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EVALUATION OF THE IMPACT OF INSTRUCTIONAL METHODOLOGY OF THE WHO/UNICEF BREASTFEEDING TRAINING ON MATERNAL-CHILD NURSE KNOWLEDGE GAIN AND PERCEPTION OF BREASTFEEDING SUPPORT

By
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A DISSERTATION

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EVALUATION OF THE IMPACT OF INSTRUCTIONAL METHODOLOGY OF THE WHO/UNICEF BREASTFEEDING TRAINING ON MATERNAL-CHILD NURSE KNOWLEDGE GAIN AND PERCEPTION OF BREASTFEEDING SUPPORT

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Nurses are the largest group of healthcare professionals who support breastfeeding and lactating mothers in maternity facilities. Yet, the most effective instructional methodology to deliver the 20-hour WHO/UNICEF breastfeeding training for maternal-child nurses is still not determined. Breastfeeding knowledge gain and perception of breastfeeding support are two key modifiable outcomes of breastfeeding training that are commonly identified in the nursing literature. The purpose of this study was to evaluate the impact of instructional methodology (classroom versus computer-based) on the maternal–child nurse’s breastfeeding knowledge gain and perception of breastfeeding support for nurses that participated in the 20-hour WHO/UNICEF breastfeeding training. A secondary analysis was conducted on a sample of 521 cases of attendance by three types of maternal–child nurses- labor and delivery, postpartum, and neonatal- at a metropolitan hospital. The 20-hour training was offered in five 4-hour sessions with the option of computer-based or classroom instruction for each session. Commercial breastfeeding knowledge tests had been administered pre- and post each session. A perception of breastfeeding support
questionnaire, the Iowa Infant Feeding Attitude Scale, and demographic information had been collected at the end of each session. Instructional methodology significantly impacted breastfeeding knowledge gain for one content-specific breastfeeding session. The best predictor of perception of breastfeeding support was not instructional methodology, but infant feeding attitude. Type of maternal-child nurse significantly impacted breastfeeding knowledge gain and perception of breastfeeding support. These findings will have significant applications in choice of instructional methodology for breastfeeding education in the acute care setting, as well as continuing breastfeeding education post the 20-hour training. However, more research is needed to explore the impact of instructional methodology of the 20-hour WHO/UNICEF training on maternal-child nurses’ breastfeeding outcomes.
Dedication

This dissertation is dedicated to my family and husband who have provided unwavering support, love, understanding, and guidance throughout my doctoral journey.

First, I dedicate this work to my mother, Shermaine Green-Brown, who has supported me from birth. You taught me that being strong is all I have in this journey of life. You showed how dedication and hard work always pays off and so I followed in your footsteps. You were a steadfast voice on this particular journey and ignited the flame that gave me the motivation to finish. Thank you.

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Third, I dedicate this work to the rest of my family, Paul A. Brown (Daddy), Tiffany L.S. Brown (Sister), and Kyle A. Brown (Brother), who have sacrificed with me on this journey. Your inspirational words have helped me to reach the end of this journey and be curious about my next. Thank you.

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Chapter 1

Introduction

In the United States, 14.27% of births presently occur in a facility that has implemented recommended care for lactating and breastfeeding mothers and babies. This is a marked increase from 2007, when the rate was 2.9% (Baby-Friendly USA, 2015). This steady increase has resulted in the surpassing of the Healthy People 2020 goal of 8.1% (Healthy People, 2015). Improving how lactating and breastfeeding mothers and babies are supported also increases breastfeeding rates, another Healthy People 2020 goal, which is set at 81.9% for ever breastfed infants (Healthy People, 2015). However, this goal has not yet been achieved: the percentage of ever breastfed infants in the United States is at 79.2% (Centers for Disease Control and Prevention [CDC], 2014). Strikingly, it is estimated that the United States could save $10.5 billion and prevent 741 infant deaths a year if breastfeeding rates were increased to the national recommendation of 81.9% of infants born annually (Bartick & Reinhold, 2010).

Nevertheless, it is important to note that the recommended care to support lactating and breastfeeding mothers in birthing settings is not a contemporary concept. The initiative has been promoted since 1989 by the World Health Organization (WHO) and the United Nations Children’s Fund (UNICEF) when WHO and UNICEF jointly introduced *Ten Steps to Successful Breastfeeding* (Ten Steps) to the global healthcare community (see Appendix A for a list of the Ten Steps). Those Ten Steps which were groundbreaking at the time are international best practices that promote, protect, and support breastfeeding (WHO, 1998). The Ten Steps were designed to target maternity

Lactation and breastfeeding experts agree that healthcare professionals have a major influence on a mother’s decision to initiate breastfeeding or to lactate (Bonuck et al., 2014; CDC, 2014; Smith, 2010; USDHHS, 2011). The United States Breastfeeding Committee and Dr. Miriam Labbok, a leading national breastfeeding expert, explored and mapped the relative influence of potential breastfeeding obstacles or supports (Smith, 2010). Their research demonstrates the strong impact of maternal–child staff. Compared to other influential factors, such as maternal concerns, commercial marketing, family, work pressures, and societal pressures, the influence of maternal–child staff was strongest during pregnancy and at birth. An even more stunning detail from their work was that maternal–child staff members have the strongest influence on not only the mother’s decision to initiate breastfeeding, but also on the mother’s duration of breastfeeding/lactation once she leaves the hospital. To be specific, the influence of maternal–child staff was still strong 4–6 months post-delivery. These findings highlight that breastfeeding support given by maternal–child staff in the hospital has a ripple effect in the community (Smith, 2010).

This discovery is important because it emphasizes the critical role of maternal–child (labor and delivery, postpartum, and neonatal) nurses to lactating and breastfeeding mothers and babies. Nurses are the largest maternal–child staff group that supports mothers and babies in meeting their lactation and breastfeeding needs (CDC, 2014; USDHHS, 2011; Spatz, 2010a; Spatz, 2010b). Consequently, maternal–child nurses have
the most influence on breastfeeding outcomes in the hospital and post-discharge. As a result, nurses should be well trained and equipped with the best evidence-based techniques to promote, protect, and support breastfeeding (CDC, 2014; USDHHS, 2011). The best evidence to date is the Ten Steps (Baby-Friendly USA, 2015; CDC, 2014; Cox, 2010; Fairbank et al., 2000; USDHHS, 2011; WHO, 1998).

**The Baby-Friendly Hospital Initiative (BFHI)**

Recognizing the need of maternity facilities (hospitals and birthing centers) to implement the Ten Steps, the WHO and UNICEF launched the Baby-Friendly Hospital Initiative (BFHI) in 1991 (WHO, 2015). Maternity facilities that successfully implemented the Ten Steps and the International Code of Marketing of Breast-milk Substitutes (see Appendix B for a summary of the Code) are rewarded and recognized as a “Baby-Friendly” facility (Baby-Friendly USA, 2015). To date, more than 20,000 maternity facilities in 152 countries have earned the accreditation (WHO, 2015). In the United States, 288 hospitals and birthing centers in 47 states and the District of Columbia hold the Baby-Friendly designation. Whether or not maternity hospitals and birthing centers decide to earn the Baby-Friendly designation, the ultimate goal is to implement the Ten Steps and to train maternal–child staff to effectively practice the steps (Pound & Unger, 2012).

**Effectiveness of the Ten Steps and the BFHI**

Maternity practices and maternal–child staff cannot be solely responsible for a mother’s success with lactation and breastfeeding in the hospital and at home. However, improving the support that mothers receive from maternal–child staff can be a
prerequisite to better breastfeeding and lactation success (Cor & Zakanj, 2014). This argument is supported by research done on institutions that have implemented the Ten Steps, as well as institutions that have acquired the BFHI accreditation (Khan & Akram, 2013; Venancio, Saldiva, Escuder, & Giugliani, 2012).

One of the most analyzed outcomes on the effectiveness of the Ten Steps is the breastfeeding rate change. An increase in breastfeeding rates post-implementation has been noted in maternity facilities that train their maternal–child staff on the Ten Steps. One such example is a study by Venancio, Saldiva, Escuder, and Giugliani (2012), who retrospectively analyzed breastfeeding rates in the first hour of life and on the first day at home for a total of 65,936 infants in 64 municipalities in Brazil who were covered by the country’s 2008 immunization campaign. The analysis revealed that infants born in Baby-Friendly designated hospitals (BFHs) were 9% more likely to be breastfed in the first hour of life and 6% more likely to be breastfed on the first day at home.

Venancio et al., (2012) did not want to look just at breastfeeding probability but also at the probability of breastfeeding exclusivity. Breastfeeding exclusivity occurs when the infant only ingests breast milk (CDC, 2014); the relevance being that the inherent benefits of breastfeeding are best experienced when infants are exclusively breastfed (Binns & Lee, 2014).

Venancio et al., (2012) found that exclusive breastfeeding was 13%, 8%, and 6% more likely in infants born in BFHs under the ages of 2, 3, and 6 months, respectively. Not surprisingly, birth in a BFH also correlated with significantly less pacifier use. Less pacifier use is noted with more breastfeeding exclusivity in the literature (Binns & Lee, 2014; Vieira et al., 2014). Based on the study’s significant results, the researchers
concluded that policy makers and health professionals need to become aware of the importance and potential of training maternal–child staff with the Ten Steps.

Though Venancio et al., (2012) indicated that breastfeeding outcomes are better in BFHs, Yoda, Takahashi, and Yamauchi (2013) demonstrated that breastfeeding outcomes in hospitals that implement the BFHI can also assist in surpassing projected goals. Yoda et al. analyzed trends in breastfeeding rates in BFHs in Japan during a national breastfeeding campaign.

Japan launched the national “Healthy and Happy Family 21” campaign to increase the nationwide breastfeeding rate for babies in the first month of life from 50% to 60%. A mandate was made under the campaign to launch the BFHI at maternity hospitals. Yoda et al. (2013) conducted a four-year (2007–2010) retrospective analysis of hospital-based breastfeeding data from BFHs during Japan’s national campaign. The collection rate for each year was 100%. The numbers of BFHs for each year were 45 in 2007, 54 in 2008, 59 in 2009, and 61 in 2010. The number of breastfed newborns ranged from 14,579 (80.2%) in 2007 to 19,209 (73.2%) in 2010. Yoda et al. found that BFHs had an average breastfeeding rate of 75% for infants still breastfeeding at one month of age, compared to the national average of 50%. Furthermore, the 75% breastfeeding rate exceeded the 60% goal set by the national campaign. Such findings support the ability of the BFHI to lead to above-average breastfeeding outcomes.

Despite the exceptional outcomes of the BFHI, a logical criticism is that the implementation of such evidence-based programs is expected to improve breastfeeding rates within the hospital or birthing center setting; however, the true test is whether the BFHI will have a positive change in the post-discharge breastfeeding practices of
mothers, such as increasing the duration of breastfeeding and lactation post-discharge. At home, mothers usually do not have the luxury of maternal–child nurses around the clock to assist them, nor do they always have the ability to seek assistance from trained lactation specialists. Mothers have to rely on their training and support from the hospital as the determining factor in whether they stop or continue breastfeeding and/or lactation (Smith, 2010).

An observational study conducted by Khan and Akram (2013) in Sindh, Pakistan, sought to determine changes in the breastfeeding practices of mothers after receiving counseling on the Ten Steps, as defined by the BFHI, comparing BFHs to non-BFHs. Khan and Akram conducted the study for 2 years and employed nonprobability purposive sampling to randomly select BFHs and non-BFHs. A total of 236 women where included in the study. Of that total, 196 were from BFHs and 40 from non-BFHs. The investigators found that 194 (98.97%) of the mothers in the BFH group breastfed post-discharge compared to 12 (30%) of the mothers in the non BFH group. Hence, the BFHI can improve breastfeeding practices among mothers after leaving maternity facilities.

While an improvement in breastfeeding practices and outcomes is expected with the BFHI, an intriguing and unexpected finding about the implementation of the Ten Steps and the BFHI was that it may also reduce socioeconomic disparities in breastfeeding (Hawkins, Stern, Baum, & Gillman, 2015). Interestingly a quasi-experimental study conducted by Hawkins, Stern, Baum, and Gillman (2015) utilizing data from five states (Alaska, Maine, Nebraska, Ohio, and Washington) that participated in the Pregnancy Risk Assessment Monitoring System from 1999 to 2009 did not actually find differences in breastfeeding initiation rates between BFHs and non-BFHs.
The researchers, however, did find that breastfeeding initiation increased by 3.8 percentage points among mothers with lower education who delivered in BFHs \((p = .05)\), but there was no significant increase among mothers with higher education (Hawkins et al., 2015). Exclusive breastfeeding also increased for \(\geq 4\) weeks by 4.5 percentage points \((p = .02)\) among mothers with lower education who delivered in BFHI facilities (Hawkins et al., 2015). According to the CDC (2014), there is a major gap between breastfeeding rates in lower socioeconomic scale (SES) mothers compared to higher SES mothers, the latter having higher breastfeeding rates. The implication of such a finding could be significant in closing the gap between breastfeeding rates of lower and higher SES mothers.

**Significance of Breastfeeding Support, Promotion, and Protection**

Supporting, promoting, and protecting lactation and breastfeeding has become a contemporary public health initiative (Bartick, Stuebe, Shealy, Walker, & Grummer-Strawn, 2009; CDC, 2014; USDHHS, 2011). Breastfeeding combines two crucial elements of infant survival: nurturing by a constant caregiver and nourishment (Cox, 2010; WHO/UNICEF, 2003). More than 40 years of strong evidence acknowledges that breast milk is the ideal form of infant nutrition (American Academy of Pediatrics [AAP], 2012; Eidelman, 2012; USDHHS, 2011). Breast milk is the only substance that can optimally grow the infant’s brain (Hallowell & Spatz, 2012; Jantscher-Krenn, & Bode, 2012; Kotey & Spatz, 2013). But the benefits of breast milk do not stop there. Infants who receive breast milk and who consume it for longer periods are healthier both short- and long-term (Musilova, Rada, Vlkova, & Bunesova, 2014). Infants who receive breast
milk may even be more intelligent by the time they are of school age (Fonseca, Albernaz, Kaufmann, Neves, & de Figueiredo, 2013; Horwood & Ferguson, 1998).

Lactating and breastfeeding mothers also gain from providing their babies breast milk. Researchers have found that these mothers have: (a) a reduced risk of postpartum hemorrhage; (b) quicker return to pre-pregnancy weight; (c) less chance of postpartum depression; (d) less risk of developing uterine, breast, and other female cancers; and (e) less chance of developing diabetes, osteoporosis, and rheumatoid arthritis (Ip et al., 2007; Ip, Chung, Raman, Trikalinos, & Lau, 2009; Schwarz & Nothnagle, 2015). Regardless of the significant disease-related benefits of breastfeeding, the psychosocial benefits of breastfeeding are most appealing to mothers. In very early research on the breastfeeding experience, researchers found that breastfeeding enhances maternal–infant attachment and continues to do so today (Kielbratowska, Kazmierczak, Michalek, & Preis, 2015). But an often overlooked advantage of providing breast milk is the significant financial savings that can be achieved by the mother and family, if applicable (Saunders, 2011). Breastfeeding families save on direct costs of formula and bottles; no bottle use also makes breastfeeding the “green” option for infant feeding. Tuttle and Dewey (1996) reported that families save from $597 to $808 on food expenses per breastfed child during the first year of life. Savings also come from indirect costs, including fewer infant medical bills and fewer lost workdays by parents (Ball & Wright, 1999).

Interestingly, the benefits of breastfeeding on the economy has gained strong credence in the past few years among governmental and accreditation bodies (USDHHS, 2011). A cost analysis by a group of Harvard researchers, Bartick and Reinhold (2010), estimated that if 90% of American mothers were to exclusively breastfeed for 6 months,
it would save the U.S. economy 13 billion dollars per year. This calculation includes
direct and indirect medical expenses and time away from work for the mother. It also
includes the lost potential lifetime wages of $10.56 million for each infant who dies from
SIDS. Breastfeeding is known as an effective, low-cost preventative strategy for
improving the health of maternal–child dyads in both developed and developing countries
(Ma, Brewer-Asling, & Magnus, 2012).

The Joint Commission (TJC), an independent, nonprofit organization that sets
performance accountability standards for healthcare organizations and is the most
influential accreditation body that has recently taken significant steps to ensure that the
recommended care for lactating and breastfeeding mothers and babies—the Ten Steps—
are being taught and implemented in maternity facilities (The Joint Commission [TJC],
2012). As of January 2014, maternity facilities with 1,100 births or more per year are
mandated to report their exclusive breastfeeding rates to the TJC as part of the perinatal
care core measure set. Loss of TJC accreditation can put a hospital in jeopardy of losing
reimbursement or being suspended from operation. Additionally, TJC performs in-person
visits to validate hospital practices before granting accreditation, which is renewed every
4 years. Consequently, maternal–child staff members need to demonstrate knowledge and
skill in the Ten Steps.

The government has also weighed in on the matter. In 2011, The U.S. Surgeon
General, Regina M. Benjamin, publicly endorsed the Ten Steps and mandated that
maternal–child staff be trained in them (USDHHS, 2011). She pointed out that nurses
play an integral role in the matter; thus, their training in nursing school and in the hospital
is vital to the nation’s success in meeting national recommendations for breastfeeding.
The U.S. Surgeon General had effectively put out a call to action to support, promote, and protect breastfeeding to the entire U.S. healthcare community (USDHHS, 2011).

**The 20-Hour WHO/UNICEF Breastfeeding Training**

Implementation of the Ten Steps requires training of all healthcare professionals who take care of mothers and babies (Baby-Friendly USA, 2015). In fact, the second step of the Ten Steps is to train all healthcare staff in the skills necessary to support successful breastfeeding and lactation as outlined by the other steps. This step is crucial to the success of any facility that is implementing the Ten Steps because staff knowledge, attitude, perception of support, and skill in breastfeeding and lactation management will affect compliance with the other steps (Zakarija-Grkovic & Burmaz, 2010). Consequently, eventual success in improving breastfeeding outcomes is also impacted.

To aid with consistent care for mothers and babies and to ensure that best practices are being taught, WHO and UNICEF (2009) provided a 20-hour detailed curriculum and training guideline (see Appendix C for an outline of the 20-hour curriculum).

The training guideline provides clear instructions on the execution of the 20-hour training. Firstly, training must be mandatory for all maternal–child staff. As such, strong commitment from organizational leaders is required. Additionally, breastfeeding training must be included as part of the orientation of new staff members. Further stressed in the guideline is the requirement for practical, in-person training for a minimum of 5 hours, which is noted to be a major indicator of staff acquisition of skills. The other 15 hours are designated for classroom instruction.
Statement of the Problem

According to the 20-hour WHO/UNICEF breastfeeding training curriculum, the instructional methodology that is best suited to train maternal–child staff is classroom instruction (WHO/UNICEF, 2009). However, in this growing technological age, the 20-hour WHO/UNICEF breastfeeding training is being offered commercially via computer-based instruction (The Healthy Children’s Project, 2015). Even the USDHHS (2011) recommends the computer-based approach over classroom instruction as a cheaper and easier instructional methodology to implement the 20-hour training.

While computer-based instruction is cheaper, more easily accessible, and easier to implement, this method can compromise knowledge gain, perception of skill, and actual skill acquisition (Fenesi, Vandermorris, Kim, Shore, & Heisz, 2015; Jordan et al., 2013; Rogers, Regehr, Yeh, & Howdieshell, 1998). Maternal–child staff members who lack the knowledge and skill to support breastfeeding and lactation negatively affect women’s initiation, duration, and experiences with breastfeeding (CDC, 2014; Spiby et al., 2009; USDHHS, 2011). Therefore, choice of instructional methodology for the 20-hour breastfeeding training could play a major role in whether a maternity facility is able to achieve improved breastfeeding outcomes and ultimately impact public health.

Since nurses are the largest group of healthcare professionals that support breastfeeding and lactating mothers in maternity facilities, research is needed to explore the impact of instructional methodology—classroom versus computer-based—of the 20-hour WHO/UNICEF breastfeeding training among maternal–child nurses (Dodgson & Tarrant, 2007; Spatz, 2010a; Zakarija-Grkovic & Burmaz, 2010). The maternal–child nurse’s breastfeeding knowledge gain and perception of breastfeeding support are two
key modifiable outcomes of breastfeeding training that are commonly identified in the literature (Darent & Kempenaar, 2014; Deloian, Lewin, & O’Connor, 2015; Watkins & Dodgson, 2010). No research to date has compared the impact of these two instructional methodologies for the 20-hour WHO/UNICEF breastfeeding training on maternal–child nurse breastfeeding knowledge gain and perception of breastfeeding support (Spiby et al., 2009). It is important to identify an effective instructional methodology for the 20-hour WHO/UNICEF breastfeeding training in order to equip maternal–child nurses with the knowledge, skills, and self-perceived confidence to provide the best support to the mother–baby dyad.

**Purpose of the Study**

The purpose of this study was to evaluate the impact of instructional methodology (classroom versus computer-based) on the maternal–child nurse’s breastfeeding knowledge gain and perception of breastfeeding support for nurses that participated in the 20-hour WHO/UNICEF breastfeeding training. The relationships that were examined in this study are shown in Figures 1 and 2. Each arrow illustrates a relationship that was examined during data analysis.
Figure 1. Relationships examined between instructional methodology and knowledge gain. The dependent variable is nurse breastfeeding knowledge gain. Each variable’s impact on nurse breastfeeding knowledge gain was examined individually and collectively. However, the main independent variable of interest for this study is instructional methodology.
Figure 2. Relationships examined between instructional methodology and nurse perception of breastfeeding support. The dependent variable is nurse perception of breastfeeding support. Each variable’s impact on nurse perception of breastfeeding support was examined individually and collectively. However, the main independent variable of interest for this study is instructional methodology.

This study utilized data collected between January 2013 and August 2013 from a South Florida metropolitan hospital as part of the mandatory requirement that maternal–child nurses labor and delivery, postpartum, and neonatal be educated with the 20-hour WHO/UNICEF breastfeeding training. The 20-hour training was offered in five 4-hour
sessions. Participants chose sessions by personal convenience. Two instructional methodologies (classroom and computer-based) were offered for each 4-hour session. For that reason, the opportunity to evaluate differences in effectiveness of instructional methodology was achievable. Knowledge tests were administered prior to and following each 4-hour session. The Iowa Infant Feeding Attitude Scale (IIFAS), and a Likert-scale perception of breastfeeding support questionnaire based on the Ten Steps, were administered at the end of each 4-hour session. Consequently, these variables (knowledge gain, IIFAS, breastfeeding session, instructional methodology, type of nurse, and perception of breastfeeding support) were selected for analysis.

**Specific Aims and Hypotheses**

This study pursued four specific aims:

1. To determine the impact of instructional methodology (classroom vs. computer-based) in the following areas upon maternal–child nurses who take the 20-hour WHO/UNICEF breastfeeding training: (a) breastfeeding knowledge gain and (b) perception of breastfeeding support.
   a. The working hypothesis for this aim was that nurses who attend the classroom training will have a higher level of breastfeeding knowledge gain than nurses who attend the computer-based training.
   b. The working hypothesis for this aim was that nurses who attend the classroom training will have a more positive perception of breastfeeding support than nurses who attend the computer-based training.

2. To determine the impact of instructional methodology (classroom vs. computer-based) in the following areas upon labor and delivery, postpartum,
and neonatal maternal–child nurses who take the 20-hour WHO/UNICEF breastfeeding training: (a) breastfeeding knowledge gain and (b) perception of breastfeeding support.

a. The working hypothesis for this aim was that nurses who attend the classroom training will have a higher level of breastfeeding knowledge gain, across all three types of nurses, than nurses who attend the computer-based training.

b. The working hypothesis for this aim was that nurses who attend the classroom training will have a more positive perception of breastfeeding support, across all three types of nurses, than nurses who attend the computer-based training.

3. To determine the impact of instructional methodology (classroom vs. computer-based) upon maternal–child nurses, across all five 4-hour sessions, for the 20-hour WHO/UNICEF breastfeeding training in the following areas: (a) breastfeeding knowledge gain and (b) perception of breastfeeding support.

a. The working hypothesis for this aim was that nurses who attend the classroom training will have a higher level of breastfeeding knowledge gain, across all five 4-hour sessions, than nurses who attend the computer-based training.

b. The working hypothesis for this aim was that nurses who attend the classroom training will have a more positive perception of breastfeeding support, across all five 4-hour sessions, than nurses who attend the computer-based training.
4. To determine the best predictor (knowledge gain, infant feeding attitude, or instructional methodology) of maternal–child nurses’ perception of breastfeeding support in nurses who attend the 20-hour WHO/UNICEF breastfeeding training.

a. The working hypothesis for this aim was that instructional methodology is the best predictor of maternal–child nurses’ perception of breastfeeding support in nurses who attend the 20-hour WHO/UNICEF breastfeeding training.

This study has the potential to positively affect change in the understanding of effective instructional methodology of the 20-hour WHO/UNICEF breastfeeding training for maternal–child nurses.

**Theoretical Framework**

The guiding theoretical framework for this study was social learning theory. Social learning theory, proposed by Albert Bandura (1977), synthesizes concepts and processes from cognitive, behavioristic, and emotional models of behavior change. Bandura mapped out a perspective that learning includes consideration of the personal characteristics of the learner, relevant behavioral factors, and environmental influences. Personal characteristics can include demographic information but also can encompass knowledge, expectations, attitudes, and beliefs. Behavioral factors can include elements such as skills, practice, and self-efficacy. Environmental influence can include the social context of learning such as social norms, access of learners, format of learning, and even influence of others. A basic premise of social learning theory is that people learn not only
through their own experiences but also by observing the actions of others and the results of those actions (Bandura, 1977).

