>	9 (39.1%)	30 (25.4%)	0.2874
	<i>Public institution</i>	10 (43.5%)	72 (61.0%)	
	<i>State-assisted institution</i>	4 (17.4%)	16 (13.6%)	

* Indicates a statistically significant result ($p=0.005$)

¹ Cochran Armitage test for trend p-value

Table 8: Perceived benefits and barriers as stated by survey respondents

Benefits	Barriers
I think this is a great idea. More use of simulations can enhance our ability to host more interns per program completion year.	We do not have the infrastructure (technology support, financial support, or human resources support) to implement the technology.
... it may be beneficial if it helps prepare students in real world situations.	The problem becomes the money to purchase the software.
... I believe there is a place for this kind of technology in preparing interns for the workplace.	I feel like some young people already communicate too much electronically. We are finding issues with the inability to communicate person to person. Some would rather play "farmville" all day long than live in the real world. So I guess they could play "hospital patient" or "hospital food service" effectively too but that doesn't mean that they could function in the real world setting.
If the simulations are high quality, they could result in the student mastering competencies faster than under supervised experiences.	For students that are afraid to approach a real patient (and there are those students), technology will never prepare them to work in the real world.
Simulation is an excellent enhancement/preparation for supervised-practice experiences, which can reduce the overall length required for supervised practice.	I think it would be a GIANT step back. Young students are crippled by current technology. The constant texting and emailing is leading to a socially inept population!
I think it would be a good option for programs who have had difficulty getting preceptors.	funding and tech support would be my biggest concerns
I think anything that decreases the burden on our sites is positive as long as it provides the needed practice/experience.	...there are the "high touch" skills, such as interviewing patients, that really do need face-to-face contact in the real world. Interns need to develop what I (for lack of a better term) call the "Spidey Sense" where they can pick up intuitively [on] things that are going on in a patient that are not expressly verbalized or stated in a chart.
I think this is an appropriate method to help introduce concepts and to expand student thinking and interpretation of the medical case.	
I think it would provide an opportunity to expose students to variable technology and keep them updated with digitally based practice.	
It think that it is becoming essential as hours are increased and placements are limited. This is a great way to start the students out and build their skills before they are placed in a medical facility.	
I prefer to use it along with a supervised practice experience to enhance it...	
Anything to provide equivalent experience that does not tap preceptors for time and energy would be wonderful.	

Table 8 continued on next page

Table 8 continued from previous page

I would be comfortable using it to support the intern developing competencies...	
This would be very useful and important in providing a wider range of experiences due to the decreasing number of preceptors and sites that are available for supervised practice experiences.	
They could provide more consistent and higher quality experience in specific areas... It's better than not offering any experience at all.	
If you want us to be able to provide as many spots for students, or even more, to try to increase supply of internship spots, you must let us use technology for some of the supervised practice hours.	
I feel that this is a necessity for some dietetic internships.	
If students are willing to 'play around' on the program, they can see detrimental responses [to] contraindicated nutrition support.	
...providing a way to practice and get feedback before working with actual patients would be reassuring (confidence-building for skill development)...	
I can see where programs that are having trouble getting enough facilities or preceptors might find these necessary and useful...	
I think it has its place for certain experiences - especially if the site cannot provide it.	
... if it got to the point where we didn't have enough preceptors, then I would be open to a small portion of the supervised practice hours being taught this way.	
I feel that it would be a good compliment to person-to-person contact and give programs a better chance at completing all the supervised hours.	

APPENDIX B
INITIAL PROPOSED SURVEY

Distance Education and Computer-Based Simulations

First, we would like to ask you some questions about your experiences with and perspectives about the use of technology and distance education.

1. On average, how much time do you use the computer each day for both personal and work purposes (include use of the internet for e-mail, instant messaging, surfing the web, research, and other activities)?

- Less than one hour per day
- 1-2.9 hrs per day
- 3-4.9 hrs per day
- 5-6.9 hrs per day
- 6+ hrs per day

2. On average, how much time do you use the following social and professional networking sites?

Sites	Never	Several hours per year	Several hours per month	Several hours per week	1-3.9 hrs per day	4-6 hrs per day	6+ hrs per day
a. Facebook							
b. Twitter							
c. LinkedIn							
d. Second Life							
e. Other (please specify)____							

3. Have you ever taken a fully online course or hybrid course? (A hybrid course uses a combination of online and face-to-face instruction).