The conceptualization of person–behavior–environment interaction is one of triadic reciprocity. The interplay is depicted in Figure 3. Bandura (1977) stressed the notion of reciprocal determinism, which is the central construct of his theory. Bandura explained that a person could be both an agent for change and a responder to change. Learners experience the environment and interpret it according to unique internal and personal factors, then display behavior in response to their experiences (Bandura, 1977). The resulting behavior will have an effect on the environment, and thus the cycle repeats.

*Figure 3.* Diagrammatic representation of Bandura’s social learning theory.
Bandura’s theory extends the learning process beyond the educator-learner relationship to the larger social world. As such, a learner’s environment can have an impact on the learner and his or her subsequent behavior. However, the individuality of the learner also plays a role in subsequent behavior and can influence the learning environment. Consequently, in a learning environment that is devoid of interaction with other people or an instructor, one can expect a different experience from the learner (and effect on the learner’s subsequent behavior) than in a learning environment that is rich with interpersonal interactions. Controlling for effects of intrapersonal factors, the effect of the learning environment can be determined on both learner knowledge gain and subsequent behavior or on skill acquisition, as applicable (Bandura, 1977).

Bandura’s social learning theory is a valuable heuristic aid for researchers who are seeking to understand the learning process in a social context. The holistic approach to learning, which takes both intrapersonal and interpersonal factors into account, allows the theory to be readily applied to counseling interventions for disease prevention, management, and health promotion (Akers, Greca, Cochran, & Sellers, 1989). In nursing research, social learning theory has been applied to nursing education, competency acquisition, and self-efficacy, as well as to addressing nurse practice problems (Bahn, 2001; Bastable, 2008; Perry, 1988; Price, 2015; Roelands, Van Oost, Depoorter, Buysse, & Stevens, 2006).

**Application of the Theoretical Framework to this Study**

Similar to much of the research that uses social learning theory, breastfeeding support is a health-promotion intervention. Educating maternal–child nurses to support mothers’ breastfeeding efforts requires not only the provision of knowledge, but also the
consideration of personal and environmental influences that can predict whether that
nurse will feel confident in successfully supporting a mother’s efforts to breastfeed. Based on the interplay of the learner’s personal characteristics, the environment, and subsequent behavior, social learning theory provided the most relevant framework for this study.

Social learning theory drove and operationalized the central hypothesis of the study: the maternal–child nurse’s instructional methodology (learning environment) impacts the nurse’s knowledge gain (personal factor) as well as the nurse’s perception of breastfeeding support (behavior). The study tested the relationship between learner, learning environment, and behavior in the theory’s model by manipulating the learning environment and evaluating the impact on the learner and behavior. The researcher hypothesized that maternal–child nurses who are trained in groups with an instructor at all times (i.e., classroom instruction) will have higher breastfeeding knowledge gain and a more positive perception of breastfeeding support than maternal–child nurses who are trained in groups with no instructors (i.e., computer-based instruction) because of the positive influence of the social aspect of learning in the classroom with other learners and a role model instructor.

Assumptions

Based on the theoretical model for this study, the assumptions included the following:

1. Instructional methodology (environmental factor) can impact knowledge gain (personal factor) and perception of breastfeeding support (behavioral factor).
2. Classroom instruction provides an advantage over computer-based instruction in that the learner has access to a role model (the instructor), can be influenced by that role model, and has the ability to interact with the role model and other learners.

3. Type of nurse (personal factor) and breastfeeding session attended (environmental factor) are important influences of breastfeeding knowledge gain (personal factor) and perception of breastfeeding support (behavioral factor).

4. Personal factors, such as infant-feeding attitude and knowledge gain, as well as environmental factors, such as instructional methodology, are important influences on one’s perception of breastfeeding support (behavioral factor).

Delimitations

This study was subject to the following limitations: (a) secondary data was used, and (b) only data from maternal–child nurses who took part in the mandatory training held between January 2013 and August 2013 was included in the study. The study data was also collected from maternal–child nurses at one South Florida hospital in a metropolitan setting that is the past employment site of the researcher.
Definition of Terms

The conceptual and operational definitions for the study variables are as follows:

Breastfeeding Session

**Conceptual definition.** This was one of the five 4-hour sessions of the 20-hour WHO/UNICEF breastfeeding training. Each 4-hour session had unique content based on the 20-hour WHO/UNICEF curriculum.

**Operational definition.** Each session was defined operationally as 1 through 5. This variable was a single item score. This means that each participant had one entry for each session.

Breastfeeding Knowledge Gain

**Conceptual definition.** The ability of maternal–child nurses to demonstrate comprehension and retention of information and facts from the 20-hour WHO/UNICEF breastfeeding training beyond their baseline breastfeeding knowledge.

**Operational definition.** Breastfeeding knowledge gain was the difference between pre- and post-session test scores from standardized tests that were commercially developed for the 20-hour WHO/UNICEF breastfeeding training for each of the five sessions. This item was a composite score. The most common method of combining several items to compute a composite score is to take the mean score of the multiple items (Bannon, 2013).
Infant Feeding Attitude

**Conceptual definition.** The disposition of each maternal–child nurse toward breastfeeding or formula feeding.

**Operational definition.** Infant feeding attitude was measured by a composite score on the IIFAS (De la Mora, Russell, Dungy, Losch, & Dusdieker, 1999), which was administered at the end of each of the five sessions in both the classroom and computer-based sessions.

Instructional Methodology

**Conceptual definition.** The learning environment or format in which the breastfeeding training was delivered to the maternal–child nurses.

**Operational definition.** Instructional methodology was operationalized as either classroom or computer-based. It was a single item score, which means that the entry for this variable will reflect the instructional methodology for each study participant. Both the classroom and computer-based trainings were delivered in five 4-hour sessions with all data collected being paper-based.

Perception of Breastfeeding Support

**Conceptual definition.** Perception of breastfeeding support was awareness by maternal–child nurses of the Ten Steps and their self-reported practice of the Ten Steps.

**Operational definition.** Perception of breastfeeding support was operationalized by a composite score from a questionnaire that was based on the Ten Steps from each of the five sessions. The questionnaire was developed by the researcher, who worked as a hospital breastfeeding educator at the time of data collection. The questionnaire was
administered at the end of each of the five sessions in both the classroom and computer-based sessions.

**Type of Nurse**

**Conceptual definition.** This was the main unit and job function of the maternal–child nurse participant.

**Operational definition.** Type of nurse was defined operationally as one of three categories: (a) labor and delivery nurse, (b) postpartum nurse, and (c) neonatal nurse. This variable was a single-item score.

**Conclusion**

In summary, this introductory chapter suggests that maternal–child nurses provide crucial support to breastfeeding mothers and are capable of positively impacting the health and behaviors of mothers, families, and communities (Spatz, 2010a; Spatz, 2010b; Spatz, 2014). The 20-hour WHO/UNICEF breastfeeding training is the international “gold standard” for educating nurses to provide evidence-based breastfeeding support (WHO/UNICEF, 2009). Although the 20-hour breastfeeding training was designed to be delivered in-person in a classroom format, computer-based training is a cost-effective contemporary format for the 20-hour training (Jordan et al., 2013; The Healthy Children’s Project, 2015). Bandura’s (1977) social learning theory explains that a learner’s environment can have an impact on the learner and his or her subsequent behavior. It follows, then, that it is important to study the impact of instructional methodology of the 20-hour WHO/UNICEF breastfeeding training because it may have consequences on the maternal–child nurse’s ability to:
(a) acquire breastfeeding and lactation knowledge and/or (b) support breastfeeding and lactation for mothers and babies.
Chapter 2

Review of the Literature

The literature review is organized into 13 major areas and is limited to the variables under investigation. The review begins with a brief history of breastfeeding in the United States and is followed by a section on breastfeeding as a public initiative. The next sections include current literature on breastfeeding knowledge among maternal–child nurses and the impact of effective breastfeeding education. A discussion of the independent variables (breastfeeding education, type of maternal–child nurses, and instructional methodologies) is addressed in the subsequent three sections. The link between these independent variables and breastfeeding knowledge is the focus of the next section. Research studies related to maternal–child nurses’ perception of breastfeeding support and the impact of perception are presented in the next two sections. A review of infant feeding attitude is then presented and the link between this independent variable and the three aforementioned independent variables, with maternal–child nurses’ perception of support, is addressed.

The literature review concludes with a summary of the variables and relationships among the variables under investigation. Figure 4 graphically depicts the concepts that guide this study in that instructional methodology of the 20-hour WHO/UNICEF breastfeeding training may affect maternal–child nurse breastfeeding knowledge gain and perception of breastfeeding support. This literature review will demonstrate the need for research to determine the optimal instructional methodology for the 20-hour WHO/UNICEF breastfeeding training regarding acquisition of nursing breastfeeding
knowledge and nurse perception of breastfeeding support. Both nurse breastfeeding knowledge and nurse perception of breastfeeding support impact breastfeeding outcomes and, by extension, the health of the community (Bartick et al., 2009).

![Graphical model of the major variables in this study.](image)

**Figure 4.** Graphical model of the major variables in this study.

**Breastfeeding Rates: A Brief History in the United States**

Breastfeeding combines two crucial elements of infant survival: nurturing by a constant caregiver and nourishment. Breastfeeding has come to mean both the provision of a mother’s milk to her baby and the mother’s act of feeding her baby directly at the breast (Cox, 2010). For nearly, all infants, breastfeeding is the optimal source of nutrition. Yet in developed countries, such as the United States, women struggle to meet
their breastfeeding goals (CDC, 2014; U.S. Department of Health and Human Services [DHHS], 2011).

The decline of breastfeeding rates in the Western world is not a contemporary phenomenon (Thulier, 2009). In the mid to late 20th century, there was a worldwide decrease in breastfeeding rates. The reduction was attributed to a multi-faceted explanation. Initially, the rise of women in the workforce and the feminist movement were obvious rationalizations. The formula-feeding culture emerged as artificial infant milk substitutes seemed like an easy and convenient option for working mothers. In fact, the emancipation of women that began in the 1920s was symbolized by bottle-feeding. Most women viewed breastfeeding in terms of being “tied down.” The breast was moving from a source of nourishment and nurturance to a sex symbol.

By the 1970s, when breastfeeding rates were at their lowest (about 28%), mothers had knowledge only of artificial infant milk substitutes (bottle-feeding). As the grandmothers of the 1990s, these mothers had no ability to assist their daughters with breastfeeding support. The handing down of generational wisdom and knowledge in families about breastfeeding was decreasing (Cox, 2010).

Simultaneously, the medical profession was on the rise in the Western countries (Thulier, 2009). The holistic care provided by a midwife at home transitioned to fragmented care provided by health professionals in hospitals. New understandings of the cause of disease also altered maternity care so that aseptic practices were employed at birth. Women began to have little access to their babies in the first week of birth. Health practitioners had moved from belief that commercial feeding could healthfully augment or replace breastfeeding to a belief that it was actually better than breastfeeding.
Medically directed, non-evidence-based maternity care became the norm and breastfeeding rates continued to decline (Thulier, 2009).

In an effort to promote and protect breastfeeding and ensure safe nutrition for infants worldwide, joint global initiatives were undertaken by WHO and United Nations Children’s Fund (UNICEF, 2015). The International Code of Marketing of Breast Milk Substitutes was ratified in 1981. See Appendix B for a summary of the Code. This document addressed the concerns of marketing practices by the infant formula manufacturers. The code was overwhelmingly supported by the World Health Assembly and passed by a vote of 118 to 1. Unfortunately, the United States concerned with the effects of such a code on the formula and formula-related businesses, cast the lone dissenting vote.

Eight years later, in 1990, the United States cosponsored, with Sweden, the landmark WHO/UNICEF Innocenti Declaration on the Protection, Promotion, and Support of Breastfeeding. One of the operational targets of the Innocenti Declaration was to ensure that every facility that provided maternity care services would practice Ten Steps to Successful Breastfeeding (WHO/UNICEF, 1989, 2009; WHO, 1998). See Appendix A for a list of the Ten Steps. WHO/UNICEF then launched the BFHI in 1991. The basis of BFHI accreditation is the Ten Steps to Successful Breastfeeding. The aim of the BFHI was to support and promote baby- and mother-friendly hospital settings that support each mother’s informed choice of mode of feeding and ensure exclusive breastfeeding in the hospital and beyond (Baby-Friendly USA, 2015).

Breastfeeding rates fluctuated with the times in the United States (Miles & Herrick, 2010). The rates of initiation dramatically increased from 1971 to 1982 (62%),
but then declined from 1983 to 1989. Healthy People 2010 set a breastfeeding initiation goal of 75%. The prevalence of breastfeeding initiation has been continually rising, from 52 percent in 1990 to 74 percent in 2009. By 2010, the 75% goal was attained by the United States. Today, the Healthy People 2020 goal is 81.9% breastfeeding initiation in the early postpartum period.

**Breastfeeding: The Public Health Initiative**

Breastfeeding initiation rates were not the only health outcome impacted by the introduction of artificial infant milk substitutes. A noted trend to the increase in formula usage was the parallel rise of infant mortality and morbidity as more infants were fed artificial infant milk substitutes. Ironically, the introduction of artificial infant milk substitutes has also led to identification of the health benefits of human milk to the infant (Melnik, 2014). With more than 40 years of evidence, the benefits of breastfeeding are well established and new benefits continue to be discovered (American Academy of Pediatrics [AAP], 2012; Eidelman, 2012). Breastfeeding, and the use of human milk, is now a public health issue and not just a lifestyle choice (Spatz, 2014).

**Health Benefits**

The health benefits of breastfeeding extend to both the mother and infant and, by extension, to the community. Wright, Parkinson, and Drewett (2004) indicated that there is also evidence to support the premise that benefits increase with breast milk exclusivity. The primary benefit of breastfeeding to the infant is nutritional. Breast milk is the only fuel for brain development. Human milk contains the right amount of fatty acids, lactose, water, and amino acids necessary for the brain to grow (Hallowell & Spatz, 2012;
Breast milk is also able to enhance the bioavailability of nutrients, such as iron and zinc, to the infant (Ronis et al., 2015).

The breastfeeding mother has the ability to produce antibodies to diseases that are present in the environment (Verhasselt, 2015). Substantial evidence indicates that breast milk is able to immunize the infant from gastrointestinal infections (Arifeen et al., 2001), respiratory infections (Arifeen et al., 2001), otitis media (Bowatte et al., 2015), infections caused by rotavirus (Krawczyk, Lewis, Venkatesh, & Nair, 2015), enterobacteria (Arifeen et al., 2001), Streptococcus pneumonia (Boccolini, Carvalho, Oliveira, & Boccolini Pde, 2011), necrotizing enterocolitis (Gephart, McGrath, Effken, & Halpern, 2012), bacteremia (Hassiotou & Geddes, 2015), and urinary tract infections (Mårild, Hansson, Jodal, Odén, & Svedberg, 2004) through passive immunity. Breast milk also appears to have a protective advantage against some childhood and adult-onset diseases, such as insulin-dependent diabetes mellitus, asthma, lymphoma, leukemia, Hodgkin’s disease, ulcerative colitis, Crohn’s disease, celiac disease, hypertension, obesity, and elevated serum cholesterol levels (Armstrong & Reilly, 2002; Balban & Silva, 2004; Berner, Denic, & Galadari, 2001; Musilova, Rada, Vlkova, & Bunesova, 2014; Robinson & Fall, 2012; Thompson, 2005). An additional advantage is the enhanced cognitive development and educational achievement associated with breastfed infants at school age and even into adulthood (Fonseca, Albernaz, Kaufmann, Neves, & de Figueiredo, 2013; Victora et al., 2015).

One of the most commonly cited benefits of breastfeeding to the mother is weight loss. Evidence exists to support the premise that women who breastfed lost more weight
during the postpartum period than those who did not breastfeed (Jarlenksi, Bennett, Bleich, Barry, & Stuart, 2014). A reduction in postpartum blood loss and infection has also been noted in breastfeeding mothers, compared to non-breastfeeding mothers (Lawrence & Lawrence, 2011). More benefits of lactation for mothers include a reduced risk of disease development in women who breastfeed as opposed to women who do not. Researchers have identified that osteoporosis, ovarian cancer, premenopausal breast cancer, and rheumatoid arthritis are less prevalent in women who breastfeed (Schwarz & Nothnagle, 2015).

Regardless of the significant disease-related benefits of breastfeeding, physiological benefits of breastfeeding are most appealing to mothers. Breastfeeding has been found to enhance maternal–infant attachment (Kim et al., 2011). Hwang, Guyda, and Frisen (1971) found that the oxytocin released while the infant is nursing contributes to maternal care-taking behavior, suggesting one pathway through which maternal–infant attachment is improved. A later study demonstrated that breastfeeding mothers also have enhanced maternal role attainment and self-esteem (Driscoll, 1992). In a preliminary study by Feldman and Eidelman (2003), evidence emerged that breastfeeding may also improve maternal mood and interactive behaviors. Three years earlier, a study by Papinczak and Turner (2000) found a decrease in depression levels along with other physiological benefits in breastfeeding women who lactated for longer periods compared to non-breastfeeding women and women who weaned early. These benefits included increased confidence, lower anxiety levels, and improved coping ability.
Economic Benefits

Breastfeeding is an effective, low-cost preventative strategy for improving the health of maternal–child dyads in both developed and developing countries (Ma, Brewer-Asling, & Magnus, 2012). The business case for breastfeeding has gained strong credence in the past few years. A cost analysis by a group of Harvard researchers, Bartick and Reinhold (2010), estimated that, if 90% of American mothers were to exclusively breastfeed for 6 months, it would save the U.S. economy $13 billion dollars per year. This calculation includes direct and indirect medical expenses and time away from work for the mother. It also includes the lost potential lifetime wages of $10.56 million per death of an infant from SIDS.

Breastfeeding families save on direct costs from formula and bottles; no bottle use also makes breastfeeding the “green” option for infant feeding. Ball and Wright (1999) found that, in formula-fed infants’ first year of life, after adjusting for confounders, there were 2,033 excess office visits, 212 excess days of hospitalization, and 609 excess prescriptions for these three illnesses per 1,000 never-breastfed infants compared to 1,000 infants exclusively breastfed for at least 3 months. These additional health care services cost the managed care health system between $331 and $475 per never-breastfed infant during the first year of life.

Knowledge of Breastfeeding among Maternal–child Nurses

Based on the extensive research that supports breastfeeding as the optimal infant feeding practice, many people assume that maternal–child (labor and delivery, postpartum, and neonatal) nurses, have the most evidence-based breastfeeding knowledge
to support the mother–baby dyad. In fact, that is not always the case; truthfully, it is more of the exception than the rule (Cricco-Lizza, 2009; Watkins & Dodgson, 2010). The implication of such a finding is that mothers and families who seek breastfeeding support from maternal–child nurses are faced with an array of potentially inaccurate and inconsistent messages.

One team of researchers, Hauck, Graham-Smith, McInterney, and Kay (2010), explored women’s perceptions of conflicting advice around breastfeeding from formal support networks, specifically health professionals involved in postnatal support. A qualitative exploratory design was employed using the critical incident technique. Data were obtained from 62 Western Australian women who responded to an invitation to share incidents of receiving conflicting advice. Women who had breastfed a child within the past 12 months shared their experience through a telephone interview (n = 50) or by completing a brief questionnaire (n = 12). The research team reported that mothers received inconsistent information, little support, a lack of empathy, judgmental attitudes, or simply no information from healthcare personnel, especially maternal–child nurses.

Though one can concede that inconsistencies in health information is a function of the complexity of the care delivery model in the United States, the lack of evidence-based breastfeeding knowledge among maternal–child staff has been historically documented in the literature (Cricco-Lizza, 2006; Dachew & Bifftu, 2014; Freed et al., 1995; Karipis & Spicer, 1999; Zadoroznyj, Brodribb, Young, Kruske, & Miller, 2015). Contemporary studies continue to explore the deficits in breastfeeding knowledge among maternal–child nurses (Clark, Anderson, Adams, Baker, Barrett, 2009; Cricco-Lizza, 2009; Darwent & Kempenaar, 2014; Deloian, Lewin, & O’Connor, 2015; O’Connor, Brown, & Lewin,
evaluated knowledge deficits among 3,736 nurses, 728 nurse practitioners/midwives, and 3,106 nursing students who participated in a free Web-based breastfeeding educational program between April 13, 1999 and December 31, 2011. Participants took a pre-test and post-test as part of the educational experience. Across the three groups, the modules with the lowest median pre-test scores were Anatomy/Physiology (67%), Growth and Development of the Breastfed Infant (67%), The Breastfeeding Couple (73%), and The Term Infant with Problems (60%). Although Deloian et al. (2015) emphasized the gaps in breastfeeding knowledge among nurses, it is apparent from their results that the knowledge deficits range from basic breastfeeding knowledge to essential breastfeeding management knowledge.

On a smaller scale, McLaughlin, Fraser, Young, and Keogh (2010) examined breastfeeding knowledge among a convenience sample of 241 pediatric nurses from metropolitan and regional hospital settings. The research team explored breastfeeding knowledge related to breastfeeding the hospitalized infant. A descriptive, cross-sectional survey design was employed in which the pediatric nurses self-reported answers to a 139-item questionnaire. One shocking revelation in the findings of McLaughlin et al.’s study was that almost half (45%) of the pediatric nurses reported that breast milk was nutritionally equivalent to formula. If pediatric nurses are not aware that formula is not the same as breast milk or of the potential damage of supplementation with formula, a major assumption can be made that formula promotion is part of a mother’s experience in the hospital.
After embarking on a retrospective analysis of data from the Infant Feeding Practices Study II performed by CDC from 2005-2007, Grummer-Strawn, Scanlon, and Fein (2008) found that formula use in the hospital was high. Responses to a 7-day food recall chart that was administered every month were reviewed from a sample of 1,782 mothers. Supplementation of breast milk with formula in the hospital was very common. About 52% of the mothers acknowledged the practice on the food recall chart.

Despite the fact that a body of evidence is building in the literature on maternal–child nurses’ breastfeeding knowledge, the issue of lack of adequate breastfeeding knowledge among front-line maternal–child staff is not as superficial as one may think. Further exploration into the formal lactation education training of maternal–child healthcare providers, such as registered nurses, revealed little training for providers either in school or on the job (Anderson & Geden, 2001; Martucci, 2012).

There is neither consistent nor extensive breastfeeding education in baccalaureate nursing curricula (Ahmed et al., 2011; Bozzette & Posner, 2013; Spatz, 2014). In a review of breastfeeding content in nursing textbooks, Philipp, McMahon, Davies, Santos, and Jean-Marie (2007) demonstrated that breastfeeding information was often omitted and at times was inaccurate and inconsistent. Furthermore, based on only 14.27% of births currently occurring in a facility that has implemented recommended care for lactating and breastfeeding mothers and babies, evidence-based breastfeeding training on the job is also lacking in the United States (CDC, 2014; Boyd & Spatz, 2013; Watkins & Dodgson, 2010). Instead, nurses tend to rely on information from their own clinical or personal breastfeeding experiences, which can result in improper breastfeeding or lactation management (Benoit & Semenic, 2014; Freed et al., 1995; Karipis & Spicer,
1999). Sadly, the main stakeholders who suffer directly from improper management are the mother and her baby; and, ultimately, the community.

In response, the United States Breastfeeding Committee (USBC), along with other leading experts, has indicated—with strong conviction—that it is critical to public health to increase breastfeeding knowledge among healthcare professionals (Spatz, 2014; USDHHS, 2011). The 20-hour WHO/UNICEF breastfeeding training was developed to eliminate inconsistencies in information and ensure that best practices for supporting breastfeeding dyads are adopted. WHO/UNICEF understood the gravity of the matter and created a solution (WHO, 1998; WHO/UNICEF, 1989, 2009).

**Impact of Breastfeeding-Knowledgeable Maternal–Child Nurses**

Although breastfeeding-knowledgeable maternal–child nurses may seem trivial in light of all other health competencies, it is in fact crucial in terms of today’s concern over maternal–child health. The implications of improper breastfeeding or lactation management make having knowledgeable breastfeeding maternal–child nurses not just important but essential (CDC, 2014; Hellings & Howe, 2004; USDHHS, 2011). The next six subsections will outline the impact of breastfeeding-knowledgeable maternal–child nurses.

**Mutually Beneficial Breastfeeding Support**

Martucci (2012) emphasized that providing breastfeeding support constitutes a unique form of emotional support for mothers. Because mothers seek emotional support from their nurses, breastfeeding support creates an opportunity for knowledgeable maternal–child nurses to meet one aspect of their patients’ emotional needs. Further,
Martucci explained that nurse-provided breastfeeding support is in itself empowering, because nurses do not require a physician’s order to do so. Hence, the provision of breastfeeding support by a knowledgeable maternal–child nurse is a mutually beneficial interaction between the nurse and the mother–baby dyad.

**Positive Perception of Support**

The quality of breastfeeding knowledge, combined with the advice of the maternal–child nurse, can affect nurses’ level of breastfeeding support (Britton, McCormick, Renfrew, Wade, & King, 2007). A literature review conducted by Clifford and McIntyre (2008) included 152 articles to determine who is supporting breastfeeding in this current environment. The authors concluded that both mothers and maternal–child nurses had a positive perception of the breastfeeding experience if the nurse was knowledgeable and had a positive attitude toward breastfeeding.