- yes
- no

4. If yes, how many fully online and/or hybrid courses have you taken?

- 1
- 2
- 3
- 4+

5. In the next year, how likely are you to take a continuing education course that is either hybrid or fully online?

- very likely
- likely
- unlikely
- very unlikely
- not sure

6. How useful do you think distance education is to the education of nutrition professionals in undergraduate, graduate and professional education?

Level of Education	Not Useful	Somewhat Useful	Neutral	Useful	Very Useful
Undergraduate					
Graduate					
Continuing and Professional					

7. Research in nutrition and other fields has highlighted some of the benefits of distance education for both students and instructors. Please indicate to what extent you agree or disagree with the following statements regarding potential benefits of distance education.

Potential Benefit	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. Distance education is more time efficient than traditional education for students.					
b. Distance education is more cost efficient than traditional education.					
c. Distance education reduces travel time for students and instructors.					
d. Distance education provides increased flexibility for students.					
e. Distance education provides increased flexibility for instructors.					

f. Distance education offers more varied learning opportunities for students than traditional education.					
g. Distance education offers more varied teaching opportunities for instructors.					
h. Distance education offers equal quality of teaching compared to traditional education.					

8. Research has also identified some of the potential barriers of distance education for students and instructors. Please indicate to what extent you agree or disagree with the following statements regarding potential barriers of distance education.

Potential Barriers	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. Distance education provides lower quality learning for students than traditional education.					

b. Distance education is more challenging than traditional education for students due to technological issues.					
c. Distance education is more challenging than traditional education for instructors due to technological issues.					
d. Distance education is not as cost effective as traditional education for students.					
e. Distance education is more impersonal than traditional education for students.					
f. Distance education is more impersonal than traditional education for instructors.					
g. Distance education is more time consuming than traditional education for students.					
h. Distance education is more time consuming than traditional education for instructors.					

Go to: <http://www.youtube.com/watch?v=7wDI5suE2Uo> to view a 4 min. 20 sec. video highlighting some of the possibilities of using computer-based simulations in nutrition and public health education. This is a *Second Life* program featuring a 3-D virtual community.

Now that you have viewed the video, we would like to hear about your experiences with and perspectives on the use of computer-based simulations as a teaching tool.

9. Prior to the video you just viewed, have you ever used a computer-based simulation?

_yes
_no

10. Are computer-based simulations included in the nutrition/dietetic program at your university, hospital or place of employment?

_yes
_no
_I don't know

11. If not, how likely do you think your department might be to incorporate computer-based simulations into the curriculum or program options in the next year?

_very likely
_likely
_unlikely
_very unlikely
_not sure

12. In the next year, how likely would it be for you personally to take advantage of the opportunity to use a computer-based simulation as part of a continuing education course either through your work or elsewhere?

_very likely
_likely
_unlikely
_very unlikely
_not sure

13. Do you think that computer-based simulations should be used to supplement supervised practice?

_yes
_no

14. Do you think that computer-based simulations should be used to supplement courses?

_yes
_no

15. Please indicate the extent to which you agree or disagree with the following statements:

Simulations can be useful...

Educational Goal	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. for the education of nutrition professionals					
b. to expose students to unfamiliar medical conditions					
c. to cultivate sensitivity towards patient with disabilities					
d. in developing counseling skills					
e. to expose students to a variety of cultures and food-related practices					
f. for enhancing cultural competency training					

16. In what setting/s do you think computer-based simulations could be useful? Check all that apply.

- Undergraduate level courses
- Graduate level courses
- Dietetic internships
- Continuing and Professional Education
- Other (please specify) _____
- None of the above
- Comments:

17. Please indicate how useful you think computer-based simulations would be in the following courses.

Course	Very Useful	Useful	Neutral	Somewhat Useful	Not Useful

a. Counseling					
b. Medical Nutrition Therapy					
c. Community Nutrition					
d. Food Science Courses					
e. Other: (Please specify_____)					

The next two questions address your perspectives on “virtual patients”, one type of simulation seen in the video clip, that are used in educating health professionals to teach clinical skills, cultivate patient sensitivity, and reduce patient bias.