**Successful Breastfeeding Initiation and Exclusivity**

The United States Breastfeeding Committee and Dr. Miriam Labbok insist, based upon their work on breastfeeding support, that healthcare professionals impact a mother’s decision to initiate exclusive breastfeeding (Smith, 2010). Nurses are the largest group of healthcare professionals available to provide crucial breastfeeding support to mothers and their families. Thus, nurses can positively influence breastfeeding outcomes (Spatz, 2010b).

Because hospitals who have received the Baby-Friendly Hospital designation are required to train their nurses using the 20-hour WHO/UNICEF breastfeeding curriculum, the assumption can be made that such nurses are knowledgeable enough to support
breastfeeding with the best evidence-based practices. Philipp et al. (2001) demonstrated the impact of knowledgeable nurses on breastfeeding initiation and exclusivity by exploring the two outcomes before (1995), during (1998), and after (1999) Boston Medical Center sought and received the Baby-Friendly Hospital designation.

Boston Medical Center is an inner-city teaching hospital that provides care to a large number of low SES families. The medical center acquired the Baby-Friendly Hospital designation in 1999. Philipp et al. (2001) reviewed the medical records of 200 infants admitted to the newborn service at Boston Medical Center during 1995, 1998, and 1999. The charts were randomly selected by a computer. Infants were excluded for medical records missing feeding data, human immunodeficiency virus–positive parent, neonatal intensive care unit admission, maternal substance abuse, adoption, incarceration, or hepatitis C–positive mother. All infant feedings during the hospital postpartum stay were tallied, and each infant was categorized into one of four groups: exclusive breast milk, mostly breast milk, mostly formula, and exclusive formula. Maternal and infant demographic data were also collected. Infant and maternal demographics were similar for all 3 years (p values ranged from .013 to .66 for each demographic item).

Strikingly, as the nurses improved in their breastfeeding knowledge from 1995 to 1998 to 1999, the breastfeeding initiation rates increased as well. The breastfeeding initiation rate increased from 58% (1995) to 77.5% (1998) to 86.5% (1999). The exclusively breastfed infants also increased simultaneously. Infants who are exclusively breastfed only consume breast milk. Exclusively breastfed infants increased from 5.5% (1995) to 28.5% (1998) to 33.5% (1999). Knowledgeable maternal–child nurses can significantly influence breastfeeding initiation and exclusivity.
The relationship between knowledgeable maternal–child nurses and breastfeeding initiation was also confirmed in a contemporary study by Hawkins, Stern, Baum, and Gillman (2014). The investigators employed a quasi-experimental study design that utilized data gathered from the Pregnancy Risk Assessment Monitoring System (PRAMS) from 2004 to 2008 to: (a) examine compliance with the BFHI and (b) evaluate the BFHI and its components on breastfeeding initiation and duration overall as well as according to maternal education level. Nine hundred and fifteen mothers who gave birth in four hospitals that were BFHI-accredited or became accredited and 1,099 mothers from six matched non-BFHI facilities. Mothers reported on seven (of 10) BFHI practices (breastfeeding practice score 0–7) and receipt of a gift pack with formula (yes/no). Among mothers with lower education, the BFHI increased breastfeeding initiation by 8.6 percentage points (adjusted coefficient, 0.086 [95% CI, 0.01 to 0.16]) and, independently, each additional breastfeeding practice was associated with an average increase in breastfeeding initiation of 16.2 percentage points (adjusted coefficient, 0.162 [95% CI, 0.15 to 0.18]). The study further solidified the link between breastfeeding initiation and knowledgeable maternal–child nurses. One major limitation of the study, however, was self-report of breastfeeding by the mother.

**Longer Breastfeeding Duration**

The positive ripple effect in the community of strong breastfeeding support by knowledgeable maternal–child nurses in the hospital was a profound finding by The United States Breastfeeding Committee and Dr. Miriam Labbok (Smith, 2010). Nurse researchers Ekstrom, Kylberg, and Nissen (2012) investigated the impact of knowledgeable maternal–child nurses on mothers’ exclusive breastfeeding duration in a
randomized control study with longitudinal follow up at 3 days, 3 months, and 9 months postpartum. Ten municipalities in Sweden were randomized to the either the intervention (breastfeeding training) or control (no breastfeeding training) groups. Midwives and postnatal nurses were the types of maternal nurses that were included the study. Primiparas—first-time mothers \( n = 540 \)—living in either an intervention or a control municipality were asked to participate in the longitudinal study to evaluate the care given. The researchers found that the intervention group of mothers had a significantly longer duration of exclusive breastfeeding than the corresponding mothers in the control group \( p = 0.01 \). As a result, the authors associated breastfeeding training with delayed introduction of breast milk substitutes (formula) after discharge from the hospital and thus a longer duration of breastfeeding. One limitation of the study was the inability to control for previous breastfeeding training among the maternal–child nurses. Nonetheless, this study still illustrates the positive impact of knowledgeable maternal–child nurses on duration of breastfeeding.

**Improved Health Benefits**

With all the well-recognized health benefits of breastfeeding, the latter has become a primary healthcare strategy that protects mothers and infants. Breastfeeding-knowledgeable maternal–child nurses provide effective evidence-based breastfeeding support (Watkins & Dodgson, 2010). The positive ramification of more breastfeeding mother–baby dyads is a healthier nation. The decision to not breastfeed because of poor information or misguided advice could be a decision to shorten the lifespan or decrease the quality of life of the mother, baby, or both (Gonzalez-Jimenez, Garcia, Aguilar, Padilla, & Alvarez, 2014; Salone, Vann, & Dee, 2013).
Financial Benefits

Since maternal–child nurses are largely responsible for supporting breastfeeding and lactation in mothers, maternal–child nurses are, therefore, responsible for the economic ramifications. Smith (2013) claimed that the potential loss of economic value from not protecting women’s lactation and milk production from competing market pressures is large. Thus, maternal–child nurses who are not knowledgeable enough to support breastfeeding could be costing the country money. Smith insisted that, in Australia, current human milk production levels exceed $3 billion annually. Smith also contended that the United States has the potential to produce human milk worth more than US$110 billion a year, but currently nearly two-thirds of this value is lost due to premature weaning. In Norway, production valued at US$907 million annually is 60% of its potential value. Knowledgeable maternal–child nurses can indeed make an economic difference.

Types of Maternal–child Nurses

Nursing and breastfeeding literature is filled with examples that illuminate the critical role of the nurse in supporting breastfeeding (Bomer-Norton, 2014; Kjelland, Corley, Slusher, Moe, & Brockopp, 2014; Kornides & Kitsantas, 2013; Pentecost & Grassley, 2014; Spear, 2010; Weddig, 2011). A large body of evidence also exists to support the premise that pregnancy and the immediate postpartum period are the most influential timeframes (CDC, 2014; USDHHS, 2011). In the U.S., nurses who primarily care for mothers during those timeframes work in labor and delivery, postpartum, and the neonatal intensive care units (Martucci, 2012; Weddig, 2011).
With the nursing research indicating that nurses who are knowledgeable, have a positive attitude, and foster a good perception of breastfeeding support have better breastfeeding outcomes, nurse researchers tested breastfeeding knowledge and experiences specific to the type of nurse (Darwent & Kempenaar, 2014; Deloian, Lewin, & O’Connor, 2015; Pentecost & Grassley, 2014). For instance, Muthike (2014) explored the lived experience of postpartum nurses. The qualitative study featured a sample of 14 nurses who revealed that their own difficulties with breastfeeding impacted their perception of breastfeeding support. The participants were more empathetic when they had personal struggles with breastfeeding.

Nurse researchers also tested breastfeeding educational interventions specific to the type of nurse (Spiby et al., 2009). To illustrate, Bernaix, Schmidt, Arrizola, Iovinelli, and Medina-Poelinez (2008) tested an educational intervention designed to improve the knowledge, attitudes, and beliefs of NICU nurses. The educational intervention was 4 hours long, NICU-specific, and included information on how to augment the support that the mother may have received from labor and delivery and in postpartum nurses.

It is, therefore not uncommon that, because of the fragmentation of care in the U.S. system, each type of nurse in the hospital may have specialty-specific breastfeeding knowledge either from experience or on-the-job training (Deloian et al., 2015; McLaughlin, Fraser, Young, & Keogh, 2011; Weddig, 2011). Deloian, Lewin, and O’Connor (2015), as one of their objectives in evaluating an online breastfeeding education program, measured the baseline knowledge of 3,736 nurses, 728 nurse practitioners/midwives, and 3,106 nursing students from across the United States who completed one pre-test or post-test on the Breastfeeding Basics website between April
1999 and December 2011. The study conclusion for this objective was that gaps exist in nurses’ breastfeeding knowledge of caring for both preterm infants and healthy term infants.

Not all maternal–child nurses know how to take care of a healthy full-term infant, because maternal–child nurses include neonatal and labor and delivery nurses. Labor and delivery nurses may not know how to assist with breastfeeding beyond the first feed because the baby is taken care of after birth by a postpartum nurse or a neonatal nurse. Hence, each specialty nurse will not be able to set the mother up for success from birth to the postpartum period, because there is a lack of or inadequate understanding of the next breastfeeding support strategies beyond their care specialization.

Deloian et al.’s (2015) conclusion, which highlights the inability of maternal–child nurses to provide effective continuity of care, adds weight to research findings that show mothers receive inadequate and often misinformed breastfeeding support because of fragmented care in the hospital (Hauck, Graham-Smith, McInerney, & Kay, 2011). It is important to note that Deloian et al. (2015) did not have a randomly selected sample, which is a major limitation of the study; nevertheless, the sample size was large (7,570).

**Breastfeeding Education for Maternal–child Nurses**

Ineffective and/or inadequate breastfeeding education is a popular reason for maternal–child nurses’ poor knowledge of breastfeeding and lactation (Bozzette & Posner, 2013). Bozzette and Posner explained that the problem stems from the fact that most nursing programs provide little to no breastfeeding content in their curriculum. In 2003, Chiu, Gau, Kuo, and Chung investigated problems commonly seen in the clinical breastfeeding practice of undergraduate nursing students. A sample of 60 students in their
second year of nursing and who had completed obstetric nursing education participated in a clinical performance breastfeeding examination. The most common mistakes ranged from identifying when a baby is ready to initiate or stop breastfeeding to health teaching during a breastfeeding session. The pass rate in the clinical examination was only 26.67%.

Dodgson and Tarrant (2007) maintained that it is the educational institution’s responsibility to provide nursing students with the knowledge and practical experiences of best practices and international standards of care. As early as 2005, Spatz (2005) proposed a model for educating nursing students with a sample course schedule. To date, permanent changes to include breastfeeding as a standard part of nursing education has not occurred (Bozzette & Posner, 2013). Nursing graduates enter the hospital setting with limited ability to assist mothers with breastfeeding and/or lactation.

In order to compensate for the lack of knowledge and skill of nursing graduates to the maternal–child field, many hospitals provide in-service programs to their nursing staff (Bozzette & Posner, 2013). Research has shown that targeted breastfeeding education has been successful at significantly increasing maternal–child nurse knowledge, attitudes, beliefs, and perceptions of breastfeeding support (Cricco-Lizza, 2009; Li et al., 2014; Moran, Bramwell, Dykes, & Dinwoodie, 2000; Zakarija-Grkovic et al., 2012; Zakarija-Grkovic & Burmaz, 2010). Outlining the appropriate breastfeeding training for maternal–child nurses has been addressed by nursing experts in breastfeeding and lactation research and practice (Spatz & Pugh, 2007).

Specifically, the American Academy of Nursing endorsed core competencies for nurses that were developed from the United States Breastfeeding Committee (Spatz,
2014). The competencies were categorized into: (a) knowledge competencies, (b) skills competencies, and (c) attitudes competencies. Nonetheless, the majority of international breastfeeding and lactation experts agree that the maternal–child nurses should receive at least the 20-hour WHO/UNICEF breastfeeding training as the international evidence-based standard (Baby-Friendly USA, 2015; Bozzette & Posner, 2013; Watkins & Dodgson, 2010).

**Instructional Methodology of Breastfeeding Education**

According to the 20-hour WHO/UNICEF breastfeeding training curriculum, the instructional methodology that is best suited to train maternal–child staff is classroom instruction (Baby-Friendly USA, 2015; Watkins and Dodgson, 2010). However, some experts may challenge the view that classroom instruction is the best-suited methodology for maternal–child nurse training. One such group of experts is Bozette and Posner (2013), who argue that there is significant cost and time associated with training all maternal–child nurses in a hospital with 20 hours of classroom instruction.

Admittedly, when it comes to the topic of instructional methodology, most experts will readily agree that computer-based instruction is cheaper and more convenient to the learner. Where this agreement ends, however, is on the question of knowledge retention, knowledge gain, impact on attitude, and impact on perception of skill (Maloney et al., 2012; Nousiainen, Brydges, Backstein, & Dubrowski, 2008; Platz, Liteplo, Hurwitz, & Hwang, 2011; Porte, Xeroulius, Reznick, & Dubrowski, 2007). Whereas some experts are convinced that classroom instruction is superior in improving those outcomes, others maintain that classroom and computer-based instruction are comparable.
in improving these same outcomes (Jordan et al., 2013; Maloney et al., 2011; Platz et al., 2011).

Recent work comparing computer-based instruction and classroom instruction also challenges proponents of classroom instruction by noting that millennial learners prefer computer-based instruction (Jordan et al., 2013). Jordan et al. (2013) compared asynchronous, computer-based instruction with traditional didactics (classroom instruction) for 44 senior medical students during a week-long intensive course in acute care. The study employed a prospective, quasi-experimental design. Pre- and post-tests to measure knowledge gain and change in attitude were administered. The investigators hypothesized that both modalities would be equivalent. Not surprisingly, a higher percentage of students preferred computer-based to classroom instruction, 39.6% and 23%, respectively. Flexibility of the computer-based instruction made this format more desirable. The learners, who were millennials, indeed preferred computer-based, self-paced instruction.

Surprisingly, the knowledge gain mean difference between classroom instruction and computer-based instruction was 18.45% with 95% CI [10.40 to 26.50]; $p = .0001$. In light of these findings and despite the limitations of study design in terms of limited generalizability and weak claims to causality, Jordan et al. (2013) made the bold recommendation of caution in trading in traditional classroom lectures in favor of asynchronous computer-based education for novice learners in acute care. At first glance, Jordan et al.’s recommendation is bold. But closer inspection of the nursing literature of breastfeeding training for maternal–child nurses appears to validate that recommendation.
Consider the following. Maternal–child nurses who operate in an acute setting are novice learners when it comes to breastfeeding and lactation knowledge and support. Maternal–child nurses are novices because they lack adequate training to be considered experts. The lack of training is evident by the struggling breastfeeding outcomes and unsatisfied mothers (CDC, 2014; USDHHS, 2011). Because maternal–child nurses are novice learners, Jordan et al.’s (2013) findings are interestingly similar to that of leading nurse researchers who tested breastfeeding educational interventions among maternal–child nurses and found that classroom instruction significantly increased breastfeeding knowledge and support among maternal–child nurses (Bernaix et al., 2008; Law et al., 2007; Mellin, Poplawski, Gole, & Mass, 2011).

In recent work, Mellin Poplawski, Gole, and Mass, (2011) investigated whether implementation of a formal breastfeeding education program including a breastfeeding protocol, a resource guide, and educational presentations would have an impact on knowledge, comfort level, and attitudes toward breastfeeding among healthcare providers, as well as on the amount of exclusive breastfeeding at their hospital. The educational intervention was a 1-hour evidence-based presentation (classroom instructional methodology) given to all maternal–child nurses as well as other maternity healthcare providers. The study employed a quasi-experimental design that included a survey to obtain a pre-intervention baseline measurement and a post-intervention measurement 6 months after the formal breastfeeding educational program. Healthcare providers showed increased levels of knowledge and comfort dealing with breastfeeding issues after the education program. Knowledge scores were significantly improved (pre-vs. post-implementation scores were 20.2 vs. 22.2, \( p < .05 \)). Comfort level scores were
also significantly improved (pre- vs. post-implementation scores were 20.7 vs. 29.4, \( p < .05 \)). There was no statistically significant change in attitude toward breastfeeding (pre-implementation score = 43.8, post-implementation score = 43.4, \( p = .075 \)). Besides the limitations of the study design, results from this study are limited by the small sample size as well as the fact that the study was carried out in one suburban hospital with a primarily homogenous population of affluent Caucasians.

Computer-based, self-paced breastfeeding training has also been shown to improve breastfeeding knowledge gain among maternal–child nurses. Deloian et al.’s (2015) study, as discussed in the “type of maternal–child nurse” section of this dissertation, demonstrates these results. The argument could be posed, then, of comparable outcomes between the two instructional methodologies.

Another type of instruction methodology to evaluate breastfeeding knowledge gain that has been tested by breastfeeding experts is the combination of classroom instruction and computer-based instruction. An example of such a research study that also has a more robust design is a quasi-experimental time series pre-test/post-test study by Bernaix, Beaman, Schmidt, Harris, and Miller (2010). The objective was to test the effect of a breastfeeding educational program for improving breastfeeding knowledge, attitudes, and perceptions of support of maternal–child nurses. The educational intervention comprised: (a) a self-study of 10 modules and (b) a peer training component. Thirteen hospitals in Midwestern and East Coast states participated in the study. Nine units (206 maternal–child nurses) were experimental sites and three (34 maternal–child nurses) were control sites. Both the experimental and the control group completed two questionnaires. The experimental group completed the surveys upon study entry and then again after
completion of the educational intervention. The control group completed the questionnaires twice with a 4- to 6-week interval between without access to the self-study module. The latter is a limitation because peer training in the control group could not be measured or controlled. Moreover, convenience sampling and the small sample size of this study present more limitations and generalization of findings. Nonetheless, Bernaix et al. (2010) reported significant improvements in breastfeeding knowledge \( (t = 10.99, p < .001) \), attitudes \( (t = 2.77, p = .006) \), and perceptions [beliefs \( (t = 2.58, p = .011) \) and intentions \( (t = 3.00, p = .003) \)].

Other researchers have done a synthesis of the literature to explore the impact of breastfeeding educational interventions for health professionals (Spiby et al., 2009; Ward & Byrne, 2011; Watkins & Dodgson, 2010). A contemporary example that focused on effects of knowledge gain and increased confidence in maternal–child nurses is a research synthesis that followed Cooper’s (1998) five stages of research synthesis (Watkins & Dodgson, 2010). The databases searched included CINAHL, ERIC (via CSA Illumina), PsychInfo, MEDLINE, and Cochrane. Eighty-seven studies were initially identified. Twenty-seven studies met the inclusion criteria and the final sample was 14 intervention studies described in 15 articles.

The articles were diverse in country of origin, study participants (maternal–child nurses were 78.6%), design, and setting. Only four of the articles were randomized controlled trials, which is a limitation of the review. However, the authors concluded that breastfeeding knowledge among maternal–child nurses is a modifiable factor that can be impacted by an educational intervention. Maternal–child nurse confidence was also increased with breastfeeding education.
The most revealing unintentional outcome of the synthesis was the non-standardized breastfeeding educational interventions among the studies reviewed. There was an assortment of intervention lengths (from as short as 40 minutes to as long as three days), instructional methodology (in-person, video, Web-based, CD-ROM, information sheets, home visits) and content (researcher-developed or commercially available). It follows, then, that effectiveness research of instructional methodology via a meta-analysis is an understandable challenge and a major gap in the literature.

Another alarming gap in the literature is the number of researchers who tested the effectiveness of the international “gold standard” of breastfeeding education—the 20-hour WHO/UNICEF breastfeeding training (Ward & Byrne, 2013). Moran, Bramwell, Dykes, and Dinwoodie (2000) conducted a quasi-experimental study with a nonrandomized, between-subject design to test breastfeeding support skills among midwives in the United Kingdom who had completed the 20-hour WHO/UNICEF breastfeeding training. The instructional methodology of the training was classroom. Breastfeeding support skills were evaluated pre- and post-training using the breastfeeding support skills tool (BeSST) that was developed and validated by the same researchers in 1999. The sample included 13 pre-training midwives and 15 post-training midwives from 4 different hospitals. A number of methodological weaknesses are already evident—non-experimental design, lack of randomization, and small sample size. Nonetheless, improvements were reported on breastfeeding support skills when the post-training group (mean = 29.9) was compared to the pre-training group (mean = 19.8), \( t(23.39) = 2.94, p < .01. \)
Another team of researchers evaluated the effectiveness of the 20-hour WHO/UNICEF breastfeeding training in improving health professionals’ knowledge, practices, and attitudes to breastfeeding among five maternity facilities in Croatia (Zakarija-Grkovic & Burmaz, 2010). Over a 2-year period, an anonymous questionnaire testing knowledge (6 questions), practices (6 questions), and attitudes (the 17-item validated Iowa Infant Feeding Attitude Scale [De la Mora, Russell, Dungy, Losch, & Dusdieker, 1999]) was distributed to 425 health professionals before the training and 308 health professionals after the training. The instructional methodology of the training was classroom. Once again, the same methodological limitations existed—non-experimental design and lack of randomization. In this study, however, the sample size was larger and more diverse, which improves generalizability. The majority of the participants in the training were midwives, followed by nurses, pediatricians, and finally, gynecologists. The proportion of health professionals who recognized hospital practices that support breastfeeding doubled after the training ($p < .001$). The number of staff with positive attitudes toward breastfeeding increased from 65% to 79%, whereas the number of staff with neutral attitudes dropped from 26.6% to 9.9% ($p < .001$). The overall conclusion was that the 20-hour WHO/UNICEF breastfeeding training was effective in statistically improving health professionals’ breastfeeding knowledge, attitudes, and practices.

The third and last retrieved study was conducted by the same Croatian researchers from 2008 to 2009 with a few new colleagues (Zakarija-Grkovic et al., 2012). Using a pre-post design with longitudinal follow-up at 3, 6, and 12 months, the team evaluated hospital practices and breastfeeding rates before and after the 20-hour WHO/UNICEF breastfeeding training. Again, the instructional methodology of the training was
classroom and the results demonstrated a significant improvement in some hospital practices and initial exclusive breastfeeding rates.

Ultimately, several studies exist in the literature exploring impact of education on breastfeeding knowledge, attitude, and perception of support. All the studies explored one instructional methodology and only three studies utilized the 20-hour WHO/UNICEF breastfeeding training as the educational intervention. None of the researchers in the literature compared instructional methodology for breastfeeding education for maternal–child nurses. Because of the non-equivalency of breastfeeding education interventions and outcomes, meta-analyses and literature reviews have not been able to conduct comparisons that examine the impact of instructional methodology. Therefore, questions remain about which is the most effective instructional methodology to educate maternal–child nurses.

Summary

Significant benefits to the mother and baby are acquired when maternal–child nurses support the breastfeeding dyad. It is thus in the public’s best interest to have knowledgeable maternal–child nurses (CDC, 2014; Spatz, 2014; USDHHS, 2011). The reality is that the majority of nursing education curriculum does not have adequate breastfeeding and lactation content; and, once in practice, nurses either have specialty specific knowledge, no knowledge, or grossly inaccurate knowledge (Martucci, 2012; Watkins & Dodgson, 2010). To compound the problem, effectiveness research on instructional methodology to best support maternal–child nurses’ breastfeeding training is lacking in the literature (Watkins & Dodgson, 2010). Studies exist that use either classroom or computer-based instruction, but no studies could be retrieved that compared
both methodologies (Ward & Byrne, 2011). Further, no studies could be retrieved that compared both methodologies using the international standard for breastfeeding training—the 20-hour WHO/UNICEF breastfeeding training. There is a need in the literature for comparative effectiveness research on instructional methodology for maternal–child nurses’ breastfeeding education.

**Maternal–Child Nurse Perception of Breastfeeding Support**

Maternal–child nurse perception of breastfeeding support is the ability of the nurse to recognize best practices that support breastfeeding and lactation (Zakarija-Grkovic & Burmaz, 2010). Researchers have identified several factors that can influence a nurse’s ability to be aware of or recognize best practices—(1) breastfeeding and lactation knowledge (Ward & Byrne, 2011); (2) type of nurse (Kjelland et al., 2014); (3) attitude toward breastfeeding (Grassley & Nelms, 2008; Toyama, Kurihara, Muranaka, & Kamibeppu, 2013); (4) previous breastfeeding experience (Hauck et al., 2010); and (5) social environment (Dodgson, Bloomfield, & Choi, 2014). These factors complicate breastfeeding and lactation support by maternal–child nurses.

Yet, Martucci (2012) argued that the role of the nurse in shaping the meaning and experience of the breastfeeding and lactating mothers in the United States has been overlooked. Providing breastfeeding and lactation support to mothers and babies in the hospitals and birthing centers is part of the job function of every maternal–child nurse (CDC, 2014). However, Martucci explained that, beginning in the 20th century, when more babies were born in the hospital and breastfeeding practices were in a general decline, the battle between the breasts vs. formula was a formidable struggle. The idea of formula feeding appealed to nurses because of both institutional and maternal factors.
In general, nurses felt that providing breastfeeding support to mothers was an arduous task (Martucci, 2012). Both mothers and nurses came to realize that nurses did not favor assisting breastfeeding mothers. Formula feeding was easier. Further, hospital policies and procedures, such as feeding schedules, completely contradicted the principles of breastfeeding. Therefore, maternal expectations of breastfeeding support and nursing execution of breastfeeding support became polar opposites. As a result, mothers struggled with breastfeeding in the hospital and nurses became less knowledgeable and experienced at providing breastfeeding and lactation support. Hence, moving into the 21st century, nurses’ perception of what adequate breastfeeding and lactation support should look like was less than optimal (Martucci, 2012).

**Impact of Positive Maternal–child Nurse Perception of Breastfeeding Support**

Just as knowledgeable maternal–child nurses can impact health outcomes, nurses who have a positive perception of breastfeeding and lactation support and are able to recognize best practices in order to implement them when applicable will directly improve the health outcomes of mothers and babies (Kornides & Kitsantas, 2013). The next four subsections will outline the impact of maternal–child nurses who have positive perceptions of breastfeeding support.

**Satisfying Experience for Mother and Nurse**

There is documented evidence in the literature that mothers value the breastfeeding and lactation support that they receive from maternal–child nurses (Atchan, Davis, & Foureur, 2013; Grassley & Nelms, 2008; Pentecost & Grassley, 2014). Nurses also have an intrinsic desire to support mothers with all their birthing needs (Martucci,
2012). When both the nurse and the mother are able to meet each other’s needs, the encounter is a satisfying experience for both parties (Pentecost & Grassley, 2014).

**Positive Reputation for Institutions**

It is well established that Baby-Friendly hospitals give mothers and babies the best start in feeding their babies (Baby-Friendly USA, 2015; Ferrarello, 2012; Pound & Unger, 2012). In a Baby-Friendly hospital, everyone who cares for the mother is trained to support mothers’ breastfeeding and lactation needs. An in-depth review of global implementation of the Baby-Friendly Hospital Initiative indicates that maternity care is a top priority for both developed and developing countries and thus institutions are embarking on becoming Baby-Friendly in greater numbers than previous years (Labbok, 2012). Acquisition of the Baby-Friendly designation positively reflects on that institution’s dedication to evidence-based maternity care.

**Financial Benefits**

The Institute for Healthcare Improvement describes an approach to optimizing health system performance called the “Triple Aim” (Institute of Healthcare Improvement [IHI], 2015). The Triple Aim has three dimensions, which include: (1) population health, (2) experience of care, and (3) per capita cost. The focus on cost and quality care was also embraced by the Centers for Medicare and Medicaid Services (CMS) in the embodiment of the hospital value-based purchasing program. Hospitals receive reimbursement based on their quality outcomes and patient experience (CMS, 2015). Breastfeeding and lactation support is a major part of patient experience for maternity hospitals. Hence, hospitals that implement the *Ten Steps to Successful Breastfeeding*
(WHO/UNICEF, 1989) will have higher patient experience with breastfeeding and lactation and, thus, a higher reimbursement potential. Hospitals who acquire the Baby-Friendly designation will have external validation that they have correctly implemented the Ten Steps and can feel more confident about a higher reimbursement margin compared to non-Baby-Friendly hospitals.

**Better Health Outcomes**

When compared with the health outcomes of formula-fed children, breastfed children have irrefutable advantages (Salone et al., 2013). Moreover, children who are breastfed longer experience more health benefits (Musilova et al., 2014). Since maternal–child nurses can impact both the initiation and duration of breastfeeding and lactation, it is safe to make the assumption that nurses who are aware of and implement best practices will positively impact breastfeeding outcomes (Spatz, 2010b). This assumption is supported by work done by Rempel and McCleary (2012) in a Canadian public health agency. The investigators compared breastfeeding knowledge and practice beliefs before and one year after the implementation of a breastfeeding best practice guideline (BPG). The public health nurses surveyed before and 1 year after implementation reported increased BPG-related knowledge and stronger beliefs regarding breastfeeding duration beyond 1 year. The impact of more knowledgeable and more self-aware nurses was that mothers in the post-implementation period were still breastfeeding at 6 months and intended to continue breastfeeding longer compared to no breastfeeding mothers at 6 months in the pre-implementation period.
Infant Feeding Attitude among Maternal–Child Nurses

Maternal–child staff attitudes toward infant feeding have long been an area of interest for breastfeeding and lactation researchers (Bernaix, 2000; Leahy-Warren, Mulcahy, Phelan, & Corcoran, 2013; Maheshwari, Gupta, Arora, Karunakaran, & Bhandari, 1987; Walsh, Pincombe, & Henderson, 2011). Personal experience, attitudes, and beliefs can impact one’s perception of breastfeeding support (Toyama et al., 2013). An examination of maternity staff attitudes towards implementing the Baby-Friendly hospital initiative in Australia revealed that staff attitudes can hinder or promote the initiative (Walsh et al., 2011). The examination was done via focus group interviews of 31 maternal–child staff participants in differing roles from six hospitals. In addition, to understand the role of staff attitudes, education was also found to be important to improve staff practices and support.

Summary

Healthcare professionals who are knowledgeable and confident in a skill are more likely to practice the skill (Walsh et al., 2011). Moreover, if their beliefs and perceptions of the skill are positive, they are also more likely to practice the skill (Hawkins et al., 2015). Breastfeeding support by maternal–child nurses is no exception to that rule. Breastfeeding education, instructional methodology, type of nurse, attitude, and knowledge can impact perception. The relevance of perception of breastfeeding support is its direct impact on breastfeeding outcomes (Monterrosa et al., 2013).
Conclusion

In conclusion, nurses’ breastfeeding knowledge and perceptions about breastfeeding support can significantly affect mothers’ breastfeeding success (Clifford & McIntyre, 2008). Training maternal–child nurses can affect breastfeeding knowledge and improve support of breastfeeding mothers (Watkins & Dodgson, 2010), but it is unclear which instructional methodology of educating maternal–child nurses best impacts breastfeeding knowledge gain and perception of support. Specifically, how breastfeeding knowledge gain and perception of breastfeeding support change based on instructional methodology, type of nurse, or breastfeeding educational content has not been explored. Furthermore, the best predictor of maternal–child nurse perception of breastfeeding support among factors such as instructional methodology, infant feeding attitude, and breastfeeding knowledge gain has not been studied either. This study attempted to fill these gaps and add to the body of knowledge by exploring the most effective instructional methodology for training maternal–child staff with best evidence-based material to date, the 20-hour WHO/UNICEF breastfeeding training course (Britton et al., 2007).
Chapter 3

Methodology

This chapter presents an overview of the methodology of the study. The study purpose, design, sampling, instrumentation, data collection procedures, data analysis, and protection of human subjects. A detailed description of the parent educational intervention will also be presented.

Purpose

The purpose of this study was to evaluate the impact of instructional methodology (classroom versus computer-based) on the maternal–child nurse’s breastfeeding knowledge gain and perception of breastfeeding support for nurses that participated in the 20-hour WHO/UNICEF breastfeeding training.

Study Design

This study was a secondary data analysis of selected data collected between January 2013 and August 2013 from a South Florida metropolitan hospital as part of the mandatory requirement that maternal–child nurses—labor and delivery, postpartum, and neonatal—be educated with the 20-hour WHO/UNICEF breastfeeding training.
Parent Intervention

Setting

The parent educational intervention took place in a South Florida metropolitan hospital with approximately 450 beds. The hospital is part of a not-for-profit healthcare system with four maternity hospitals and more than 500 maternal–child staff. However, this hospital is the center of excellence for maternity care in the system and provides award-winning services. The hospital has about 300 maternal–child nurses, including labor and delivery, postpartum, and neonatal nurses. The hospital is also on the road to achieving Baby-Friendly designation. This initiative was led by a leadership appointed taskforce of maternal-child staff with expertise in breastfeeding. At the time of the intervention, the researcher chaired the taskforce.

Intervention

Between January 2013 and August 2013, one South Florida metropolitan hospital embarked on a program to educate all $N=556$ maternal–child staff (nurses, physicians, clinical partners, non-clinical unit staff) with the 20-hour WHO/UNICEF breastfeeding training (199 computer-based and 322 classroom). See Appendix C for the detailed curriculum. The content and materials for the 20-hour training was purchased from Healthy Children’s Center for Breastfeeding (2012)—the largest national provider of lactation management education for healthcare professionals for the past 30 years.

The content of the 20-hour training was offered in five 4-hour sessions. Each maternal–child staff member had to take all five of the 4-hour sessions in order for each nurse to achieve the 20-hour requirement. The content objectives of each of the five
sessions were organized as depicted in Appendix D. Table 1 gives the general topics, skills, and interactive games (only in the classroom sessions) in each of the five sessions.

Table 1

*General Topics, Skills, and Interactives of the Five Sessions*

<table>
<thead>
<tr>
<th>Session</th>
<th>Topics</th>
<th>Skill</th>
<th>Interactive Game</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Introduction to Baby-Friendly Hospitals Initiative, Communication, &amp; Milk Physiology</td>
<td>Identification of Good Latch vs. Poor Latch</td>
<td>Role Playing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supporting a Breastfeeding Mother</td>
</tr>
<tr>
<td>Two</td>
<td>Promoting Breastfeeding during Pregnancy, Labor, and Immediately after Birth</td>
<td>Identification of Breastfeeding Holds for Mothers</td>
<td>Role Play Assisting with a Breastfeed</td>
</tr>
<tr>
<td>Three</td>
<td>Practices that Assist with Breastfeeding and the Promotion of Milk Supply</td>
<td>Hand Expression &amp; Assisting with Pumping</td>
<td>Group Case Study on Assisting Mother with Hand Expression &amp; Pumping</td>
</tr>
<tr>
<td>Four</td>
<td>Supporting the Non-Breastfeeding Mother and the Mother with Special Needs</td>
<td>Safe Formula Preparation &amp; Safety</td>
<td>Role Play Safe Formula Preparation &amp; Safety</td>
</tr>
<tr>
<td>Five</td>
<td>Ongoing Support for Mothers and Making Your Institution a Baby-Friendly Hospital</td>
<td>Identification of Local Support Groups for Mothers &amp; the Stages of Local Support</td>
<td>Group Jeopardy based on Identification of Local Support</td>
</tr>
</tbody>
</table>
Sessions were offered in either a classroom or computer-based format. The same content was used for both the classroom and the computer-based format in all five sessions of each format. The assignment of computer-based or classroom format was assigned by the institution’s room scheduler based on the availability of classrooms and computer rooms. There was no organized or random assignment of rooms. The number of classroom and computer-based classes offered for each of the five sessions can be found in Table 2.

Table 2

*Number of Classroom and Computer-based Classes per Session*

<table>
<thead>
<tr>
<th>Session</th>
<th>Computer-Based</th>
<th>Classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Two</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Three</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Four</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Five</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Maternal–child staff chose which sections to attend based on personal convenience. Because each session had independent content, as noted in Appendix D, maternal–child staff were not required to take the five sessions in any particular order. Staff members signed up for each of the five sessions via the online hospital continuing education sign-up program.

Both the classroom and the computer-based sessions for all five sessions were led by the same instructor in the case of the classroom sessions and the same facilitator in terms of the computer-based sessions. The instructor or facilitator was always an International Board-Certified Lactation Consultant (IBCLC). The classroom sessions had an instructor because the material was taught to the staff members who attended this format. The classroom instruction incorporated instructor-led presentation of the material, interactive games, return demonstration, instructor’s personal breastfeeding stories, answering of maternal–child staff participant questions, and sharing of maternal–child staff participants’ personal breastfeeding stories. For the return demonstration, the participants were able to observe the instructor perform breastfeeding-related skills and then practice these skills in front of the instructor until they were performing them correctly. Pre- and post-educational measures were administered by the instructor.

The computer-based instructional methodology was administered in a computer room. Each maternal-child staff member had his or her own computer. The material for each session was loaded for each maternal–child staff member at the beginning of the session by the facilitator. The maternal–child staff member were then given 4 hours to complete the material, self-completed skills, and take the pre- and post-educational
measures at their own pace but within a 4-hour limitation. Once the maternal–child staff participants were done, they could leave.

The computer-based sessions had a facilitator because each staff member had a computer and could go through the material at his/her own pace for up to 4 hours. The rooms (classroom or computer) were booked for only 4 hours and the staff were mandated by leadership to complete each session in that timeframe. The facilitator only interacted with the maternal–child staff participants to load the material on the computer and provide pre- and post-educational measures.

Occasionally, the facilitator would assist with troubleshooting computer-related problems. There were no interactive games, instructor-led return demonstrations, instructor’s personal breastfeeding stories, answering of maternal–child staff participant breastfeeding questions, or sharing of maternal–child nurse participants’ personal breastfeeding stories. For skill demonstration, breastfeeding videos were loaded by the facilitator for each nurse to watch on his or her own computer during the 4-hour time limit. Demos were available for the staff to practice on their own based on the videos. However, the facilitator was not available for validation. It is important to note that post the 20-hour training for all staff, the taskforce planned to have yearlong hands on in-services for all staff on the required 5-hours of skills.

Due to the software restrictions of this program, staff did not know what instructional methodology (classroom or computer-based) they were signing up to attend until they arrived for the session. The nurses received four continuing education credits (CEUs) per 4-hour session attended for a total of 20 credits that could be applied toward
license and certification renewal. Both classroom and computer-based sessions received the same four CEUs.

**Measures**

Educational measures administered for both classroom and computer-based instructional sessions are: 1) a perception of breastfeeding support questionnaire, (2) knowledge tests, and (3) the Iowa Infant Feeding Attitude Scale (IIFAS), and 4) an optional standard evaluation. All measures were decided upon by the hospital-based maternal-child staff taskforce of breastfeeding experts and were paper-based.

**Data Storage**

Each unit’s (labor and delivery, postpartum, and neonatal) clinical educator kept an electronic spreadsheet with the names, dates, and scores for each measure of each maternal-child staff member on the unit’s shared drive for tracking, quality improvement, and accreditation purposes. The shared drive is accessed from a password-protected facility computer that is only accessible by the unit clinical educator.

**Secondary Study**

**Sample**

The sample of this secondary analysis was \( n = 521 \) cases of maternal-child nurse attendance from each of the five 4-hour sessions from a metropolitan South Florida hospital. Each case represented maternal-child nurse attendance to one of the five 4-hour sessions. Inclusion criteria for each case was: a) be a registered nurse, b) work as a maternal child- nurse (labor and delivery, postpartum, and neonatal), c) be employed full-
time, part-time, or per diem at the South Florida Hospital from January 2013 to August 2013. Participants were excluded if they did not meet all three of the above inclusion criteria.

**Instruments**

*Perception of breastfeeding support questionnaire.* This questionnaire (See Appendix E) was developed by the researcher (who was serving in the capacity of the chair of the hospital breastfeeding taskforce at the time) of this study based on the Ten Steps from each of the five sessions (WHO/UNICEF, 1989, 2009; WHO, 1998). The questionnaire was administered at the end of each of the five sessions in both the classroom and the computer-based sessions. The questionnaire has 11 statements reflecting breastfeeding support, and respondents were asked to indicate the extent to which they agree with each statement on a 5-point Likert scale ranging from 1 = “strongly disagree” to 5 = “strongly agree.” The reliability of this instrument has not been tested. The acceptability, face validity, and content validity of the instrument was tested with a group of ten breastfeeding experts who are IBCLCs and who were employed at the study hospital. A few minor corrections to the wording were made before the data collection began. Demographic (personal) data was also collected at the end of the questionnaire.

*Knowledge tests.* Knowledge tests were purchased as part of the commercial training 20-hour WHO/UNICEF breastfeeding training from Healthy Children’s Center for Breastfeeding (2015). Since these tests are copyrighted, they cannot be shared within this dissertation. The number of knowledge test questions and the test content per session is shown in Table 3.3 below. Knowledge tests were administered at the beginning and
end of each of the five sessions in both the classroom and computer-based sessions. The content validity of the test was assessed via a panel of breastfeeding experts at Healthy Children’s Center for Breastfeeding who were involved in the development of the test for commercial use.

Table 3

Knowledge Test Questions per Session

<table>
<thead>
<tr>
<th>Session</th>
<th>Number of Knowledge Test Questions</th>
<th>Test Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session One</td>
<td>18</td>
<td>Introduction to Baby-Friendly Hospitals Initiative, Communication, &amp; Milk Physiology</td>
</tr>
<tr>
<td>Session Two</td>
<td>20</td>
<td>Promoting Breastfeeding during Pregnancy, Labor, and Immediately after Birth</td>
</tr>
<tr>
<td>Session Three</td>
<td>11</td>
<td>Practices that Assist with Breastfeeding and the Promotion of Milk Supply</td>
</tr>
<tr>
<td>Session Four</td>
<td>29</td>
<td>Supporting the Non-Breastfeeding Mother and the Mother with Special Needs</td>
</tr>
<tr>
<td>Session Five</td>
<td>22</td>
<td>Ongoing Support for Mothers and Making Your Institution a Baby-Friendly Hospital</td>
</tr>
</tbody>
</table>

Iowa Infant Feeding Attitude Scale (IIFAS). Maternal–child staff members’ attitudes toward infant feeding were assessed using the IIFAS (De la Mora, Russell,
Dungy, Losch, & Dusdieker, 1999). Permission to use the scale was obtained by the researcher, who was in the capacity of hospital breastfeeding educator at the time of data collection. The IIFAS covers various dimensions of infant feeding (cost, nutrition, convenience, bonding) within 17 statements, and respondents were asked to indicate the extent to which they agree with each statement on a 5-point Likert scale ranging from 1 = “strongly disagree” to 5 = “strongly agree.” IIFAS is a reliable and validated tool shown to have a Cronbach alpha ranging from 0.85 to 0.86 (De la Mora et al., 1999). The scale was administered at the end of each of the five sessions in both the classroom and computer-based sessions. See Appendix G for the email permission request to use the scale. Upon publication of the dissertation, the scale will not be printed in full per request of the De la Mora et al. (1999).

**Demographic Characteristics**

Demographic information for the study included: (a) gender demographic, (b) number of years of nursing, (c) number of years at current institution, (d) number of breastfeeding educational hours prior to 20-hour training, and (e) personal breastfeeding experience. These demographic data were obtained as part of the perception of breastfeeding support questionnaire as seen in Appendix E.

**Study Variables**

This study had two dependent variables: (1) breastfeeding knowledge gain and (2) perception of breastfeeding support. The study also had five independent variables: (1) instructional methodology, (2) breastfeeding session, (3) infant feeding attitude, (4) type of nurse, and (5) knowledge gain. For clarity, the classification of each variable is listed.
Breastfeeding knowledge gain. This variable was both an independent and a dependent variable, depending on the specific aim being analyzed. It was a continuous variable (ratio level of measurement). Breastfeeding knowledge gain was the difference between pre- and post-session test scores from standardized tests that were commercially developed for the WHO/UNICEF 20-hour breastfeeding training for each of the five sessions. Both the pre- and post-session test scores were composite scores from the standardized tests assigned to that session.

Perception of breastfeeding support. This variable was a dependent variable. It was a continuous variable (ratio level of measurement). Perception of breastfeeding support is operationalized by a composite score from perception of breastfeeding support questionnaire given at the end of each session for both computer and classroom sessions. Scores range from 11 to 55, with a higher score indicating a more positive perception of breastfeeding support.

Instructional methodology. This was an independent variable. It was a dichotomous categorical variable (nominal level of measurement). Instructional methodology was operationalized as either classroom or computer-based. This variable was a single item score.

Breastfeeding session. This was an independent variable. It was a categorical variable (nominal level of measurement). This was one of the five 4-hour sessions of the WHO/UNICEF 20-hour breastfeeding training. Session was defined operationally as 1 through 5. This variable was a single item score.

Infant feeding attitude. This was an independent variable. It was a continuous variable (ratio level of measurement). Infant feeding attitude was measured by a
composite score on the IIFAS administered at the end of each of the five sessions in both classroom and computer-based sessions. IIFAS scores range from 17 to 85, with a higher score indicating a more positive attitude toward breastfeeding (De la Mora et al., 1999).

**Type of nurse.** This was an independent variable. It was a categorical variable (nominal level of measurement). This was the main unit and job function of the maternal–child nurse participant. Type of nurse was defined operationally as one of three categories: (a) labor and delivery nurse, (b) postpartum nurse, and (c) neonatal nurse. This variable was a single-item score.

**Data Storage**

The researcher was given a de-identified data set with requested study variables from each unit clinical educator on a hospital encrypted flash drive. No linkage dataset to participant names exists. The de-identified data set is password protected and was copied and stored on a password protected computer only accessible to the researchers.

**Data Analysis**

Data analysis was performed using the IBM SPSS Statistics Grad Pack 23 PREMIUM software. Prior to data analysis, a check of data integrity was done (Bannon, 2013). This integrity check included data cleaning, coding, and appropriateness of the data for analysis—notably parametric testing assumptions. An examination of test assumptions to indicate a satisfactory level of homoscedasticity, adequate sample size, linearity, independence, and normality was done. An assessment of the data to detect multicollinearity was also be performed and threats to data integrity were addressed. Non-parametric tests were utilized when parametric testing assumptions were not met.
The assumption of non-parametric tests that there be independence of observations was addressed.

Data analysis was conducted in three phases (Bannon, 2013). First, all study variables were analyzed descriptively via univariate analysis. Descriptive statistics for all continuous variables (breastfeeding knowledge gain [BKG], perception of breastfeeding support [PBS], and Infant feeding attitude [IFA]) included minimums, maximums, means, standard deviation, and frequencies. Mean is one measure of the central tendency of a probability distribution. A low standard deviation shows that the data points are near the average, whereas high standard deviation shows that much variation exists from the average (Faul et al., 2007). Descriptive statistics for all categorical variables (instructional methodology [IM], type of nurse [TN], breastfeeding session [BS]) included frequencies. Similarity of nurse participants between the two instructional methodologies was tested for each demographic item collected in the study.

Secondly, bivariate analysis between the dependent variable and independent variables was examined. Choice of bivariate analysis statistical test was based on type of variables (continuous vs. categorical). The alpha ($\alpha$) was set at .05 for statistical significance and at .01 when homogeneity of variance was not met. Effect size statistics were also calculated. Effect size statistics gives an indication of the magnitude of the relationship (Bannon, 2013; Pallant, 2013).

One-way between groups analysis of variance (ANOVA) was conducted between BKG and BS and TN independently as well as between PBS and BS and TN independently. The one-way between groups ANOVA compares the variance in scores (BKG or PBS) between the different groups (BS or TN) with the variance within each of
the groups (Bannon, 2013). Independent *t*-tests were performed with BKG and IM as well as PBS and IM. The *t*-test compares the mean score (BKG or PBS) for two different groups (IM, Bannon, 2013). Lastly, Pearson product-moment correlation coefficient was calculated to describe the strength and direction of the relationship between two-variable dyads (PBS & BKG, and PBS & IFA, Bannon, 2013).

In the third and final stage of data analysis, significant bivariate relationships were entered in the final multivariate model. Non-significant bivariate relationships were also be entered to detect interaction, overall significance of the model, and variance explained. Two-way between groups ANOVA was conducted to explore (PBS, IM, & BS; PBS, IM, & TN; BKG, IM, & BS; BKG, IM, & TN). This analysis allows the simultaneous testing for the effects of two independent variables on a dependent variable and also identifies any interaction effect (Pallant, 2013). Post hoc analysis was performed on all significant results to specify which group means were different from each other. Finally, a standard or simultaneous multiple linear regression was conducted to evaluate the predictive power of BKG, IM, and IFA on PBS (Bannon, 2013).

Because comparative research on educational interventions has not consistently been reported in the literature, effect sizes for variables similar to those being examined in this study have also not been reported (Spiby et al., 2009). An a priori power analysis indicated that a minimum of 129 study cases would provide sufficient statistical power (an alpha of .05; power of 80) to detect a medium effect (Cohen’s $f^2$ of .15) between independent and dependent variables within a multiple linear regression model using four predictors (Faul, Erdfelder, Buchner, & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007). An a priori power analysis indicated a minimum of 62 study participants would
provide sufficient statistical power (an alpha of .05; power of 80) to detect a medium
effect (Cohen’s $f^2$ of .15) between independent and dependent variables within a 2-way
between groups ANOVA model using four predictors (Faul et al., 2009; Faul et al.,
2007). Thus, the current number of 521 study cases should provide sufficient statistical
power. Power analyses were done using G*Power software.

In terms of missing data, the plan was to use multiple imputation if a substantial
amount of missing data (> 5%) existed in the data set. Bannon (2013) believed that, as the
field of quantitative research evolves, it is less and less acceptable to ignore missing data
in statistical analysis. Bannon (2013) explained that accounting for missing data values
using traditional methods, such as mean substitution, are flawed. Multiple imputation can
be performed using SPSS and is the most sophisticated method to account for missing
data.