18. Consider a situation in which you encountered a patient, client or student with an unfamiliar health condition, disability or cultural difference. To what extent do you think prior exposure to a virtual patient simulation would have been helpful in preparing you to effectively handle the situation?

- very likely
- likely
- unlikely
- very unlikely
- Comments:

19. For the purposes of practicing counseling skills, do you think that “virtual” patients could serve as a substitute for role playing teaching scenarios?

- yes
- no
- Comments:

20. Research has identified some of the potential barriers of computer-based simulations for students and instructors. Please indicate to what extent you agree or disagree with the following potential barriers of computer-based simulations in nutrition education.

Barriers	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. Computer-based simulations may not be effective teaching tools due to technological issues.					
b. Computer-based simulations are not as cost efficient as other educational methods.					
c. Computer-based simulations are too time consuming to use for instructors.					
d. Computer based simulations are too time consuming to use for students.					
e. Computer-based simulations provide unrealistic interactions.					
f. Other: (Please specify_____)					

Finally, we would like to know a little about you.

21. What is your gender?

- Male
- Female

22. What is your age range?

- 18-25 years
- 26-30 years
- 31-40 years
- 41-50 years
- 51-60 years

61 years or older

23. What is the highest level of education that you have completed?

Bachelor's degree

Master's degree

Doctoral degree

24. How long has it been since you've finished your highest degree?

0-5.9 years

6-10.9 years

11-15.9 years

16 years or more

25. What is your current position/title? Please check all that apply.

Registered Dietitian

Licensed Dietitian/Nutritionist

Dietetic Internship Director

Didactic Program in Dietetics (DPD) Director

Director of Coordinated Program

Director of International Coordinated Program

Director of Dietetic Technician Program

Other (please specify) _____

26. How many students are enrolled in your program?

1-10

11-20

21-30

31-40

40+

27. How long have you been in your current position?

0-5.9 years

6-10.9 years

11-15.9 years

16 years or more

28. Please use the space below to share any additional comments you have regarding the use of distance education and computer-based simulations.

APPENDIX C

E-MAIL: INVITATION TO PARTICIPATE

My name is Kirsten Schlein and I am a graduate student in the Department of Nutrition at the University of Massachusetts, Amherst. I am conducting a research study to determine the perceptions and attitudes of Dietetic Program Educators regarding distance education and computer-based simulations. In order to accomplish this, I am requesting your participation to complete an online survey, which will take approximately 15 minutes.

By completing this survey, you will contribute to data that will help to determine future use of distance education and computer-based simulations in nutrition and dietetics education. Please complete the survey by Nov. 1, 2010. Your consent will be given when you complete the survey. Your willingness to participate in this survey is greatly appreciated. If you wish to include your name in the survey, you will automatically be included in a drawing for a Whole Foods gift certificate to show appreciation for your completion of the survey. The data will be reported as a group and may be published, however there is no information that will be linked directly to you. If you choose not to complete the survey no action is required.

If you have any questions about the study before or after you complete the survey, please contact me at 646-823-4725 or e-mail kschlein@nutrition.umass.edu. You may also contact my advisor, Elena Carbone, DrPH, RD, LDN at ecarbone@nutrition.umass.edu. If you have any questions regarding your rights as a participant in this study you may call Elaine Puleo at the Institutional Review Board at 413-545-1869.

Thank you for taking the time to participate in this study.

Sincerely,

Kirsten Schlein
Masters Graduate Student
Department of Nutrition
University of Massachusetts, Amherst

APPENDIX D

CONSENT FORM FOR PARTICIPATION IN A RESEARCH STUDY

University of Massachusetts Amherst

Principal Investigator: Dr. Elena Carbone
Student Researcher: Kirsten Schlein
Study Title: Perceptions and Attitudes of Dietetic Program Educators
Regarding Distance Education and Computer-Based
Simulations

1. WHAT IS THIS FORM?

This form is called a Consent Form. It will give you information about the study so that you can make a decision about whether or not you would like to participate.

2. WHO IS ELIGIBLE TO PARTICIPATE?

To participate in this study you must hold one of the following titles: 1) Dietetic Program Director, 2) Director of a coordinated program in dietetics, 3) Director of a dietetic internship program, or 4) Director of a dietetic technician program.