Four specific aims framed the analysis for this study. Table 4 illustrates the
comprehensive data analysis plan with the associated specific aim and hypothesis. Each
statistical analysis was chosen based on type of variables and the assumption that only
parametric tests would be performed.
Table 4

*Comprehensive Data Plan with Associated Specific Aim and Hypothesis*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type/Level of Measurement</th>
<th>Univariate Analysis</th>
<th>Bivariate Analysis</th>
<th>Multivariate Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding Knowledge Gain (BKG)—Dependent Variable</td>
<td>Continuous/Ratio</td>
<td>Descriptives—min, max, mean, std. deviation, frequencies</td>
<td>BKG &amp; BS</td>
<td>BKG &amp; IM &amp; BS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1-way ANOVA)</td>
<td>(2-way ANOVA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Specific Aim</td>
<td>Specific Aim</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1a</td>
<td>2a</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BKG &amp; IM &amp; TN (2-way ANOVA)</td>
<td>BKG &amp; IM &amp; TN (2-way ANOVA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Specific Aim</td>
<td>Specific Aim</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1a</td>
<td>2a</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BKG &amp; PBS (Pearson product-moment correlation coefficient)</td>
<td>BKG &amp; PBS (Pearson product-moment correlation coefficient)</td>
</tr>
<tr>
<td>Variable</td>
<td>Type/Level of Measurement</td>
<td>Univariate Analysis</td>
<td>Bivariate Analysis</td>
<td>Multivariate Analysis</td>
</tr>
<tr>
<td>------------------------------</td>
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<td>-------------------------</td>
</tr>
<tr>
<td>Perception of Breastfeeding Support (PBS)</td>
<td>Continuous/Ratio</td>
<td>Descriptives—min, max, mean, std. deviation, frequencies</td>
<td>PBS &amp; BS (1-way between groups ANOVA)</td>
<td>PBS &amp; IM &amp; BS (2-way between groups ANOVA)—PBS &amp; TN (1-way between groups ANOVA)</td>
</tr>
<tr>
<td>Instructional Methodology (IM)</td>
<td>Categorical/ Nominal</td>
<td>Descriptives—frequencies</td>
<td>IM &amp; BKG (independent t-test)—</td>
<td>Specific Aim 1a</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------</td>
<td>--------------------------</td>
<td>-------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>IM &amp; PBS (independent t-test)—</td>
<td>Specific Aim 1b</td>
<td>IM &amp; BKG &amp; BS</td>
<td>(2-way between groups ANOVA)—</td>
<td>Specific Aim 3a</td>
</tr>
<tr>
<td>IM &amp; BKG &amp; BS</td>
<td>(2-way between groups ANOVA)—</td>
<td>Specific Aim 2a</td>
<td>IM &amp; PBS &amp; BS</td>
<td>(2-way between groups ANOVA)—</td>
</tr>
<tr>
<td>IM &amp; PBS &amp; BS</td>
<td>(2-way between groups ANOVA)—</td>
<td>Specific Aim 2a</td>
<td>IM &amp; BKG &amp; TN</td>
<td>(2-way between groups ANOVA)—</td>
</tr>
</tbody>
</table>

**Variable**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type/Level of Measurement</th>
<th>Univariate Analysis</th>
<th>Bivariate Analysis</th>
<th>Multivariate Analysis</th>
</tr>
</thead>
</table>

- Instructional Methodology (IM)
- Categorical/ Nominal

**Univariate Analysis**

- Descriptives—frequencies

**Bivariate Analysis**

- IM & BKG (independent t-test)—
- Specific Aim 1a
- IM & PBS (independent t-test)—
- Specific Aim 1b

**Multivariate Analysis**

- IM & BKG & BS (2-way between groups ANOVA)—
- Specific Aim 3a
- IM & PBS & BS (2-way between groups ANOVA)—
- Specific Aim 2a
- IM & BKG & TN (2-way between groups ANOVA)—
### Specific Aim 3b

**IM & PBS & TN**  
(2-way between groups ANOVA) —

### Specific Aim 3b

**PBS & BKG & IFA & IM**  
(Multiple regression) —

### Specific Aim 4

<table>
<thead>
<tr>
<th>Variable Type/Level of Measurement</th>
<th>Variable Type/Level of Measurement</th>
<th>Univariate Analysis</th>
<th>Bivariate Analysis</th>
<th>Multivariate Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Nurse (TN)</strong></td>
<td>Categorical/ Nominal</td>
<td>Descriptives—frequencies</td>
<td><strong>TN &amp; BKG</strong> (1-way between groups ANOVA)</td>
<td><strong>TN &amp; IM &amp; BKG</strong> (2-way between groups ANOVA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>TN &amp; PBS</strong> (1-way between groups ANOVA)</td>
<td><strong>Specific Aim 2a</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>TN &amp; PBS &amp; IM</strong></td>
</tr>
</tbody>
</table>
Breastfeeding Session (BS) & Categorical/Nominal Descriptives—frequencies

<table>
<thead>
<tr>
<th>Specific Aim 3b</th>
<th>BS &amp; BKG (1-way between groups ANOVA)</th>
<th>BS &amp; IM &amp; BKG (2-way between groups ANOVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS &amp; PBS (1-way between groups ANOVA)</td>
<td>BS &amp; PBS &amp; IM (2-way between groups ANOVA)</td>
<td>Specific Aim 3b</td>
</tr>
</tbody>
</table>

Infant Feeding Attitude (IFA) & Continuous/Ratio Descriptives—min, max, mean, std. deviation, frequencies

<table>
<thead>
<tr>
<th>Specific Aim 4</th>
<th>PBS &amp; IFA (Pearson product-moment correlation coefficient)</th>
<th>PBS &amp; BKG &amp; IFA &amp; IM (Multiple regression)</th>
</tr>
</thead>
</table>
Protection of Human Subjects

Institutional Review Board (IRB) exemption for the study was sought through the hospital system’s and the University of Miami’s IRBs. The study was deemed exempt by both IRBs. All research personnel had to abide by hospital confidentiality and privacy policies and procedures as well as safety policies. The protection of the privacy and confidentiality of participant information in this study was a high priority because the study data was collected from the participants’ past place of employment. As such, issues concerning coercion, lack of privacy, lack of confidentiality, and fear of loss of employment were addressed.

Confidentiality and privacy was protected by several mechanisms. First, the electronic de-identified data set used by the researcher included only the study variables of interest. Individual ID numbers were assigned to the respondents. No linkage database of the participants’ names and ID numbers exists. Further, the researcher is no longer employed by the hospital and does not have access to the unit educator data set either. The researcher received demographic data—(a) gender demographic, (b) number of years of nursing, (c) number of years at current institution, (d) number of breastfeeding educational hours prior to the 20-hour training, and (e) personal breastfeeding experience and length of breastfeeding if the participant personally breastfed—collected on the perception of breastfeeding questionnaire. This demographic data does not meet the level of any of the 18 identifiers listed by the USDHHS (2015) in accordance with the Health Insurance Portability and Accountability Act of 1996 (HIPAA) Privacy Rule.

To further enhance the confidentiality and privacy of the maternal–child nurse participants, the researcher reports findings in aggregate form. The electronic de-
identified data set is password-protected on a password-protected computer only accessible to approved personnel on the IRB exemption applications. The transfer of data to the researcher was also done on a hospital encrypted flash drive. The electronic de-identified data set will kept as long as the hospital and University of Miami IRBs indicate per policy.

**Conclusion**

This chapter described both the research design and major specific aims that frame the analysis of the study. A detailed description of the parent setting, participants, educational intervention, and measures were outlined. Thereafter, the current study’s design, variables, data analysis plan, and human subjects’ protection plan were detailed.
Chapter 4

Results

The purpose of this study was to evaluate the impact of instructional methodology (classroom versus computer-based) on the maternal–child nurse’s breastfeeding knowledge gain and perception of breastfeeding support for nurses who participated in the 20-hour WHO/UNICEF breastfeeding training. This study utilized data collected between January 2013 and August 2013 from a South Florida metropolitan hospital as part of the mandatory requirement that maternal–child nurses- labor and delivery, postpartum, and neonatal (NICU)- be educated with the 20-hour WHO/UNICEF breastfeeding training. The 20-hour training was offered in five 4-hour sessions. Two instructional methodologies (classroom and computer-based) were offered for each 4-hour session. Knowledge tests were administered prior to and following each 4-hour session. The Iowa Infant Feeding Attitude Scale (IIFAS), and a likert-scale perception of breastfeeding support questionnaire based on the Ten Steps, were administered at the end of each 4-hour session. Data was collected from 512 cases of attendance to the training. This chapter presents the findings from the analysis of the data.

Data Management and Screening

The data integrity check and analysis were performed using IBM SPSS Statistics Grad Pack 23 PREMIUM for Windows. This program was used to house and analyze the data. The researcher performed the integrity check which included data cleaning, coding, and appropriateness of the data for analysis—notably parametric testing of assumptions.
An examination of test assumptions to indicate a satisfactory level of homoscedasticity, linearity, independence, and normality was done. An assessment of the data to detect multicollinearity was also be performed and threats to data integrity were addressed. Discussion of the assumptions for each respective statistical test is included in the chapter and will be integrated and presented with reported findings. Non-parametric testing performed was also done using the aforementioned statistical software.

First, descriptive statistics will be used to present demographic characteristics of the study sample. Then, descriptive statistics for each variable, results of the assumption testing for parametric analysis, and the results of inferential statistical tests will be presented to answer each research hypothesis. The dataset had no missing data.

Sample Demographic Characteristics

The sample of this secondary analysis consisted of 521 cases of maternal-child nurse attendance from each of the five 4-hour sessions that made up the 20-hour WHO/UNICEF breastfeeding training. Each case represents maternal-child nurse attendance to one of the five 4-hour sessions.

Demographic characteristics of the total sample of cases are displayed in Table 5. The sample of attendance to the training was predominantly female (98.7%) and the majority of nurses (46.3%) had 5 or fewer years of nursing experience. An even higher percentage of nurses (58.7%) who attended the training reported working 5 years or fewer in the current hospital. In both categories for number of years of nursing experience and number of years of nursing experience in the current hospital, the second largest group was the > 10 years group with 38.5% and 26.4% respectively. Also noteworthy is that 78.1% of the nurses reported having 1-10 hours of breastfeeding
education prior to the training. Strikingly, more than half of the study sample (65.3%) reported personal experience with breastfeeding.

Table 5

Demographic Characteristics of Study Sample

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7</td>
<td>1.3</td>
</tr>
<tr>
<td>Female</td>
<td>514</td>
<td>98.7</td>
</tr>
<tr>
<td><strong>Years of Nursing Experience</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5</td>
<td>241</td>
<td>46.3</td>
</tr>
<tr>
<td>6-9</td>
<td>79</td>
<td>15.2</td>
</tr>
<tr>
<td>&gt; 10</td>
<td>201</td>
<td>38.5</td>
</tr>
<tr>
<td><strong>Years of Nursing at Current Hospital</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5</td>
<td>306</td>
<td>58.7</td>
</tr>
<tr>
<td>6-9</td>
<td>78</td>
<td>14.9</td>
</tr>
<tr>
<td>&gt; 10</td>
<td>137</td>
<td>26.4</td>
</tr>
<tr>
<td><strong>Hours of Prior Breastfeeding Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-10</td>
<td>407</td>
<td>78.1</td>
</tr>
<tr>
<td>11-19</td>
<td>44</td>
<td>8.4</td>
</tr>
<tr>
<td>&gt; 20</td>
<td>70</td>
<td>13.5</td>
</tr>
</tbody>
</table>
Maternal-child nurse demographics were similar across the two attended trainings (classroom vs. computer-based) for each demographic item ($p$ values ranged from .11 to .85). Independent $t$-tests were performed between continuous demographic characteristics and the instructional methodology variable, while Chi-square tests were performed between categorical demographic characteristics and the instructional methodology variable. Table 6 illustrates the $p$ values for each demographic characteristic. The classroom and computer study participants were not statistically different from each other.

Table 6

**Similarities between Classroom and Computer Participants**

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>$p$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>.52</td>
</tr>
<tr>
<td>Years of Nursing Experience</td>
<td>.75</td>
</tr>
<tr>
<td>Years of Nursing at Current Hospital</td>
<td>.18</td>
</tr>
<tr>
<td>Hours of Prior Breastfeeding Education</td>
<td>.85</td>
</tr>
<tr>
<td>Personal Breastfeeding Experience</td>
<td>.11</td>
</tr>
</tbody>
</table>
Descriptive Statistics

The findings begin with an overview of descriptive statistics. In Table 7 frequencies related to all the study variables: (1) instructional methodology, (2) type of nurse, (3) breastfeeding session, (4) breastfeeding knowledge gain, (5) perception of breastfeeding support, and (6) infant feeding attitude are outlined. It is interesting to note that there were almost double the number of nurses who attended the classroom training (322, 61.8%) when compared to nurses who attended the computer-based training (199, 38.2%) in the study sample. Further, the study sample had more postpartum nurses overall (245, 47%).

Table 7

*Frequency Table of Study Variables*

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instructional Methodology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom</td>
<td>322</td>
<td>61.8</td>
</tr>
<tr>
<td>Computer</td>
<td>199</td>
<td>38.2</td>
</tr>
<tr>
<td><strong>Type of Nurse</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor &amp; Delivery</td>
<td>159</td>
<td>30.5</td>
</tr>
<tr>
<td>Postpartum</td>
<td>245</td>
<td>47.0</td>
</tr>
<tr>
<td>Neonatal (NICU)</td>
<td>117</td>
<td>22.5</td>
</tr>
<tr>
<td><strong>Breastfeeding Session</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session One Introduction Anatomy</td>
<td>74</td>
<td>14.2</td>
</tr>
<tr>
<td>Session Two Promoting Breastfeeding</td>
<td>109</td>
<td>20.9</td>
</tr>
</tbody>
</table>
The researcher conducted descriptive statistics to measure the mean and standard deviation of the continuous study variables: (1) breastfeeding knowledge gain, (2) breastfeeding perception of support, and (3) infant feeding attitude (see Table 8). Breastfeeding knowledge gain was the difference between pre- and post-session test scores from standardized tests that were commercially developed for the WHO/UNICEF 20-hour breastfeeding training for each of the five sessions. A review of Table 8 shows that the study variable, breastfeeding knowledge gain, had a mean score of 2.68 and standard deviation of 2.79. The range was from -9 (i.e., loss of knowledge from participant baseline score) to 20 (i.e., gain of knowledge from participant baseline score).

Perception of breastfeeding support was operationalized by a composite score from perception of breastfeeding support questionnaire given at the end of each session for both computer and classroom sessions. Scores ranged from 11 to 55, with a higher score indicating a more positive perception of breastfeeding support. A review of Table 8 shows that perception of breastfeeding support had a mean of 50.25 and standard deviation of 4.41. The minimum score in the study sample was 35 which was 24 points more than the lowest possible score of 11.
Infant feeding attitude was measured by a composite score on the IIFAS administered at the end of each of the five sessions in both classroom and computer-based sessions. IIFAS scores ranged from 17 to 85, with a higher score indicating a more positive attitude toward breastfeeding (De la Mora et al., 1999). Infant feeding attitude had a mean of 72.02 and standard deviation of 8.59. While the mean score of 72.02 was closer to the highest possible score of 85 by just about 13 points, the minimum score, 22, in the study sample was 5 points away from the lowest possible score of 17. Achievement of the maximum score for both perception of breastfeeding support and infant feeding attitude were attained by 21.3% (111) and 6.5% (34) of the nurses respectively.

Table 8

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding Knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain</td>
<td>-9</td>
<td>20</td>
<td>2.68</td>
<td>2.792</td>
</tr>
<tr>
<td>Perception of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding Support</td>
<td>35</td>
<td>55</td>
<td>50.25</td>
<td>4.418</td>
</tr>
<tr>
<td>Infant Feeding Attitude</td>
<td>22</td>
<td>85</td>
<td>72.02</td>
<td>8.598</td>
</tr>
</tbody>
</table>

Assumptions Testing

Sample Size

The issue at stake with sample size is generalizability. Small samples can result in findings that are not generalizable and thus have little scientific significance (Pallant,
Tabachnick and Fidell (2007) give a formula for calculating sample size requirements, taking into account the number of independent variables that you wish to use: $N > 50 + 8m$ (where $m = \text{number of independent variables}$). With three independent variables in the regression analysis for hypothesis 7, 74 cases are needed. With the study sample, $n = 521$ cases of maternal-child nurse attendance, this assumption was met.

**Independence of Observations**

Independence of observations was obtained because each case can be counted once in each group. Also study variables, breastfeeding knowledge gain, infant feeding attitude, and perception of breastfeeding support, were collected individually from each study participant for each session in both computer and classroom training. This assumption was met.

**Outliers**

Parametric techniques can be impacted by outliers. In particular, multiple regression is very sensitive to outliers - very high or very low scores (Pallant, 2013). The researcher did a data check for outliers in both dependent and independent study variables. The limited response on the categorical variables addressed outliers. Outliers found among the continuous variables were given a score for that variable that was high but not too different from the remaining cluster of scores as advised by Pallant (2013). This assumption was met.
Normal Distribution

Parametric testing assumes normality. Statistical testing of normality can be done by assessing skewness and kurtosis. Skewness is a measure of the asymmetry in a variable distribution. Kurtosis is a measure concerned with how values are spread out in a normal distribution. The values for skewness and kurtosis of continuous variables should be between -2 and +2 to affirm normal distribution (Bannon, 2013; George & Mallery, 2010). The skewness and kurtosis for most of the continuous study variables were within the range of -2 and +2 as shown in Table 9. This assumption was met for those variables (perception of breastfeeding support and infant feeding attitude). The skewness and kurtosis for breastfeeding knowledge gain were outside the values range of -2 and +2.

Table 9
Skewness and Kurtosis of Continuous Study Variables

<table>
<thead>
<tr>
<th></th>
<th>Skewness Statistic</th>
<th>Std. Error</th>
<th>Kurtosis Statistic</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding Knowledge Gain</td>
<td>1.013</td>
<td>.107</td>
<td>3.995</td>
<td>.214</td>
</tr>
<tr>
<td>Perception of Breastfeeding Support</td>
<td>-.875</td>
<td>.107</td>
<td>-.155</td>
<td>.214</td>
</tr>
<tr>
<td>Infant Feeding Attitude</td>
<td>-.695</td>
<td>.107</td>
<td>1.375</td>
<td>.214</td>
</tr>
</tbody>
</table>

The Kolmogorov-Smirnov and Shapiro-Wilk statistical tests were conducted to further assess whether the breastfeeding knowledge gain scores were approximately
normally distributed. Both tests are each fairly rigorous (Bannon, 2013). The Kolmogorov-Smirnov and Shapiro-Wilk statistical tests compare the distribution of scores of a variable to a normally distributed set of scores with the same mean and standard deviation. When either tests fail to achieve statistical significance ($p > .05$), this indicates that the distribution of scores within the variable is not significantly different from the normal distribution. Thus, the scores are approximately normal. A review of Table 10 shows that breastfeeding knowledge gain did achieve statistical significance ($p < .001$) which means that the scores are not normally distributed. Table 10 also reports the results for perception of breastfeeding support and infant feeding attitude but normality was achieved statistically with skewness and kurtosis.

Table 10

*Kolmogorov-Smirnov and Shapiro-Wilk Tests of Normality*

<table>
<thead>
<tr>
<th></th>
<th>Kolmogorov-Smirnov</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>$df$</td>
</tr>
<tr>
<td>Breastfeeding Knowledge Gain</td>
<td>.157</td>
<td>521</td>
</tr>
<tr>
<td>Infant Feeding Attitude</td>
<td>.076</td>
<td>521</td>
</tr>
<tr>
<td>Instructional Methodology</td>
<td>.402</td>
<td>521</td>
</tr>
</tbody>
</table>

The impact of outliers was assessed on both aforementioned tests of normality but still the breastfeeding knowledge gain variable was not normally distributed. The researcher considered transformation but since the values associated with the scores
would be altered, the researcher opted to use non-parametric tests. Nonparametric tests
should be used when the assumption of normally distributed data is not met (George &
Mallery, 2010). Also, transformation is best suited if both homoscedasticity and normal
distribution assumptions were violated which was not the case for this study variable
(Pallant, 2013).

**Homoscedasticity**

Homoscedasticity or homogeneity of variance is an important assumption related
to an equivalent of variance when performing parametric testing (Bannon, 2013). Bannon
(2013) explains that the assumption of homoscedasticity assumes that the residuals have
similar variances at each level of an independent variable. Bannon further indicates that
lack of homogeneity of variance can weaken a study and lead to serious distortion of
statistical findings.

The researcher confirmed the assumption of homogeneity of variance that
variance within the sample is equal statistically by using the Levene’s test of
homogeneity (see Table 11 for results). Levene’s test of homogeneity examines the null
hypothesis that the sample variances are equal (O’Neill & Mathews, 2002). If the \( p \) value
is greater than .05, then the researcher accepts the null hypothesis that the sample
variances are equal (O’Neill & Mathews, 2002). A \( p \) value of > .05 validated this
assumption (see Table 11 for results from the two dependent variables). This assumption
was met for breastfeeding knowledge gain but not for perception of support across the
three type of nurses. Since perception of breastfeeding support had a normal distribution,
the researcher opted to use parametric testing with robust tests (Analysis of Variance
[ANOVA]), using a more stringent level of significance of .01. The researcher also planned to use assumption of unequal variances results when the *t*-test was performed if the Levene’s test significance level was .05 or less (Pallant, 2013).

Table 11

*Homogeneity of Variance of Key Study Variables*

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Gain</td>
<td>1.772</td>
<td>5</td>
<td>515</td>
<td>.117</td>
</tr>
<tr>
<td>Perception of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding Support</td>
<td>2.875</td>
<td>5</td>
<td>515</td>
<td>.014</td>
</tr>
</tbody>
</table>

**Linearity**

One assumption of multiple linear regression is the existence of a linear relationship between the independent and dependent variables (Osborne & Waters, 2002). To ensure that the data met this assumption, the researcher examined the relationship between the independent variables (i.e. breastfeeding knowledge gain, infant feeding attitude, and instructional methodology) and the dependent variable (i.e. perception of breastfeeding support) using residuals and displayed in a scatterplot. On review of the scatterplots, a straight line fit comfortably through the data, which indicated a linear relationship between the variables. This assumption was met.
Multicollinearity

The last assumption examined for multiple linear regression analysis is the absence of multicollinearity, which occurs when two or more independent variables are linearly related (Kosfeld & Lauridsen, 2008). In a regression analysis, multicollinearity occurs when there is a strong correlation between two independent (predictor) variables. When there is a strong correlation between predictor variables, the relationship between the predictor variable and the dependent variable is often misrepresented (Bannon, 2013). To ensure the data met this assumption, multicollinearity of predictors was measured by assessing collinearity diagnostics in the regression model. The two widely used estimates of multicollinearity are the variance inflation factor (VIF) and the tolerance statistic (Bannon, 2013). The VIF indicates if a predictor has a strong correlation with other predictors in the regression model. There is no universally accepted VIF value that indicates concern (Bannon, 2013). However, a VIF value larger than 10 among predictors indicates a problem (Bannon, 2013). VIF values for the predictors of the regression model are less than 10 (see Table 12). A tolerance statistic (the reciprocal of the VIF) less than .20 indicates a cause for concern, and a value less than .10 indicates a serious problem (Bannon, 2013). The tolerance statistic for the predictor variables of the regression model were all greater than .10. Thus, the researcher concluded that there was no multicollinearity symptom.
Table 12

Multicollinearity of Independent (Predictor) Variables

<table>
<thead>
<tr>
<th>Model</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td>1</td>
<td>Breastfeeding</td>
</tr>
<tr>
<td></td>
<td>Knowledge Gain</td>
</tr>
<tr>
<td></td>
<td>Infant Feeding Attitude</td>
</tr>
<tr>
<td></td>
<td>Instructional Methodology</td>
</tr>
</tbody>
</table>

Hypothesis Testing

Aim 1

To determine the impact of instructional methodology (classroom vs. computer-based) in the following areas upon maternal-child nurses who take the 20-hour WHO/UNICEF breastfeeding training: (a) breastfeeding knowledge gain and (b) perception of breastfeeding support.

*Null Hypothesis 1: There will be no difference in breastfeeding knowledge gain between nurses who attend the classroom training and nurses who attend the computer-based training.*

*Alternative Hypothesis 1: There will be a difference in breastfeeding knowledge gain between nurses who attend the classroom training and nurses who attend the computer-based training.*
Assumptions and Statistical Test

Breastfeeding knowledge gain was not normally distributed. Thus, the researcher used the non-parametric test alternative to the independent samples t-test, the Mann-Whitney U test to test hypothesis 1 (Bannon, 2013). The assumptions of random samples and independence of observations apply with non-parametric testing (Pallant, 2013). Pallant (2013) explains that random samples do not allow for occurrence in effectiveness research. Independence of observations is obtained because each case can be counted once in either the classroom or computer-based group. To add, participants completed the knowledge tests independently. The significance criterion was set at .05 and Cohen’s criteria is the effect size index used to aid in interpretation. The effect size according to Cohen’s criteria is: .1 = small effect, .3 = medium effect, and .5 = large effect (Cohen, 1988). An approximate value of an effect size statistic, r, was calculated as follows (Pallant, 2013):

\[ r = \frac{z}{\text{square root of } N} \text{ where } N = \text{total number of cases} \]

Results

As displayed in Table 13, a Mann-Whitney U test revealed no significant difference in breastfeeding knowledge gain between nurses who attended the classroom training (Md = 2, n = 322) and nurses who attended the computer-based training (Md = 3, n = 199), \( U = 29271.5, p = .094, r = .07 \). The magnitude of the differences in the means was small. Based on this result, the null hypothesis was accepted and the alternative hypothesis rejected.
However, the mean rank for the computer-based training group (mean rank = 274.91) was higher than for the classroom training group (mean rank = 252.41).

Table 13

*Mann-Whitney U Test Results*

<table>
<thead>
<tr>
<th>Instructional Methodology</th>
<th>N</th>
<th>Mean Rank</th>
<th>Asymp. Sig. (2-tailed)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding Knowledge Gain Classroom</td>
<td>322</td>
<td>252.41</td>
<td>.094</td>
<td>2</td>
</tr>
<tr>
<td>Computer</td>
<td>199</td>
<td>274.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>521</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Null Hypothesis 2:** There will be no difference in perception of breastfeeding support between nurses who attend the classroom training and nurses who attend the computer-based training.

**Alternative Hypothesis 2:** There will be a difference in perception of breastfeeding support between nurses who attend the classroom training and nurses who attend the computer-based training.

**Assumptions and Statistical Test**

The data met parametric assumptions prior to analysis as outlined in the “Assumptions Testing” section. Homoscedasticity was met with a \( p = .16 \). The researcher performed an independent-samples \( t \)-test to assess if nurses who attended the classroom training had a more positive perception of breastfeeding support than nurses
who attended the computer-based training. The significance criterion was set at .05, and eta squared was calculated as the effect size index used to aid in interpretation (Pallant, 2013). The effect size according to Cohen’s criteria to interpret this effect size index is: .01 = small effect, .06 = medium effect, and .14 = large effect (Cohen, 1988). To further aid in interpretation, the classroom and computer-based mean, standard deviation, and standard error mean are displayed in Table 14.

Table 14

<table>
<thead>
<tr>
<th>Instructional Methodology</th>
<th>Perception of Breastfeeding Support</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>50.35</td>
<td>4.55</td>
<td>.253</td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td>50.09</td>
<td>4.21</td>
<td>.299</td>
<td></td>
</tr>
</tbody>
</table>

Results

Table 15 illustrates that an independent-samples $t$-test conducted to compare the perception of breastfeeding scores for nurses who attended the classroom training and nurses who attended the computer-based training yielded no significant difference in scores for classroom training ($M = 50.35, SD = 4.55$) and computer-based training, $M = 50.09, SD = 4.21; t (519) = .66, p = .51$ (two-tailed). The magnitude of the differences in the means (mean difference = .26, 95% CI: - .52 to 1.05) was small (eta squared = .0008). Based on this result, the null hypothesis was accepted and the alternative hypothesis rejected.
**Table 15**

*Independent Samples t-Test Results*

| Perception of Breastfeeding Support | Equal variances assumed | .658 | 519 | .511 |
| Equal variances not assumed | .670 | 443.807 | .503 |

**Aim 2**

To determine the impact of instructional methodology (classroom vs. computer-based) in the following areas upon labor and delivery, postpartum, and neonatal (NICU) nurses who take the 20-hour WHO/UNICEF breastfeeding training: (a) breastfeeding knowledge gain and (b) perception of breastfeeding support.

*Null Hypothesis 3: There will be no difference in breastfeeding knowledge gain across all three types of maternal-child nurses, who attend the classroom training as compared to the computer-based training.*

*Alternative Hypothesis 3: There will be a difference in breastfeeding knowledge gain across all three types of maternal-child nurses, who attend the classroom training as compared to the computer-based training.*
Assumptions and Statistical Test

The researcher performed a two-way between groups ANOVA to test the hypothesis. The data met parametric assumptions prior to analysis as outlined in the “Assumptions Testing” section except for normality of the dependent variable, breastfeeding knowledge gain. However, there is not a nonparametric equivalent to the two-way ANOVA and thus the researcher preformed the parametric test. ANOVA is fairly robust to non-normal distribution (Bannon, 2013; Pallant, 2013). The significance criterion was set at .05 and partial eta squared was used as the effect size index to aid in interpretation (Pallant, 2013). The effect size according to Cohen’s criteria to interpret this effect size index is: .01 = small effect, .06 = medium effect, and .14 = large effect (Cohen, 1988). To further aid in interpretation, the means and standard deviation are displayed in Table 16.

Table 16

<table>
<thead>
<tr>
<th>Instructional Methodology</th>
<th>Type of Nurse</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>Labor &amp; Delivery</td>
<td>2.26</td>
<td>2.998</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>Postpartum</td>
<td>2.68</td>
<td>2.965</td>
<td>155</td>
</tr>
<tr>
<td>NICU</td>
<td>3.08</td>
<td>2.991</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2.63</td>
<td>2.985</td>
<td>322</td>
<td></td>
</tr>
</tbody>
</table>
Results

A two-way between groups ANOVA was conducted to explore the impact of instructional methodology and type of nurse on breastfeeding knowledge gain. Table 17 displays the results of the ANOVA. The interaction effect between instructional methodology and type of nurse was not statistically significant, $F(2, 515) = .89, p = .41$. Based on these findings, the null hypothesis was accepted and the alternative hypothesis rejected.
Table 17

Breastfeeding Knowledge Gain ANOVA Summary Table

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Methodology</td>
<td>3.840</td>
<td>1</td>
<td>3.840</td>
<td>.497</td>
<td>.481</td>
<td>.001</td>
</tr>
<tr>
<td>Type of nurse</td>
<td>61.648</td>
<td>2</td>
<td>30.824</td>
<td>3.992</td>
<td>.019*</td>
<td>.015</td>
</tr>
<tr>
<td>Instructional Methodology* Type of Nurse</td>
<td>13.736</td>
<td>2</td>
<td>6.868</td>
<td>.889</td>
<td>.412</td>
<td>.003</td>
</tr>
<tr>
<td>Error</td>
<td>3976.521</td>
<td>515</td>
<td>7.721</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>4052.745</td>
<td>520</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. * p < .05.

There was a statistically significant main effect for type of nurse $F(2, 515) = 3.99, p = .02$; however, the effect size was small (partial eta squared = .02). Figure 5 graphically shows the means for each type of nurse. Overall, mean scores were higher in NICU nurses across the three types of nurses.
Figure 5. Graphical presentation of mean scores of breastfeeding knowledge gain across the three type of nurses.

Post hoc comparisons using Tukey HSD test (see Table 18) indicated that the mean score for NICU nurses ($M = 3.30$, $SD = 2.90$) was statistically different, $p = .0.2$, from labor and delivery nurses ($M = 2.38$, $SD = 2.73$). Figure 5 graphically shows that labor and delivery nurses have a much lower mean knowledge gain as compared to NICU nurses. The mean score for postpartum nurses ($M = 2.59$, $SD = 2.75$) did not differ significantly from the mean score for either NICU or labor and delivery nurses. The main effect of instructional methodology did not achieve statistical significance $F (2, 515) = .5$, $p = .48$.  

### Table 18

Post Hoc Analysis Tukey HSD Results for Breastfeeding Knowledge Gain

<table>
<thead>
<tr>
<th>(I) Type of Nurse</th>
<th>(J) Type of Nurse</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor &amp; Delivery</td>
<td>Postpartum</td>
<td>-.21</td>
<td>.283</td>
<td>.738</td>
<td>-.88</td>
<td>.45</td>
<td></td>
</tr>
<tr>
<td>NICU</td>
<td>Postpartum</td>
<td>-.92*</td>
<td>.338</td>
<td>.018</td>
<td>-1.72</td>
<td>-.13</td>
<td></td>
</tr>
<tr>
<td>Postpartum</td>
<td>Labor &amp; Delivery</td>
<td>.21</td>
<td>.283</td>
<td>.738</td>
<td>-.45</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>NICU</td>
<td>Delivery</td>
<td>-.71</td>
<td>.312</td>
<td>.060</td>
<td>-1.45</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>NICU</td>
<td>Labor &amp; Delivery</td>
<td>.92*</td>
<td>.338</td>
<td>.018</td>
<td>.13</td>
<td>1.72</td>
<td></td>
</tr>
<tr>
<td>NICU</td>
<td>Postpartum</td>
<td>.71</td>
<td>.312</td>
<td>.060</td>
<td>-.02</td>
<td>1.45</td>
<td></td>
</tr>
</tbody>
</table>

*Note: * p <.05.

**Null Hypothesis 4:** There will be no difference in perception of breastfeeding support across all three types of maternal-child nurses, who attend the classroom training as compared to the computer-based training.

**Alternative Hypothesis 4:** There will be a difference in perception of breastfeeding support across all three types of maternal-child nurses, who attend the classroom training as compared to the computer-based training.

**Assumptions and Statistical Test**

The researcher performed a two-way between groups ANOVA to test the hypothesis. The data met parametric assumptions prior to analysis as outlined in the
“Assumptions Testing” section except for homoscedasticity ($p = .01$). Therefore the significance criterion was set at .01 and not .05 to accommodate for the assumption violation (Pallant, 2013). Partial eta squared was used as the effect size index to aid in interpretation (Pallant, 2013). The effect size according to Cohen’s criteria to interpret this effect size index is: .01 = small effect, .06 = medium effect, and .14 = large effect (Cohen, 1988). To further aid in interpretation, the means and standard deviation are displayed in Table 19.

Table 19

*Univariate Group Statistics for Perception of Breastfeeding Support*

<table>
<thead>
<tr>
<th>Instructional Methodology</th>
<th>Type of Nurse</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>Labor &amp; Delivery</td>
<td>50.16</td>
<td>4.339</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>Postpartum</td>
<td>51.17</td>
<td>4.148</td>
<td>155</td>
</tr>
<tr>
<td></td>
<td>NICU</td>
<td>48.69</td>
<td>5.294</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>50.35</td>
<td>4.545</td>
<td>322</td>
</tr>
<tr>
<td>Computer</td>
<td>Labor &amp; Delivery</td>
<td>50.53</td>
<td>3.660</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>Postpartum</td>
<td>50.28</td>
<td>4.293</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>NICU</td>
<td>49.27</td>
<td>4.585</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>50.09</td>
<td>4.211</td>
<td>199</td>
</tr>
<tr>
<td>Total</td>
<td>Labor &amp; Delivery</td>
<td>50.29</td>
<td>4.101</td>
<td>159</td>
</tr>
<tr>
<td></td>
<td>Postpartum</td>
<td>50.84</td>
<td>4.215</td>
<td>245</td>
</tr>
</tbody>
</table>
Results

A two-way between groups ANOVA was conducted to explore the impact of instructional methodology and type of nurse on perception of breastfeeding support. Table 20 displays the results of the ANOVA. The interaction effect between instructional methodology and type of nurse was not statistically significant, $F(2, 515) = 1.48, p = .23$. Based on these findings, the null hypothesis was accepted and the alternative hypothesis rejected.

Table 20

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Methodology</td>
<td>.040</td>
<td>1</td>
<td>.040</td>
<td>.002</td>
<td>.963</td>
<td>.000</td>
</tr>
<tr>
<td>Type of nurse</td>
<td>236.946</td>
<td>2</td>
<td>118.473</td>
<td>6.221</td>
<td>.002*</td>
<td>.024</td>
</tr>
<tr>
<td>Instructional Methodology* Type of Nurse</td>
<td>56.271</td>
<td>2</td>
<td>28.136</td>
<td>1.477</td>
<td>.229</td>
<td>.006</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-------</td>
<td>-----</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>9807.472</td>
<td>515</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>10151.060</td>
<td>520</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* *p* < .05.

There was a statistically significant main effect for type of nurse $F(2, 515) = 6.22$, $p = .002$; however, the effect size was small (partial eta squared = .02). Figure 6 graphically shows the means for each type of nurse. Overall, mean scores were highest in postpartum nurses across the three types of nurses.
Post hoc comparisons using Tukey HSD test (see Table 21) indicated that the mean score for NICU nurses ($M = 48.95$, $SD = 4.98$) was statistically different, $p = .03$, from labor and delivery nurses ($M = 50.29$, $SD = 4.10$) and postpartum nurses ($M = 50.84$, $SD = 4.22$). Figure 6 graphically shows that NICU nurses have a less positive perception of breastfeeding support than labor and delivery and postpartum nurses. The mean score for postpartum nurses ($M = 50.84$, $SD = 4.22$) did not differ significantly from the mean score of labor and delivery nurses ($M = 50.29$, $SD = 4.10$).
The main effect of instructional methodology did not achieve statistical significance, \( F(2, 515) = .002, p = .96. \)

Table 21

*Post Hoc Analysis Tukey HSD Results*

<table>
<thead>
<tr>
<th>(I) Type of Nurse</th>
<th>(J) Type of Nurse</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor &amp; Delivery</td>
<td>Postpartum</td>
<td>-0.55</td>
<td>0.444</td>
<td>0.430</td>
<td>-1.60</td>
<td>0.49</td>
</tr>
<tr>
<td>Postpartum</td>
<td>NICU</td>
<td>1.34*</td>
<td>0.532</td>
<td>0.032</td>
<td>-0.09</td>
<td>2.59</td>
</tr>
<tr>
<td>NICU</td>
<td>Labor &amp; Delivery</td>
<td>-0.55</td>
<td>0.444</td>
<td>0.430</td>
<td>-0.49</td>
<td>1.60</td>
</tr>
<tr>
<td>NICU</td>
<td>NICU</td>
<td>1.89*</td>
<td>0.490</td>
<td>0.000</td>
<td>0.74</td>
<td>3.04</td>
</tr>
<tr>
<td>NICU</td>
<td>Labor &amp; Delivery</td>
<td>-1.34*</td>
<td>0.532</td>
<td>0.032</td>
<td>-2.59</td>
<td>-0.09</td>
</tr>
<tr>
<td>NICU</td>
<td>Postpartum</td>
<td>-1.89*</td>
<td>0.490</td>
<td>0.000</td>
<td>-3.04</td>
<td>-0.74</td>
</tr>
</tbody>
</table>

*Note.* \( *p < .05. \)

**Aim 3**

To determine the impact of instructional methodology (classroom vs. computer-based) upon maternal–child nurses, across all five 4-hour sessions, for the 20-hour
WHO/UNICEF breastfeeding training in the following areas: (a) breastfeeding knowledge gain and (b) perception of breastfeeding support.

**Null Hypothesis 5:** There will be no difference in breastfeeding knowledge gain between nurses who attend the classroom training and nurses who attend the computer-based training across all five 4-hour sessions.

**Alternative Hypothesis 5:** There will be a difference in breastfeeding knowledge gain between nurses who attend the classroom training and nurses who attend the computer-based training across all five 4-hour sessions.

**Assumptions and Statistical Test**

The researcher performed a two-way between groups ANOVA to test the hypothesis. The data met parametric assumptions prior to analysis as outlined in the “Assumptions Testing” section except for normality and homoscedasticity ($p < .001$) of the dependent variable, breastfeeding knowledge gain. However, there is not a nonparametric equivalent to the two-way ANOVA and thus researcher preformed the parametric test. Further, ANOVA is fairly robust to non-normal distribution (Bannon, 2013; Pallant, 2013). The significance criterion was set to .01 for a more stringent significance level in the face of unequal variances. The partial eta squared was used as the effect size index to aid in interpretation (Pallant, 2013). The effect size according to Cohen’s criteria to interpret this effect size index is: .01 = small effect, .06 = medium effect, and .14 = large effect (Cohen, 1988). To further aid in interpretation, the means and standard deviation are displayed in Table 22.
Table 22

*Univariate Group Statistics for Breastfeeding Knowledge Gain*

<table>
<thead>
<tr>
<th>Instructional Methodology</th>
<th>Breastfeeding Session</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>Session One Introduction Anatomy</td>
<td>1.78</td>
<td>1.586</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Session Two Promoting Breastfeeding</td>
<td>2.20</td>
<td>2.447</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Session Three Breastfeeding Practices</td>
<td>1.23</td>
<td>1.676</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Session Four Supporting Non Breastfeeding Moms</td>
<td>5.75</td>
<td>3.442</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>Session Five Post Hospital Breastfeeding Support</td>
<td>1.82</td>
<td>2.473</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.63</td>
<td>2.985</td>
<td>322</td>
</tr>
<tr>
<td>Computer</td>
<td>Session One Introduction Anatomy</td>
<td>1.89</td>
<td>1.453</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Session Two Promoting Breastfeeding</td>
<td>2.95</td>
<td>2.466</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>Session Three Breastfeeding Practices</td>
<td>2.15</td>
<td>1.770</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Session Four Supporting Non Breastfeeding Moms</td>
<td>3.50</td>
<td>3.274</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Session Five Post Hospital Breastfeeding Support</td>
<td>2.88</td>
<td>2.645</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.77</td>
<td>2.451</td>
<td>199</td>
</tr>
<tr>
<td>Total</td>
<td>Session One</td>
<td>Session Two Promoting Breastfeeding</td>
<td>Session Three Breastfeeding Practices</td>
<td>Session Four Supporting Non Breastfeeding Moms</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>-------------------------------------</td>
<td>--------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>1.80</td>
<td>2.71</td>
<td>1.48</td>
<td>5.49</td>
</tr>
<tr>
<td></td>
<td>1.561</td>
<td>2.473</td>
<td>1.743</td>
<td>3.480</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Results**

A two-way between groups ANOVA was conducted to explore the impact of instructional methodology and breastfeeding session on breastfeeding knowledge gain. Table 23 displays the results of the ANOVA. The interaction effect between instructional methodology and breastfeeding session was statistically significant, $F (2, 511) = 3.54, p = .007$; however, the effect size was small (partial eta squared = .03). Based on these findings, the alternative hypothesis was accepted and the null hypothesis rejected.
Table 23

Breastfeeding Knowledge Gain ANOVA Summary Table

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Methodology</td>
<td>.927</td>
<td>1</td>
<td>.927</td>
<td>.158</td>
<td>.692</td>
<td>.000</td>
</tr>
<tr>
<td>4-hour sessions</td>
<td>237.082</td>
<td>4</td>
<td>59.270</td>
<td>10.074</td>
<td>.000*</td>
<td>.073</td>
</tr>
<tr>
<td>Instructional Methodology*4-hour sessions</td>
<td>83.403</td>
<td>4</td>
<td>20.851</td>
<td>3.544</td>
<td>.007*</td>
<td>.027</td>
</tr>
<tr>
<td>Error</td>
<td>3006.484</td>
<td>511</td>
<td>5.884</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>4052.745</td>
<td>520</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. * p < .05.

Figure 7 graphically shows the interaction of breastfeeding session and instructional methodology for mean scores of breastfeeding knowledge gain. Overall, mean scores were higher in the computer-based training across the sessions.
With a statistically significant interaction effect, simple effects were examined. Bonferroni correction was the method used to counteract the problem of multiple comparisons (Bannon, 2013). Notably, as one increases the number of hypotheses being tested, this increases the likelihood of a rare event, and therefore, the likelihood of incorrectly rejecting a null hypothesis (i.e., make a Type I error). The analysis revealed that the only the statistically significant ($p = .006$) difference in mean scores for breastfeeding knowledge gain in breastfeeding session four indicated classroom training.
(mean score = 5.75) was higher than in computer-based training (mean score = 3.50). The pairwise comparisons are displayed in Table 24.

Table 24

Pairwise Comparisons for Breastfeeding Knowledge Gain

<table>
<thead>
<tr>
<th>Breastfeeding Session</th>
<th>Methodology (I)</th>
<th>Methodology (J)</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session One Introduction</td>
<td>Classroom</td>
<td>Computer</td>
<td>-.104</td>
<td>.863</td>
<td>.904</td>
</tr>
<tr>
<td>Anatomy</td>
<td>Computer</td>
<td>Classroom</td>
<td>.104</td>
<td>.863</td>
<td>.904</td>
</tr>
<tr>
<td>Session Two Promoting</td>
<td>Classroom</td>
<td>Computer</td>
<td>-.746</td>
<td>.498</td>
<td>.134</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>Computer</td>
<td>Classroom</td>
<td>.746</td>
<td>.498</td>
<td>.134</td>
</tr>
<tr>
<td>Session Three</td>
<td>Classroom</td>
<td>Computer</td>
<td>-.918</td>
<td>.494</td>
<td>.063</td>
</tr>
<tr>
<td>Breastfeeding Practices</td>
<td>Computer</td>
<td>Classroom</td>
<td>.918</td>
<td>.494</td>
<td>.063</td>
</tr>
<tr>
<td>Session Four Supporting</td>
<td>Classroom</td>
<td>Computer</td>
<td>2.253*</td>
<td>.815</td>
<td>.006</td>
</tr>
<tr>
<td>Non Breastfeeding Moms</td>
<td>Computer</td>
<td>Classroom</td>
<td>-2.253*</td>
<td>.815</td>
<td>.006</td>
</tr>
<tr>
<td>Session Five Post Hospital</td>
<td>Classroom</td>
<td>Computer</td>
<td>-1.059*</td>
<td>.433</td>
<td>.015</td>
</tr>
<tr>
<td>Breastfeeding Support</td>
<td>Computer</td>
<td>Classroom</td>
<td>1.059*</td>
<td>.433</td>
<td>.015</td>
</tr>
</tbody>
</table>

Note. * p < .05.
Null Hypothesis 6: There will be no difference in perception of breastfeeding support between nurses who attend the classroom training and nurses who attend the computer-based training across all five 4-hour sessions.

Alternative Hypothesis 6: There will be a difference in perception of breastfeeding support between nurses who attend the classroom training and nurses who attend the computer-based training across all five 4-hour sessions.

Assumptions and Statistical Test

The researcher performed a two-way between groups ANOVA to test the hypothesis. The data met parametric assumptions prior to analysis as outlined in the “Assumptions Testing” section including homoscedasticity ($p = .32$) of the dependent variable, perception of breastfeeding support. The significance criterion was set to 0.5. The partial eta squared was used as the effect size index to aid in interpretation (Pallant, 2013). The effect size according to Cohen’s criteria to interpret this effect size index is: $0.01 = \text{small effect, } 0.06 = \text{medium effect, and } 0.14 = \text{large effect}$ (Cohen, 1988). To further aid in interpretation, the means and standard deviation are displayed in Table 25.
Table 25

Univariate Group Statistics for Perception of Breastfeeding Support

<table>
<thead>
<tr>
<th>Instructional Methodology</th>
<th>Breastfeeding Session</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>Session One Introduction Anatomy</td>
<td>51.00</td>
<td>4.254</td>
<td>65</td>
</tr>
<tr>
<td>Session Two Promoting</td>
<td>Breastfeeding</td>
<td>49.74</td>
<td>4.661</td>
<td>35</td>
</tr>
<tr>
<td>Session Three Breastfeeding Practices</td>
<td></td>
<td>50.40</td>
<td>4.573</td>
<td>90</td>
</tr>
<tr>
<td>Session Four Supporting Non Breastfeeding Moms</td>
<td></td>
<td>49.82</td>
<td>4.828</td>
<td>77</td>
</tr>
<tr>
<td>Session Five Post Hospital Breastfeeding Support</td>
<td></td>
<td>50.62</td>
<td>4.378</td>
<td>55</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>50.35</td>
<td>4.545</td>
<td>322</td>
</tr>
<tr>
<td>Computer</td>
<td>Session One Introduction Anatomy</td>
<td>49.89</td>
<td>3.371</td>
<td>9</td>
</tr>
<tr>
<td>Session Two Promoting</td>
<td>Breastfeeding</td>
<td>49.39</td>
<td>4.114</td>
<td>74</td>
</tr>
<tr>
<td>Session Three Breastfeeding Practices</td>
<td></td>
<td>50.48</td>
<td>3.970</td>
<td>33</td>
</tr>
<tr>
<td>Session Four Supporting Non Breastfeeding Moms</td>
<td></td>
<td>49.50</td>
<td>5.817</td>
<td>10</td>
</tr>
<tr>
<td>Session Five Post Hospital Breastfeeding Support</td>
<td>50.71</td>
<td>4.254</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>------</td>
<td>------</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50.09</td>
<td>4.211</td>
<td>199</td>
<td></td>
</tr>
<tr>
<td>Session One Introduction Anatomy</td>
<td>50.86</td>
<td>4.152</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td>Session Two Promoting Breastfeeding</td>
<td>49.50</td>
<td>4.279</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>Session Three Breastfeeding Practices</td>
<td>50.42</td>
<td>4.404</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>Session Four Supporting Non Breastfeeding Moms</td>
<td>49.78</td>
<td>4.914</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>Session Five Post Hospital Breastfeeding Support</td>
<td>50.67</td>
<td>4.291</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50.25</td>
<td>4.418</td>
<td>521</td>
<td></td>
</tr>
</tbody>
</table>

**Results**

A two-way between groups ANOVA was conducted to explore the impact of instructional methodology and breastfeeding session on perception of breastfeeding support. Table 26 displays the results of the ANOVA. There were no significant main effects or interaction effect (instructional methodology $p = .54$; breastfeeding session $p = .38$; instructional methodology * breastfeeding session $p = .96$) from the analysis. Based on these findings, the null hypothesis was accepted and alternative hypothesis rejected.
### Table 26

**Perception of Breastfeeding Support ANOVA Summary Table**

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Methodology</td>
<td>7.225</td>
<td>1</td>
<td>7.225</td>
<td>.369</td>
<td>.544</td>
<td>.001</td>
</tr>
<tr>
<td>4-hour sessions</td>
<td>82.849</td>
<td>4</td>
<td>20.712</td>
<td>1.058</td>
<td>.377</td>
<td>.008</td>
</tr>
<tr>
<td>Instructional Methodology* 4-hour sessions</td>
<td>11.711</td>
<td>4</td>
<td>2.928</td>
<td>.150</td>
<td>.963</td>
<td>.001</td>
</tr>
<tr>
<td>Error</td>
<td>10002.947</td>
<td>511</td>
<td>19.575</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>10151.060</td>
<td>520</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Aim 4

To determine the best predictor (knowledge gain, infant feeding attitude, or instructional methodology) of maternal–child nurses’ perception of breastfeeding support in nurses who attend the 20-hour WHO/UNICEF breastfeeding training.

*Null Hypothesis 7: Breastfeeding knowledge gain, infant feeding attitude, or instructional methodology are not predictive factors of maternal-child nurses’ perception of breastfeeding support.*
Alternative Hypothesis 7: Breastfeeding knowledge gain, infant feeding attitude, or instructional methodology is/are predictive factors of maternal-child nurses’ perception of breastfeeding support.