3. WHAT IS THE PURPOSE OF THIS STUDY?

We are conducting this research study to gain a greater understanding of dietetic educators' perceptions of distance education and computer-based simulations, which will help guide the use of these educational strategies in nutrition and dietetics curriculum.

4. WHERE WILL THE STUDY TAKE PLACE AND HOW LONG WILL IT LAST?

The study will consist of an online survey sent to directors of dietetic programs.

5. WHAT WILL I BE ASKED TO DO?

If you agree to take part in this study, you will be asked to complete an online survey that will assess your experience with computers, distance education and computer-based simulations. The final part of the survey will ask for some basic demographic information.

6. WHAT ARE MY BENEFITS OF BEING IN THIS STUDY?

We hope that your participation in the study will help to improve the fields of nutrition and dietetics.

7. WHAT ARE MY RISKS OF BEING IN THIS STUDY?

We believe there are no known risks associated with this research study.

8. HOW WILL MY PERSONAL INFORMATION BE PROTECTED?

All electronic files (e.g., database, spreadsheet, etc.) containing identifiable information will be password protected. Any computer hosting such files will also have password protection to prevent access by unauthorized users. Only the members of the research team will have access to the passwords. At the conclusion of this study, the researchers may publish their findings. Information will be presented in summary format and you will not be identified individually in any publications or presentations.

9. WILL I RECEIVE ANY PAYMENT FOR TAKING PART IN THE STUDY?

N/A

10. WHAT IF I HAVE QUESTIONS?

We will be happy to answer any question you have about this study. If you have further questions about this project or if you have a research-related problem, you may contact Kirsten Schlein at 646-823-4725 or Dr. Elena Carbone at ecarbone@nutrition.umass.edu. If you have any questions concerning your rights as a research subject, you may contact the University of Massachusetts Amherst Human Research Protection Office (HRPO) at (413) 545-3428 or humansubjects@ora.umass.edu.

11. CAN I STOP BEING IN THE STUDY?

You do not have to be in this study if you do not want to. If you agree to be in the study, but later change your mind, you may drop out at any time. There are no penalties or consequences of any kind if you decide that you do not want to participate.

12. WHAT IF I AM INJURED?

N/A

13. SUBJECT STATEMENT OF VOLUNTARY CONSENT

I have read this form and decided that I will participate in the project described above. The general purposes and particulars of the study as well as possible hazards and inconveniences have been explained to my satisfaction. I understand that I can withdraw at any time.

Participant Signature

Date

By signing below I indicate that the participant has read and, to the best of my knowledge, understands the details contained in this document and has been given a copy.

Signature of Person
Obtaining Consent

Date

APPENDIX E

AMERICAN DIETETIC ASSOCIATION SURVEY

Attachment 4 a

ADA EC - Program Director Use of Simulations

1. Default Section

The ADA Education Committee is enlisting your feedback and input to assist us in proposing recommendations for using simulations in dietetics education. For the purpose of this survey, we are defining simulations as "computer-based or face-to-face role-playing scenarios that recreate genuine work situations experienced by dietitians and dietetic technicians that allow students to apply their knowledge in context and develop communication, collaboration, management, and teamwork skills under realistic conditions." Your completion of the questionnaire will provide valuable information to assist us in developing our recommendations. Thank you.

The ADA Education Committee

* 1. What type of program do you oversee as Program Director?

- Coordinated Program (CP)
- Didactic Program in Dietetics (DPD)
- Dietetic Internship Program (DI)
- Dietetic Technician Program (DT)

2. For supervised practice, what areas of dietetics education are you currently using technology? Check all that apply. (Technology is defined as the use of specialized software, submission of assignments online, the use of courseware, social formats such as blogs, wikis, twitter and facebook, skype, blogs, communication tools, etc.)

- Clinical
- Management
- Foodservice
- Community

Other (please specify)

ADA EC - Program Director Use of Simulations

3. For didactic education, what areas of dietetics education are you currently using technology? Check all that apply. (Technology is defined as the use of specialized software, submission of assignments online, the use of courseware, social formats such as blogs, wikis, twitter and facebook, skype, blogs, communication tools, etc.)