Assumptions and Statistical Test

The data met parametric assumptions prior to analysis as outlined in the “Assumptions Testing” section. Normality, linearity, and independence were met on inspection of Figures 8, 9, and 10 for the dependent variable, perception of breastfeeding support. However, also noted in Figure 10 homoscedasticity was violated. Consequently, the significance criterion was set to .01 for a more stringent significance level in the face of unequal variances.
Figure 8. Histogram of perception of breastfeeding support regression standardized residuals. Bell-shaped curve noted.
Figure 9. Normal P-P plot of perception of breastfeeding support regression standardized residual. Linear relationship noted.
Figure 10. Scatterplot of perception of breastfeeding support regression standardized residual. Most scores concentrated along the zero point but there is a downward trend.

Results

Table 27 presents the results of a bivariate analysis to test the significance of relationships between each predictor and perception of breastfeeding support. The researcher conducted a correlational analysis for each dyad. Pearson product-moment correlation coefficient indicated that the only predictor variable, infant feeding attitude, and perception of breastfeeding support were positively correlated at a statistically significant level, $r = .53$, $p < .001$. 
Table 27

*Bivariate Analysis of Predictor Variables with Perception of Breastfeeding Support*

<table>
<thead>
<tr>
<th></th>
<th>Breastfeeding Knowledge Gain</th>
<th>Infant Feeding Attitude</th>
<th>Instructional Methodology</th>
<th>Perception of Breastfeeding Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding Knowledge Gain</td>
<td>1</td>
<td>-.036</td>
<td>.024</td>
<td>-.075</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.407</td>
<td>.583</td>
<td>.088</td>
</tr>
<tr>
<td>Infant Feeding Attitude</td>
<td>-.036</td>
<td>1</td>
<td>.067</td>
<td>.531*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.407</td>
<td>.127</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Instructional Methodology</td>
<td>.024</td>
<td>.067</td>
<td>1</td>
<td>-.029</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.583</td>
<td>.127</td>
<td>.511</td>
<td></td>
</tr>
<tr>
<td>Perception of Breastfeeding Support</td>
<td>-.075</td>
<td>.531**</td>
<td>-.029</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.088</td>
<td>.000</td>
<td>.511</td>
<td></td>
</tr>
</tbody>
</table>

*Note. * p <.05
The researcher conducted a multiple linear regression analysis to test the hypothesis. The objective was to determine if instructional methodology is the best predictor of maternal–child nurses’ perception of breastfeeding support in nurses who attend the 20-hour WHO/UNICEF breastfeeding training while also considering the influence of infant feeding attitude and breastfeeding knowledge gain individually and together.

Table 28, 29, and 30 present the results of the regression analysis. The overall model was statistically significant, $F(3, 517) = 69.98, p < .001$. In fact, the model (infant feeding attitude, breastfeeding knowledge gain, and instructional methodology) explained about 29% ($R^2 = .289$, adjusted $R^2 = .285$) of the variance in the dependent variable, perception of breastfeeding support. Infant feeding attitude was the only significant ($B = .274, SE = .019, \beta = .533, p < .001$) predictor of perception of breastfeeding support after controlling for the other two predictors, breastfeeding knowledge gain and instructional methodology. Maternal-child nurse perception of breastfeeding support increased .274 points for each point of infant feeding attitude, after controlling for breastfeeding knowledge gain and instructional methodology.
Table 28

*Model Summary*

<table>
<thead>
<tr>
<th>Model</th>
<th>$R$</th>
<th>$R$ Square</th>
<th>Adjusted $R$ Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.537</td>
<td>.289</td>
<td>.285</td>
<td>3.737</td>
</tr>
</tbody>
</table>

Table 29

*ANOVA Summary Results*

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>3</td>
<td>977.214</td>
<td>69.981</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>517</td>
<td>13.964</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>520</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 30

*Regression Analysis Coefficients Summary Results*

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>31.541</td>
<td>.289</td>
<td>21.815</td>
<td>.000</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>-.085</td>
<td>-.054</td>
<td>-1.449</td>
<td>.148</td>
</tr>
<tr>
<td>Knowledge Gain</td>
<td>-.085</td>
<td>-.054</td>
<td>-1.449</td>
<td>.148</td>
</tr>
</tbody>
</table>
Summary

The purpose of this study was to evaluate the impact of instructional methodology (classroom versus computer-based) on the maternal–child nurse’s breastfeeding knowledge gain and perception of breastfeeding support for nurses that participated in the 20-hour WHO/UNICEF breastfeeding training. Selected demographic of the study participants were reported. There were 521 cases of attendance to the training. Both classroom and computer-based training participants were statistically the same in regards to demographics. In total, there were 514 female participants and 7 male participants with a little less than half of the participants reporting 5 years or less of nursing experience.

Four specific aims framed the data analysis for this study. Seven research hypotheses were tested. Table 31 summarizes the results of statistical significance for each research hypothesis.
Table 31

*Summary of Statistical Significance of Research Hypotheses*

<table>
<thead>
<tr>
<th>Research Hypothesis</th>
<th>Statistical Significance Achieved</th>
<th>Post-Hoc Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal-child nurses who attend the classroom training will have a higher level of breastfeeding knowledge gain than nurses who attend the computer-based training.</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>Maternal-child nurses who attend the classroom training will have a more positive perception of breastfeeding support than nurses who attend the computer-based training.</td>
<td>No</td>
<td>NA</td>
</tr>
<tr>
<td>Maternal-child nurses who attend the classroom training will have a higher level of breastfeeding knowledge gain, across all three types of nurses, than nurses who attend the computer-based training.</td>
<td>No</td>
<td>Significant Main Effect of Type of Nurse</td>
</tr>
<tr>
<td>Maternal-child nurses who attend the classroom training will have a higher level of perception of breastfeeding support, across all three types of nurses, than nurses who attend the computer-based training.</td>
<td>No</td>
<td>Significant Main Effect of Type of Nurse</td>
</tr>
<tr>
<td>Maternal-child nurses who attend the classroom training will have a higher level of breastfeeding knowledge gain, across all five 4-hour sessions, than nurses who attend the computer-based training.</td>
<td>Yes</td>
<td>Significant Difference in Breastfeeding Session Four</td>
</tr>
</tbody>
</table>
Maternal-child nurses who attend the classroom training will have a more positive perception of breastfeeding support, across all five 4-hour sessions, than nurses who attend the computer-based training. Instructional methodology is the best predictor of maternal–child nurses’ perception of breastfeeding support in nurses who attend the 20-hour WHO/UNICEF breastfeeding training.

The first specific aim was to determine the impact of instructional methodology (classroom vs. computer-based) in the following areas upon maternal–child nurses who take the 20-hour WHO/UNICEF breastfeeding training: (a) breastfeeding knowledge gain and (b) perception of breastfeeding support. The results indicated that there was no statistical difference in either breastfeeding knowledge gain or perception of breastfeeding support among maternal child nurses who attended the classroom vs. the computer-based 20-hour WHO/UNICEF breastfeeding training.

The second specific aim of the study was determine the impact of instructional methodology (classroom vs. computer-based) in the following areas upon labor and delivery, postpartum, and neonatal maternal–child nurses who take the 20-hour WHO/UNICEF breastfeeding training: (a) breastfeeding knowledge gain and (b) perception of breastfeeding support. There was no statistical difference in breastfeeding knowledge gain across the three type of maternal-child nurses for those who attended the classroom vs. the computer-based 20-hour WHO/UNICEF breastfeeding training. There was a statistically significant difference in breastfeeding knowledge gain across the three
type of nurses. Specifically, neonatal nurses had a higher level of breastfeeding knowledge gain than labor and delivery nurses. There was no statistical difference in perception of breastfeeding support across the three type of maternal-child nurses for those who attended the classroom vs. the computer-based 20-hour WHO/UNICEF breastfeeding training. There was a statistically significant difference in perception of breastfeeding support across the three type of nurses. Specifically, labor and delivery nurses and postpartum nurses had a more positive perception of breastfeeding support than neonatal nurses.

The third specific aim was to determine the impact of instructional methodology (classroom vs. computer-based) upon maternal–child nurses, across all five 4-hour sessions, for the 20-hour WHO/UNICEF breastfeeding training in the following areas: (a) breastfeeding knowledge gain and (b) perception of breastfeeding support. For breastfeeding knowledge gain there was a statistically significant difference across the five 4-hour sessions in maternal-child nurses who attended the classroom vs. computer-based training. Specifically, maternal-child nurses who attended the classroom session four, breastfeeding support for non-breastfeeding mothers, had a higher level of breastfeeding knowledge gain than nurses who attended the computer-based training. However, there was no statistical significance in perception of breastfeeding support across the five 4-hour sessions in maternal-child nurses who attended the classroom vs. computer-based training.

The final specific aim was to determine the best predictor (knowledge gain, infant feeding attitude, or instructional methodology) of maternal–child nurses’ perception of breastfeeding support in nurses who attend the 20-hour WHO/UNICEF
breastfeeding training. Only infant feeding attitude, after controlling for knowledge gain and instructional methodology, was a positive predictor of perception of breastfeeding support. However the model, with the three predictors, explained about 29% of variance in perception of breastfeeding support.
Chapter 5

Discussion

This chapter provides an overview of the study, discussion of the research findings, and an interpretation of findings. In addition, this chapter provides the strengths and limitations of the study, implications of the study for breastfeeding education, recommendations for future studies, summary, and conclusions.

Overview of the Study

Lactation and breastfeeding experts agree that healthcare professionals have a major influence on a mother’s decision to initiate breastfeeding or to lactate (Bonuck et al., 2014; CDC, 2014; Smith, 2010; USDHHS, 2011). Nurses are the largest maternal–child staff group who support mothers and babies in meeting their lactation and breastfeeding needs (CDC, 2014; USDHHS, 2011; Spatz, 2010a; Spatz, 2010b). Consequently, maternal-child nurses have the most influence on breastfeeding outcomes in the hospital and post-discharge. As a result, nurses should be well trained and equipped with the best evidence-based techniques to promote, protect, and support breastfeeding (CDC, 2014; USDHHS, 2011). The best evidence to date is the Ten Steps (Baby-Friendly USA, 2015; CDC, 2014; Cox, 2010; Fairbank et al., 2000; USDHHS, 2011; WHO, 1998).

To aid with consistent care for mothers and babies and to ensure that best practices are being taught, WHO and UNICEF (2009) provided a 20-hour detailed curriculum and training guideline (see Appendix C for an outline of the 20-hour
curriculum) that provides the training for the Ten Steps. Yet there is controversy as to whether the training, designed for classroom instruction, can produce the same impact on knowledge gain, perception of skill, and actual skill acquisition when conducted as computer-based instruction. The latter is cheaper and easier to implement, especially in large healthcare systems (Fenesi, Vandermorris, Kim, Shore, & Heisz, 2015; Jordan et al., 2013; Rogers, Regehr, Yeh, & Howdieshell, 1998). Therefore, this study has the potential to contribute to the body of nursing breastfeeding education. Also, it is expected with the growing mandate to implement the Ten Steps from accreditation and governmental agencies, that healthcare systems will be seeking evidence as to the best instructional methodology to implement the 20-hour WHO/UNICEF breastfeeding training.

Evidence from the literature suggests that maternal–child nurse’s breastfeeding knowledge gain and perception of breastfeeding support are two key modifiable outcomes of breastfeeding training (Darent & Kempenaar, 2014; Deloian, Lewin, & O’Connor, 2015; Watkins & Dodgson, 2010). These modifiable outcomes also have a theoretical foundation. According to Bandura (1977), a learner’s environment can have an impact on the learner and his or her subsequent behavior. Bandura mapped out a perspective that learning includes consideration of the personal characteristics of the learner, relevant behavioral factors, and environmental influences.

The literature on maternal-child nurse breastfeeding training, knowledge gain, and perception of support has a long history (Cox, 2010). However, comparative research to determine effectiveness of the instructional methodology for breastfeeding training has been a challenge due to non-standardized breastfeeding educational interventions among
the studies reviewed (Spiby et al., 2009; Ward & Byrne, 2011; Watkins & Dodgson, 2010). Consequently, there is a major gap in the literature.

Another alarming gap in the literature is the number of researchers who tested the effectiveness of the international “gold standard” of breastfeeding education - the 20-hour WHO/UNICEF breastfeeding training (Ward & Byrne, 2013). The purpose of this study was to evaluate the impact of instructional methodology (classroom versus computer-based) on the maternal–child nurse’s breastfeeding knowledge gain and perception of breastfeeding support for nurses that participated in the 20-hour WHO/UNICEF breastfeeding training. This study was a secondary data analysis of 521 cases of attendance by maternal-child nurses - labor and delivery, postpartum, and neonatal (NICU) - to five 4-hour sessions of the 20-hour WHO/UNICEF breastfeeding training.

**Discussion of Research Findings**

The major findings of this research show that instructional methodology impacted maternal–child nurses’ breastfeeding knowledge gain when the content of the instruction was taken into consideration. Specifically, breastfeeding instruction on support of non-breastfeeding mothers had a statistically significant ($p < .001$) higher level of breastfeeding knowledge gain from participants who attended the classroom instruction than participants who attended the computer-based instruction. This finding is consistent with findings noted by Jordan et al. (2013). Higher levels of knowledge gain were noted in classroom instruction when compared to computer-based instruction ($p = .0001$) among practitioners in an acute care setting. Jordan et al. (2013) insists that novice learners in acute care settings require some degree of classroom instruction.
The present study revealed that instructional methodology does not impact maternal-child nurses’ perception of breastfeeding support. In fact, this study showed that maternal-child nurse infant feeding attitude, after controlling for the effects of instructional methodology and breastfeeding knowledge gain, was a significant ($p < .001$) positive predictor of maternal-child nurses’ perception of breastfeeding support. This finding is consistent with the literature on perception of breastfeeding support. Maternal-child nurse attitude toward breastfeeding can impact nurse perception of breastfeeding support (Grassley & Nelms, 2008; Toyama, Kurihara, Muranaka, & Kamibeppu, 2013).

In this study, four specific aims were pursued and seven research hypotheses were tested. The findings of the seven research hypotheses are discussed next.

**Research Hypothesis 1: Maternal-child nurses who attend the classroom training will have a higher level of breastfeeding knowledge gain than nurses who attend the computer-based training.**

There was no significant difference in breastfeeding knowledge gain between maternal-child nurses who attended the classroom training ($Md = 2, n = 322$) and maternal-child nurses who attended the computer-based training ($Md = 3, n = 199$), $U = 29271.5, p = 0.94, r = .07$. The research hypothesis was not achieved. However, the mean rank for the computer-based training group (mean rank = 274.91) was higher than for the classroom training group (mean rank = 252.41).

There are a few probable reasons why there was no difference in breastfeeding knowledge gain between the two instructional methodologies. It is possible that the large percentage of less experienced (approximately 46% with 5 or fewer years of nursing) and thus, potentially younger, nurses can explain these findings. Recent work comparing
computer-based instruction and classroom instruction note that millennial learners prefer computer-based instruction and are more comfortable with computer-based instruction (Jordan et al., 2013). These maternal-child nurses may have been comfortable with either type of instruction methodology and therefore could have comparable knowledge acquisition in either of the instructional methodologies. But being millennial learners, they may have preferred the computer-based instruction, and thereby were more open to learning, resulting in higher knowledge acquisition.

**Research Hypothesis 2: Maternal-child nurses who attend the classroom training will have a more positive perception of breastfeeding support than nurses who attend the computer-based training.**

There was no significant difference in maternal-child nurses’ perception of breastfeeding support for classroom training ($M = 50.35, SD = 4.55$) and computer-based training, $M = 50.09, SD = 4.21$; $t(519) = .66, p = .51$ (two-tailed). The research hypothesis was not achieved. However, the total mean score for the participants in the classroom training (50.35) was higher than the computer-based instruction (50.09). In other words, maternal-child nurses who attended the classroom training reported a more positive perception of breastfeeding support than maternal-child nurses who attended the computer-based training.

Maternal-child nurse perception of breastfeeding support is the ability of the nurse to recognize best practices that support breastfeeding and lactation (Zakarija-Grkovic & Burmaz, 2010). In this study, perception of breastfeeding support is defined conceptually as awareness by maternal–child nurses of the Ten Steps and their self-reported practice of
Despite the ability to define the concept, maternal-child nurse perception of breastfeeding support is a complex phenomenon.

Researchers have identified several factors that can influence a nurse’s ability to be aware of or recognize best practices: (1) breastfeeding and lactation knowledge (Ward & Byrne, 2011); (2) type of nurse (Kjelland et al., 2014); (3) attitude toward breastfeeding (Grassley & Nelms, 2008; Toyama, Kurihara, Muranaka, & Kamibeppu, 2013); (4) previous breastfeeding experience (Hauck et al., 2010); and (5) social environment (Dodgson, Bloomfield, & Choi, 2014).

With the two groups (classroom and computer-based) being statistically similar (p values ranged from .11 to .85), two characteristics of the study sample may have influenced the lack of statistical significance in the difference between the groups. Firstly, as discussed within the results of hypothesis one, the majority of the maternal-child nurses who participated in the study were less experienced nurses and thus would have less experience with breastfeeding support. Consequently, these nurses may be less able to identify best practice (Hauck et al., 2010). Secondly, the study sample was drawn from a social environment (South Florida) that can be viewed as not supportive of breastfeeding. To provide the premise for this negative view of the breastfeeding supportive environment, one can examine the rates for breastfeeding in Florida and the acquisition of Baby-Friendly accreditation. Implementing the recommended care for lactating and breastfeeding mothers and babies can be validated by Baby-Friendly accreditation.

The breastfeeding rate in Florida (77%) is less than the national recommendation of 81.9% and the national average of 79.2% (Centers for Disease Control and Prevention
The study hospital is not Baby-Friendly accredited. In fact, the first Baby-Friendly hospital in South Florida obtained accreditation just this year, in 2015, 18 years after Baby-Friendly USA was established (Baby-Friendly USA, 2015). In so saying, there was potential for the social environment of the study hospital to negatively impact maternal-child nurses’ perception of breastfeeding support. Maternal-child nurses may not even have the ability to practice within the guidelines of the Ten Steps because of lack of accreditation. Best practice to support breastfeeding and lactation may not have been implemented yet.

Lastly, the more positive (higher total mean scores) perception of breastfeeding support in the classroom training group as compared to the computer-based training group can be attributed to the interaction with a role model - the instructor - in the classroom training. This concept is explained by Bandura’s (1977) social learning theory that provides the theoretical framework for the study. Bandura explains that a learner’s environment can impact subsequent behavior. So, in a learning environment that is devoid of interaction with other people or an instructor (computer-based instruction), one can expect a different experience from the learner (and effect on the learner’s subsequent behavior) than in a learning environment that is rich with interpersonal interactions. It is this difference in experience (interaction with a role model instructor in the classroom training), that may have given maternal-child nurses in the classroom instruction group a more positive perception of breastfeeding support because the instructor was perhaps able to clarify and validate the nurses’ breastfeeding concerns and questions.
Research Hypothesis 3: Maternal-child nurses who attend the classroom training will have a higher level of breastfeeding knowledge gain, across all three types of nurses, than nurses who attend the computer-based training.

The interaction effect between instructional methodology and type of nurse was not statistically significant, $F(2, 515) = .89, p = .41$ for the dependent variable, breastfeeding knowledge gain. The research hypothesis was not achieved. Further, the main effect of instructional methodology did not achieve statistical significance $F(2, 515) = .5, p = .48$.

Just as was discussed with hypothesis one, the larger proportion (about 46%) of possibly younger, less experienced maternal-child nurses in the study sample may have impacted the ability to detect a significant difference between the two instructional methodologies. Also illustrated in these findings is a higher overall total mean score in the computer-based training (2.77) than the classroom training (2.63), which further underscores the belief that the millennial generation are more comfortable and more receptive to learning in a computer-based setting, and hence may have higher knowledge gain (Jordan et al., 2013).

On the other hand, there was a statistically significant main effect for type of nurse $F(2, 515) = 3.99, p = .02$; however, the effect size was small (partial eta squared = .02). With a non-significant interaction effect, the main effect can be interpreted with less caution (Pallant, 2013). The results indicated that the mean score for NICU nurses ($M = 3.30, SD = 2.90$) was statistically different, $p = .02$, from labor and delivery nurses ($M = 2.38, SD = 2.73$). The mean score for postpartum nurses ($M = 2.59, SD = 2.75$) did not differ significantly from the mean score for either neonatal (NICU) or labor and
delivery nurses. The significant difference in breastfeeding knowledge gain between NICU and labor and delivery nurses and not with postpartum nurses may seem unexplainable at first glance. But, a plausible explanation may be due to the fragmentation of care in the U.S. system. Each type of nurse in the hospital has specialty-specific breastfeeding knowledge either from experience or on-the-job training (Deloian et al., 2015; McLaughlin, Fraser, Young, & Keogh, 2011; Weddig, 2011). With NICU nurses and labor and delivery nurses being on either end of the spectrum of care and also being so specialized with their care, the significant difference in breastfeeding knowledge gain is logical.

NICU nurses do not ordinarily consider mothers as part of their care and truly focus on the baby. Labor and delivery nurses, as well as postpartum nurses, focus on mothers. Postpartum nurses focus on both mothers and babies. So essentially, NICU nurses would have a large difference in knowledge from labor and delivery and would gain more in breastfeeding knowledge from a comprehensive training such as the 20-hour WHO/UNICEF breastfeeding training. Postpartum nurses, having to care for mothers and babies, may not have much of a difference in knowledge gain from either the NICU nurse or the labor and delivery nurse. Figure 5.1 illustrates this concept. Postpartum nurses have breastfeeding knowledge that spans the entire continuum of care.
Figure 11. Graphical representation of the spectrum of care of the three types of maternal-child nurses

**Research Hypothesis 4: Maternal-child nurses who attend the classroom training will have a higher level of perception of breastfeeding support, across all three types of nurses, than nurses who attend the computer-based training.**

The interaction effect between instructional methodology and type of nurse was not statistically significant, $F(2, 515) = 1.48, p = .23$. The research hypothesis was not achieved. The main effect of instructional methodology also did not achieve statistical significance, $F(2, 515) = .002, p = .96$. Nonetheless, mean scores were higher in the classroom training across the three types of nurses, but this finding was not statistically significant.
As discussed within the results of hypothesis two, these findings are plausible in light of two factors. Firstly, the large proportion of less experienced and possibly younger nurses in the sample (about 46%) may have impacted the results. Secondly, because perception of breastfeeding support is the ability of the maternal-child nurse to identify best practices, a difference may not have been detected due the study sample being from a non-Baby-Friendly hospital. Also discussed in hypothesis two is the finding of a positive perception of breastfeeding support, as exhibited by higher total mean scores, in the classroom training. This is consistent with Bandura’s social learning theory that indicates the presence of a role model (instructor in this case) can positively impact behavior.

There was a statistically significant main effect for type of nurse $F(2, 515) = 6.22, p = .002$; however, the effect size was small (partial eta squared = .02). With a non-significant interaction effect, the main effect can be interpreted with less caution (Pallant, 2013). The mean score for NICU nurses ($M = 48.95, SD = 4.98$) was statistically different, $p = .03$, from labor and delivery nurses ($M = 50.29, SD = 4.10$) and postpartum nurses ($M = 50.84, SD = 4.22$). The mean score for postpartum nurses ($M = 50.84, SD = 4.22$) did not differ significantly from the mean score of labor and delivery nurses ($M = 50.29, SD = 4.10$). Postpartum nurses and labor and delivery nurses reported a more positive perception of breastfeeding support than NICU nurses post the 20-hour WHO/UNICEF breastfeeding training.

This finding can be arguably explained by the same discussion of findings for hypothesis three. NICU nurses do not ordinarily consider mothers as part of their care and truly focus on the baby (Deloian et al., 2015; McLaughlin, Fraser, Young, & Keogh,
So after a comprehensive training such as the 20-hour WHO/UNICEF breastfeeding training which included care of both mother and baby, the ability of NICU nurse to identify comprehensive best practices for mother and baby (perception of breastfeeding support) would not be as easily identifiable as it would be for postpartum and labor and delivery nurses who take care of both mother and baby on a daily basis.

**Research Hypothesis 5: Maternal-child nurses who attend the classroom training will have a higher level of breastfeeding knowledge gain, across all five 4-hour sessions, than nurses who attend the computer-based training.**

The interaction effect between instructional methodology and type of nurse was statistically significant, $F (2, 511) = 3.54, p = .007$; however, the effect size was small (partial eta squared = .03). The research hypothesis was achieved. Overall, mean scores were higher in the computer-based training across the sessions. Post hoc comparisons using Tukey HSD test indicated that the mean score for breastfeeding session four ($M = 5.49, SD = 3.48$) was statistically different, $p < .001$, from breastfeeding session one ($M = 1.80, SD = 1.56$), two ($M = 2.71, SD = 2.47$), three ($M = 1.48, SD = 1.74$), and five ($M = 2.42, SD = 2.62$). The statistically significant difference in mean scores for breastfeeding knowledge gain in breastfeeding session four indicated classroom training (mean score = 5.75) was higher than in computer-based training (mean score = 3.50).

Breastfeeding session four was focused on support of non-breastfeeding mothers, i.e. formula feeding mothers. It is important to note that based on the extensive research that supports breastfeeding as the optimal infant feeding practice, many people assume that maternal-child - labor and delivery, postpartum, and NICU - nurses, have the most
evidence-based breastfeeding knowledge to support the mother–baby dyad. In fact, that is not always the case; truthfully, it is more of the exception than the rule (Cricco-Lizza, 2009; Watkins & Dodgson, 2010). Furthermore, one shocking revelation in the findings by researchers, McLaughlin et al. (2010), was that almost half (45%) of the pediatric nurses reported that breast milk was nutritionally equivalent to formula.

It follows then, that finding out that breast milk is drastically different from formula in breastfeeding session four, may led to an increase in knowledge gain in about half of the participants, if McLaughlin et al.’s findings can be used as an estimate. One implication of this belief is pointed out by Martucci (2012). In general, nurses feel that providing breastfeeding support to mothers is an arduous task (Martucci, 2012). Formula feeding was easier. Further, hospital policies and procedures, such as feeding schedules, completely contradict the principles of breastfeeding. So why not feed formula, if they are the same?

One can concede that a significant difference in breastfeeding knowledge gain in breastfeeding session four, as compared to the other four sessions is quite plausible. So too, the higher knowledge gain in the classroom training as compared to the computer-based training in breastfeeding session four, can be credited to the theoretically grounded explanation of a role model (instructor) present in the classroom validating and clarifying the maternal-child nurse participants’ concerns and questions. Hence, the result is a higher level of knowledge acquisition (Bandura, 1977).

There was also a statistically significant main effect for breastfeeding session $F (2, 511) = 10.07, p < .001$ with a moderate the effect size (partial eta squared = .07). However, with a significant interaction effect, this cannot be interpreted without caution
(Pallant, 2013). The main effect of instructional methodology did not reach statistical significance $F(2, 511) = .16, p = .69$. Again, with a significant interaction effect, this main effect cannot be interpreted without caution (Pallant, 2013).

**Research Hypothesis 6: Maternal-child nurses who attend the classroom training will have a more positive perception of breastfeeding support, across all five 4-hour sessions, than nurses who attend the computer-based training.**

There were no significant main effects or interaction effect (instructional methodology $p = .54$; breastfeeding session $p = .38$; instructional methodology * breastfeeding session $p = .96$) from this analysis. The research hypothesis was not achieved. Overall, mean scores were higher in the classroom training across the sessions. However, this was not statistically significant.

Using the same initial discussion from hypothesis two, the study sample characteristics were similar in the computer-based and the classroom trainings. Accordingly, the majority of the maternal-child nurses who participated in the study were less experienced nurses and thus would have less experience with breastfeeding support and so less able to identify best practice (Hauck et al., 2010). So a difference in perception of breastfeeding support would not be detected between the instructional methodologies. The higher total mean scores in the classroom training (50.35) than computer-based training (50.09) is consistent with findings from hypothesis two.

**Research Hypothesis 7: Instructional methodology is the best predictor of maternal–child nurses’ perception of breastfeeding support in nurses who attend the 20-hour WHO/UNICEF breastfeeding training.**
The regression model (infant feeding attitude, breastfeeding knowledge gain, and instructional methodology) explained about 29% \((R^2 = .289\), adjusted \(R^2 = .285\)) of the variance in the dependent variable, perception of breastfeeding support. Infant feeding attitude was the only significant \((B = .274, SE = .019, \beta = .533, p < .001\)) predictor of perception of breastfeeding support after controlling for the other two predictors, breastfeeding knowledge gain and instructional methodology. The research hypothesis was not achieved.

The ability of the model to explain 29% of variance in perception of breastfeeding support speaks to the potential interplay of the three predictor variables (infant feeding attitude, breastfeeding knowledge gain, and instructional methodology) in impacting perception of breastfeeding support. However, there is still 71% of variance that is not explained by the model. Considering the complexity of breastfeeding support, some breastfeeding and lactation experts may consider this 29% as fairly significant (Dodgson, Bloomfield, & Choi, 2014).

It is important to note that even prior to the regression analysis, only infant feeding attitude positively correlated with perception of breastfeeding support. Therefore, the result of the model having infant feeding attitude being the only positive predictor after controlling for the two other predictor variables is consistent with the bivariate analysis. This finding is also consistent with literature that links infant feeding attitude and perception of breastfeeding support (Muthike, 2014). The more positive one’s attitude toward breastfeeding, the higher one’s perception of breastfeeding support (Toyama et al., 2013). To further validate this finding, attitude competencies are endorsed core competencies by the American Academy of Nursing for nurses (Spatz, 2014).
Lastly, the correlation between instructional methodology and breastfeeding knowledge gain with perception of breastfeeding support were respectively non-significant. The finding for instructional methodology is consistent with findings for hypothesis two. The finding for breastfeeding knowledge gain may be explained by findings in the literature. Ward and Byrne (2011) noted that the breadth of breastfeeding and lactation knowledge was what impacted perception of breastfeeding support and not knowledge gain.

**Strengths and Limitations of the Study**

The study design was secondary analysis of data. This study has both strengths and limitations. Secondary data analysis occurs when data collected from another study or source is examined for a reason that was not originally intended (Finlayson, Egan, & Black, 1999). This study utilizes an existing data set. A discussion of the strengths will be outlined first and then the limitations.

**Strengths**

**Creation of New Evidence.** This study improves on previous research studies that were not able to provide evidence on comparative effectiveness of instructional methodology for breastfeeding education due to inconsistencies in content, format, and length (Ward & Byrne, 2013). The study also fills another gap of comparative effectiveness research of instructional methodology using the gold standard- the 20-hour WHO/UNICEF training.

**Speed and Economy.** Some of the main advantages of secondary data analysis are speed and economy (Hulley, Cummings, Browner, Grady, & Newman, 2007). To
conduct a prospective study to investigate instructional methodology among maternal–child nurses who take the 20-hour WHO/UNICEF breastfeeding training would require a few years of planning and execution. The cost of paying for the nurses’ and instructors’ time, along with the educational materials, would be very expensive.

**Effectiveness.** This study, by utilizing existing data, allows the researcher to evaluate the effectiveness of instructional methodology comparatively more rapidly and inexpensively. Hulley et al. (2007) argue that a valuable contribution of this type of secondary data analysis is a better understanding of the difference between efficacy and effectiveness. Hulley et al. explained that the randomized control trial is the gold standard for determining efficacy in under highly-controlled circumstances in selected clinical settings. However, an analysis of “real world” data establishes effectiveness of interventions. In the real world, there is variability, as well as a need to understand how interventions work.

**Sample Size.** With 521 cases of attendance in the study sample, the sample size far exceeded the power analysis recommendation to achieve statistical significance of 129 (Faul, Erdfelder, Buchner, & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007).

**Limitations**

**Study Design.** Analysis of existing data sets also has disadvantages because of the study design. The main issue is that the data collection and population have already been completed. As a result, concerns may arise about how variables are measured and recorded, the quality of the data, and the data collection procedures. Fortunately, the researcher was the hospital breastfeeding educator and was intimately involved in the
educational intervention and, therefore, had a great understanding of the depth and breadth of how variables were measured, collected, and recorded.

Nonetheless, the concerns about: (a) maternal-child nurses taking sessions twice, (b) collaboration during the classroom training, (c) not having the same experience in the classroom setting due to different participants, (d) self-report of measures, (e) lack of precision (reliability) and accuracy (validity) of instruments, (f) gender-bias, (g) coding errors when transcribing scores to the clinical data set, and (h) maturation bias are limitations to this study. Lastly, in this particular study, the lack of experimental design and probability sampling also results in limited generalizability and weak claims to a casual inference (Hulley et al., 2007). All of these are threats to the external and internal validity of the study (Hulley et al., 2007).

**Sample.** The generalizability of findings is also limited because of the study utilized data from one hospital in South Florida.

**Assumptions Testing.** Some study variables did not meet the assumptions for parametric testing. Consequently, results must be interpreted with caution (Pallant, 2013). Truthfully, random sampling and independence of observations are assumptions of both parametric and non-parametric testing. However, random sampling is not always the case in real life and thus not the case for this study of effectiveness (Pallant, 2013).

Independence of observations can also be arguably violated in the study since the infant feeding attitude scores and breastfeeding knowledge gain scores can be influenced by who were present in the classroom setting - that is, if some non-breastfeeding supporters happen to be in the classroom that day. Further nurses could take both computer-based and classroom training for any of the five 4-hour sessions so their scores
could be influenced from session to session (the carry-over effect). The five sessions did present different material and thus the later can be refuted. Nonetheless, the potential for violation of independence of observations is still there on both grounds presented. Results must thus be interpreted with caution (Pallant, 2013).

**Implications for Breastfeeding Education**

With the new focus on quality driving hospital reimbursements, effective, yet cost-containing measures are paramount in maintaining healthcare operations (IHI, 2015). Implementation of the Ten Steps to Successful Breastfeeding, coined by WHO/UNICEF (1989), is the best evidence-based practices to provide quality lactating and breastfeeding support in maternity facilities. The international gold standard of training healthcare staff in the Ten Steps is the 20-hour WHO/UNICEF breastfeeding training (Baby-Friendly USA, 2015). The cost of training all maternity staff (nurses, physicians, and allied-health professionals) can be daunting in terms of cost.

To illustrate, if the average nurse in a hospital makes about $21.00, the labor cost to train one nurse with the 20-hour course would be (21 x 20): $420.00 (U. S. Department of Labor, 2015). In a hospital like the study hospital with over 300 nursing staff, the labor cost only (not including operational costs) would be about (300x 420): $126,000. With such a substantial investment, in the face of competing costs of other mandatory health education, hospital administrators would want to ensure that their maternal-child nurses are trained to effectively support lactating and breastfeeding mothers.

The study findings of a trend toward no significant difference in breastfeeding knowledge gain or perception of breastfeeding support, based on instructional
methodology is invaluable to hospital administrators who are trying to make decisions about cost of training. Asynchronous computer-based instruction is cheaper, more easily accessible, and easier to implement than classroom training (Fenesi, Vandermorris, Kim, Shore, & Heisz, 2015; Jordan et al., 2013; Rogers, Regehr, Yeh, & Howdieshell, 1998).

But there is a catch. The study findings also revealed that higher levels of breastfeeding knowledge gain were gained by participants in the computer-based training except when breastfeeding educational content was on supporting the non-breastfeeding mother. Then, classroom training was more effective in improving knowledge gain and it was statistically significant. For perception of breastfeeding support, more positive levels of perception were noted in participants who attended the classroom training.

So while instructional methodology may not generally impact maternal-child nurse outcomes, there is a chance that it could have a major impact on knowledge gain of specific breastfeeding content and on ability to support. The effects observed here hint at a possible explanation for variations in quality of care delivery and outcomes that may be linked to instructional methodology; specifically, why some hospitals implement the Ten Steps, train their staff with the 20-hours, but their outcomes are the same, or barely significant (Hawkins et al., 2015). Ultimately, what is at stake is quality of care. Hospital administrators may want to be cautious in assuming that quality outcomes can be attained independent of choice of instructional methodology.

The study also informs directions for continued breastfeeding education post the 20-hour WHO/UNICEF training. NICU nurses were found to have a less positive perception of support post the training. Clinical educators could use this information to provide more training for NICU nurses so that their perception of support is augmented.
If all nurses are not on the same level of knowledge and skill minimally, inconsistencies in care will occur, and quality will diminish. Mothers and babies deserve safe, quality care.

Lastly, the study findings indicated that maternal-child nurse infant feeding attitude can impact perception of breastfeeding support. Infant feeding attitude matters because it fosters a positive environment of breastfeeding care and support. A more positive environment enhances the patient experience, which impacts quality of care overall (IHI, 2015). In conclusion, these findings have important consequences for the broader domain of factors that impact effective maternal-child nurse education and subsequent quality healthcare outcomes.

**Recommendations for Future Studies**

1. More studies are needed that use the 20-hour WHO/UNICEF training as the educational intervention.
2. Future research that includes classroom training as a comparative group should consider multilevel (or hierarchical) modelling to account for the interaction in a group setting such as the classroom (Pallant, 2013).
3. The role of the instructor in impacting breastfeeding knowledge gain, perception of breastfeeding support, and infant feeding attitude needs to be explored.
4. Plans for future study designs should be prospective, experimental, and employ probability sampling to improve generalizability and claims to causality (Hulley et al., 2007).
5. The study population should be extended to include more than one hospital.
6. Standardized instruments that measure breastfeeding knowledge gain and perception of breastfeeding support with high precision and accuracy are needed to further drive comparative effectiveness research.

7. Collection of maternal-child nurse satisfaction with instructional methodology for each session can help to triangulate score-based findings.

8. The role of instructional methodology and perception of breastfeeding support needs to be explored further.

9. Types of instructional methodology should include a blended format and the impact of all three methodologies on maternal-child nurse breastfeeding outcomes should be tested.

10. The impact of the social environment on breastfeeding knowledge gain and perception of breastfeeding support should be further explored.

11. Further exploration of impact of instructional methodology within the three types of nurses should be done.

12. Future research should explore strategies to minimize differences in breastfeeding knowledge and perception of breastfeeding support among the three types of maternal-child nurses.

13. Future research should include a comparative analysis of non-nurses to nurses for the study dependent variables.

14. A cost analysis for each instructional methodology would be a final consideration for future studies.
Summary and Conclusions

This study adds to the empiric literature in breastfeeding education and the maternal-child nursing community by offering evidence that maternal-child nurse breastfeeding knowledge gain can be significantly impacted by choice of instructional methodology based on content area of the 20-hour WHO/UNICEF breastfeeding training. The study demonstrates that breastfeeding knowledge gain is significantly higher in the classroom setting when the content area is support of non-breastfeeding mothers.

Although this study demonstrates that there is no overall significant difference in breastfeeding knowledge gain or perception of breastfeeding support between computer-based instruction and classroom instruction, the first of its kind to date, in terms of comparative effectiveness research using the international gold standard, the 20-hour WHO/UNICEF breastfeeding training, as the educational intervention. And in fact, though the results were non-significant, a trend toward higher scores of breastfeeding knowledge gain and perception of breastfeeding support was found in the computer-based training and classroom training respectively. So although, choice of instructional methodology may be trivial, it is in fact crucial in terms of today’s focus on effective, quality maternal-child care (IHI, 2015).
References


Melnik, B. C. (2014). The potential mechanistic link between allergy and obesity development and infant formula feeding. *Allergy, Asthma, and Clinical Immunology, 10*(1), 37. doi:10.1186/1710-1492-10-37


APPENDICES

Appendix A

Ten Steps to Successful Breastfeeding

The *Ten Steps to Successful Breastfeeding* are:

1. Have a written breastfeeding policy that is routinely communicated to all health care staff.
2. Train all health care staff in the skills necessary to implement this policy.
3. Inform all pregnant women about the benefits and management of breastfeeding.
4. Help mothers initiate breastfeeding within one hour of birth.
5. Show mothers how to breastfeed and how to maintain lactation, even if they are separated from their infants.
6. Give infants no food or drink other than breast milk, unless medically indicated.
7. Practice rooming in—allow mothers and infants to remain together 24 hours a day.
8. Encourage breastfeeding on demand.
9. Give no pacifiers or artificial nipples to breastfeeding infants.
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or birth center.
Appendix B

Summary of International Code of Marketing of Breast-milk Substitutes

Courtesy: International Code Documentation Centre/IBFAN Penang, PO Box 19, 10700, Penang, Malaysia

1. **Aim:** The Code aims to protect and promote breastfeeding by ensuring appropriate marketing and distribution of breast milk substitutes.

2. **Scope:** The Code applies to breast milk substitutes, when marketed or otherwise represented as a partial or total replacement for breast milk. These breast milk substitutes can include food and beverages such as:
   - infant formula
   - other milk products
   - cereals for infants
   - vegetable mixes
   - baby teas and juices
   - follow-up milks

The Code also applies to feeding bottles and teats. Some countries have expanded the scope of the Code to include foods or liquids used as breast milk substitutes and pacifiers.

3. **Advertising:** No advertising of above products to the public.

4. **Samples:** No free samples to mothers, their families, or health workers.
5. **Healthcare facilities:** No promotion of products; i.e., no product displays, posters, or distribution of promotional materials. No use of mother-craft nurses or similar company-paid personnel.

6. **Health workers:** No gifts or samples to health workers. Product information must be factual and scientific.

7. **Supplies:** No free or low-cost supplies of breast milk substitutes to any part of the healthcare system.

8. **Information:** Information and educational materials must explain the benefits of breastfeeding, the health hazards associated with bottle feeding, and the costs of using infant formula.

9. **Labels:** Product labels must clearly state the superiority of breastfeeding, the need for the advice of a health worker, and a warning about health hazards. No pictures of infants, or other pictures or text idealizing the use of infant formula.

10. **Products:** Unsuitable products, such as sweetened condensed milk, should not be promoted for babies. All products should be of a high quality (Codex Alimentarius standards), have expiration dates, and take account of the climatic and storage conditions of the country where they are used.
Appendix C

20-hour WHO/UNICEF Breastfeeding Training Curriculum

I. The Global Strategy for Infant & Young Child Feeding and how the Global Strategy fits with other activities

II. The Baby-Friendly Hospital Initiative (BFHI)

III. How this course can assist health facilities in making improvements in evidence-based practice, quality care, and continuity of care

IV. Listening and learning

V. Skills to build confidence and give support

VI. Arranging follow-up and support suitable to the mother’s situation

VII. Parts of the breast involved in lactation

VIII. Breast milk production

IX. The baby’s role in milk transfer

X. Breast care

XI. Discussing breastfeeding with pregnant women

XII. Why breastfeeding is important

XIII. Antenatal breast and nipple preparation

XIV. Women who need extra attention

XV. Labor and birth practices to support early breastfeeding

XVI. The importance of early contact

XVII. Helping initiate breastfeeding

XVIII. Ways to support breastfeeding after a cesarean birth

XIX. BFHI practices and women who are not breastfeeding
XX. Infant feeding cues

XXI. Positioning for a pain-free breastfeeding

XXII. How to assess a feeding

XXIII. Recognize signs of optimal positioning and attachment

XXIV. Help a mother to learn to position and attach her baby

XXV. Rooming-in

XXVI. Baby-led feeding

XXVII. Dealing with sleepy babies and crying babies

XXVIII. Avoiding unnecessary supplementation

XXIX. Avoiding bottles and teats

XXX. Concerns about “not enough milk”

XXXI. Normal growth patterns of babies

XXXII. Improving milk intake and milk production

XXXIII. Strategies to support mothers with insufficient milk

XXXIV. Counseling the formula choice: A pediatric responsibility

XXXV. Teaching/assuring safe formula preparation in the postpartum

XXXVI. Safe bottle feeding; issues with overfeeding/underfeeding

XXXVII. Breastfeeding infants who are preterm, low birth weight, or ill

XXXVIII. Breastfeeding more than one baby prevention and management of common clinical concerns

XXXIX. Medical reasons for food other than breast milk

XL. Nutritional needs of breastfeeding women

XLI. How breastfeeding helps space pregnancies
XLII. Breastfeeding management when the mother is ill
XLIII. Medications and breastfeeding
XLIV. Examination of the mother’s breasts and nipples
XLV. Engorgement, blocked ducts, and mastitis
XLVI. Candida infections of the breast
XLVII. Hierarchy of feeding choices
XLVIII. Methods of milk expression
XLIX. Providing breast milk for a preterm or ill infant
L. Storage of expressed human milk
LI. Feeding expressed breast milk to the baby
LII. Use of milk from the wrong mother
LIII. Follow-up and support after discharge
LIV. Protecting breastfeeding for employed women
LV. Sustaining continued breastfeeding for 2 years or longer
LVI. Federal and state legislation
LVII. The International Code of Marketing of Breast-milk Substitutes
LVIII. Marketing practices in U.S. hospitals
LIX. The effect of marketing on infant feeding practices
LX. Responding to marketing practices
LXI. Donations in emergency situations
LXII. The role of breastfeeding in emergencies, protection, and support

LXIII. The Ten Steps to Successful Breastfeeding

LXIV. Baby-Friendly performance expectations

LXV. The 4-D pathway to Baby-Friendly designation
## Appendix D

### Educational Objectives per Breastfeeding Session

Table D1

<table>
<thead>
<tr>
<th>Breastfeeding Session</th>
<th>Educational Objectives</th>
</tr>
</thead>
</table>
| One                   | • The participant will be able to discuss the rationale for professional, governmental, and international policies that promote, protect, and support breastfeeding in the United States.  
                         | • The participant will be able to demonstrate the ability to communicate effectively about breastfeeding.  
                         | • The participant will be able to describe the anatomy and physiology of lactation and the process of breastfeeding.                                      |
| Two                   | • The participant will be able to identify teaching points appropriate for prenatal classes and interactions with pregnant women.  
                         | • The participant will be able to discuss hospital birth policies and procedures that support exclusive breastfeeding.  
                         | • The participant will be able to demonstrate the ability to identify the hallmarks of milk transfer and optimal breastfeeding. |
| Three | • The participant will be able to discuss hospital postpartum management policies and practices that support exclusive breastfeeding.  
• The participant will be able to discuss methods that may increase milk production in a variety of circumstances. |
| Four | • The participant will be able to identify teaching points to include when educating or counseling parents who are using bottles and/or formula.  
• The participant will be able to discuss contraindications to breastfeeding in the United States as well as commonly encountered areas of concern for breastfeeding mothers and their babies.  
• The participant will be able to describe management techniques for breast and nipple problems. |
| Five | • The participant will be able to identify acceptable medical reasons for supplementation of breastfed babies according to national and international authorities.  
• The participant will be able to describe essential components of support for mothers to continue breastfeeding beyond the early weeks. |
• The participant will be able to describe strategies that protect breastfeeding as a public health goal.

• The participant will be able to identify barriers and solutions to implementation of The Ten Steps to Successful Breastfeeding that comprise the Baby-Friendly Hospital Initiative.
Appendix E

Perception of Breastfeeding Support Questionnaire

Circle One Session One Session Two Session Three Session Four Session Five

This session is your (Circle One): 1st 2nd 3rd 4th 5th

Circle all that apply

<table>
<thead>
<tr>
<th>Unit</th>
<th>Specialty</th>
<th>Position</th>
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</thead>
<tbody>
<tr>
<td>High Risk Antepartum</td>
<td>OB/GYN</td>
<td>Attending MD</td>
</tr>
<tr>
<td>L &amp; D</td>
<td>Perinatology</td>
<td>MD in training</td>
</tr>
<tr>
<td>NICU</td>
<td>Family Practice</td>
<td>RN Midwife</td>
</tr>
<tr>
<td>Post-anesthesia care</td>
<td>Pediatrics</td>
<td>NNP/PNP/PA</td>
</tr>
<tr>
<td>Intermediate care nursery</td>
<td>Neonatology</td>
<td>RN</td>
</tr>
<tr>
<td>Post-partum care (mother–baby)</td>
<td>Anesthesia</td>
<td>Clinical Partner</td>
</tr>
<tr>
<td>Newborn nursery</td>
<td>Other:</td>
<td>Social worker</td>
</tr>
<tr>
<td>Transition nursery</td>
<td></td>
<td>Unit Clerk</td>
</tr>
<tr>
<td>Please check the most appropriate box</td>
<td>Strongly Agree</td>
<td>Agree</td>
</tr>
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<tr>
<td>1. Breast milk is better than formula.</td>
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</tr>
<tr>
<td>2. Breastfeeding is a mother’s choice.</td>
<td></td>
<td></td>
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<tr>
<td>3. As a healthcare professional, I feel it is my responsibility to support a mother who wants to breastfeed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. As a healthcare professional, I feel it is my responsibility to ask every mother if they want to breastfeed.</td>
<td></td>
<td></td>
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<tr>
<td>5. As a healthcare professional, I feel it is my responsibility to discuss the benefits of breastfeeding to all mothers.</td>
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<td></td>
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<tr>
<td>6. Breastfeeding can be initiated in the 1st hour of life.</td>
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<tr>
<td>7. Transitioning the baby with the</td>
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</table>
8. Skin-to-skin, also known as kangaroo care, helps support breastfeeding.

9. Breastfeeding babies should not have pacifiers unless medically indicated.

10. Rooming-in 24 hours a day helps with breastfeeding.

11. I feel comfortable supporting a mother to breastfeed.

<p>| | | | |</p>
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**Circle One**  Male  Female

Number of Years in Nursing:

Number of Years at X hospital:

Estimated number of breastfeeding education hours prior to this program:

I have personal/partner experience with breastfeeding a child (**Circle One**):

Yes  No
Appendix F

Permission to use Iowa Infant Feeding Attitude Scale (IIFAS)

From: Delamora, Arlene [SOE] [adelamor@iastate.edu]
Sent: Monday, January 14, 2013 3:34 PM
To: Shakira L. Henderson
Subject: FW: Permission to use the IIFAS
Attachments: IIFAS.pdf

I have attached a copy of our paper that describes the psychometric properties of the scale; the scale itself can be found on the last page of the paper. You have our permission to use the IIFAS in your research. In granting you permission to use the scale, I do have a couple of requests. First, we ask that you share summary data (means and std. dev.) of data collected. Second, I ask that you not publish the scale in its entirety in any paper, journal, poster, or place it on the Internet. I don’t like making the second request, but have found it necessary because I have found instances where the scale has been attributed to the wrong authors. It is all right to use some of the items for description purposes and it is all right to collect data via the Internet if the access is limited to your participants. If any of these requests present a hardship, please let me know; I am more than happy to discuss any concerns you may have.

Arlene de la Mora, Ph.D.
Research Scientist
Psychology in Education Research Lab
Iowa State University