- Clinical
- Management
- Foodservice
- Community

Other (please specify)

4. Describe any type of computer-based or other simulations that you are using in your program.

5. Click the response that most closely matches your agreement with the following statements:

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
Dietetics education needs alternatives to traditional supervised practice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dietetics education needs some different options within the supervised practice hours to complement the supervised practice hours, such as simulated education.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our administration provides financial support to purchase technology for instruction.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We have IT support staff to assure that our technology runs properly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We have support staff to help us use technology in educationally-sound methods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that I have the technological skills necessary to implement new technology within my courses or supervised practice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

ADA EC - Program Director Use of Simulations

6. Please answer yes or no to the following questions/situations

	Yes	No
Medical-simulation laboratories exist at our institution and are used by our program	<input type="radio"/>	<input type="radio"/>
Medical-simulation laboratories exist at our institution, but are not used in our program	<input type="radio"/>	<input type="radio"/>
Medical simulation laboratories are potentially available for use by dietetics students	<input type="radio"/>	<input type="radio"/>
I prefer to communicate with my students using text messaging.	<input type="radio"/>	<input type="radio"/>
I prefer to communicate with my colleagues using text messaging.	<input type="radio"/>	<input type="radio"/>
I prefer to communicate with my students using email.	<input type="radio"/>	<input type="radio"/>
I prefer to communicate with my colleagues using email.	<input type="radio"/>	<input type="radio"/>
I prefer face-to-face communication and do not use technology with my students.	<input type="radio"/>	<input type="radio"/>
I prefer face-to-face communication and do not use technology with my colleagues.	<input type="radio"/>	<input type="radio"/>
Students can evaluate preceptors on-line	<input type="radio"/>	<input type="radio"/>
Preceptors use an on-line grading system to evaluate students	<input type="radio"/>	<input type="radio"/>
We use a computer-based scheduler to assign students to supervised-practice rotations.	<input type="radio"/>	<input type="radio"/>
I currently use on-line simulations in my teaching	<input type="radio"/>	<input type="radio"/>
We currently use role-playing in our teaching	<input type="radio"/>	<input type="radio"/>
We currently use standardized patients for supervised practice	<input type="radio"/>	<input type="radio"/>
We currently use patient simulators (e.g., SimMan®, SimBaby™)	<input type="radio"/>	<input type="radio"/>
We currently use on-line case studies in our teaching	<input type="radio"/>	<input type="radio"/>

Comments

7. What is your opinion of replacing one or more supervised-practice experiences with technologies that don't require person-to-person contact (e.g. computer-based simulations)?

ADA EC - Program Director Use of Simulations

8. If you agree that simulations might in fact supplement or replace some supervised practice areas, what areas do you recommend? (Check all that apply)

- Clinical
 Management
 Foodservice
 Community

Other (please specify)

9. What do you think is a reasonable amount of hours that simulations maybe used in place of supervised practice hours for each segment that you checked above?

Clinical	<input type="text"/>
Management	<input type="text"/>
Foodservice	<input type="text"/>
Community	<input type="text"/>
Other	<input type="text"/>

10. How many years have you been a program director?

- 1-5
 5-10
 10-15
 16 +

11. How many years have you been in the profession?

- 1-5
 5-10
 10-15
 16 +

ADA EC - Program Director Use of Simulations

12. What was your education route to becoming an RD?

- AP4
- Didactic Program with an Internship
- Coordinated Program
- Graduate School plus 6 month experience
- Bachelor's Degree plus three year Traineeship

Other (please specify)

13. Which of the following best describes the location of your program? (Check all that apply.)

- Rural location
- Urban location
- Distance Education

14. Which of the following best describes your program?

- Private institution
- Public institution
- State-assisted institution

15. Where does your program reside? (Check all that apply)

- College/university based
- Hospital based
- Corporate based
- Government (entity)
- Other (please specify)

APPENDIX F

CODING KEY

(Coding used by three raters to quantify qualitative responses in question #7, the main outcome variable to determine if survey respondents were open to the use of computer-based simulations. The final responses were collapsed into three categories: 0=disagree, 1,3 and 4= agree, 9=missing, not applicable and not sure.)

0	Disagree
1	Agree
2	Not sure
3	Do not use technologies to <u>replace</u> supervised practice experience, instead use it to <u>enhance</u> or <u>complement</u> it
4	(The person seems to agree that simulations could be useful, but only under certain conditions, or they can see advantages/disadvantages to its use. For example, only if the quality is high, if it's well designed and carefully tested, good for some situations but not for others.)
9	Missing or not applicable

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