

INSTITUTE FOR

learning styles

R E S E A R C H



JOURNAL

## Volume 1, Fall 2012

*Special Edition dedicated*

*to*

*Dr. Billie Crannell*

BILLIE MARIE CRANNELL, PH.D. 1952 - 2012

Billie Marie Crannell, age 59 of Notasulga, was born September 13, 1952 in Phenix City, Alabama and died June 13, 2012 at East Alabama Medical Center in Opelika. Mrs. Crannell began her 39 year nursing career upon graduation from St. Margaret's Nursing School in Montgomery. She received her Doctorate from Auburn University. She was a Registered Nurse at EAMC, most recently serving as Director of Professional Practice and Development. Mrs. Crannell's hobbies included sewing, embroidery, gardening, and dancing. Funeral service was held on Saturday, June 16, 2012 at 11:00 a.m. at Fredericks Funeral Home, with Chaplain Scott Lee officiating.

*Journal Editor*

Dr. James E. Witte

Auburn University

[witteje@auburn.edu](mailto:witteje@auburn.edu)

[www.learningstyles.org](http://www.learningstyles.org)

Volume 1, Fall 2012  
**Table of Contents**

Clinical Practice of Registered Nurses and Learning Styles  
Preferences  
Billie A. Crannell, East Alabama Medical Center  
Maria Martinez Witte, Auburn University ..... 1

Assessing the Impact of 4MAT for College  
Joan Nicoll-Senft, Central Connecticut State University.....8

# Clinical Practice of Registered Nurses and Learning Styles Preferences

**Billie A. Crannell**  
East Alabama Medical Center

**Maria Martinez Witte**  
Auburn University

## Abstract

Learning styles are a major consideration in the education process. Knowledge of an individual's learning style can be helpful in assisting the individual to be successful in educational undertakings. Nursing is a discipline that requires ongoing learning. One specific area of learning styles is perceptual modality preferences. The purpose of this study was to determine the relationship, if any, linking the registered nurse's preferred learning style and their choice of clinical practice. Given the shortage of registered nurses the United States has experienced over the last few years, the preponderance of research relative to registered nurses has been related to job satisfaction.

## Introduction

Registered nurses (RN) comprise the largest group of health care professionals in the United States (NACNEP, 2008). According to the Bureau of Labor Statistics (BLS) (2008-2009), there are approximately 2.5 million jobs for registered nurses in the United States. In addition, there is a projected 587,000 increase in job offerings in the 2010-2016 time periods. The majority (59%) of the registered nurses work in the hospital setting (BLS, 2008-2009). Most new graduate nurses seek employment in the hospital setting. Many new graduate nurses become disillusioned shortly after beginning their practice (Adams & Bond 2000). Could this sense of disillusionment be, in part, due to poor job fit between the new graduate's learning style and the clinical area where they are placed?

The idea that the adult learner has particular goals in mind when undertaking a learning process has been well established (Dunn & Dunn, 1998; James & Blank, 1993; Saransin, 1999). This is true of an individual embarking on the journey to become a registered nurse. How an individual inputs information, processes that information, stores the information, and then recalls the information is the "learning style" of the individual. One's learning style is individual. While there are persons who have similar styles, each person has an individual spin to their particular style. Researchers have

identified various definitions for the term learning style. Saransin (1999) defines learning style as:

A certain specified pattern of behavior and/or performance according to which the individual approaches a learning experience, a way in which the individual takes in new information and develops new skills, and the process by which the individual retains new information or new skills. (p. 1)

James and Blank (1993) defined learning style “as the complex manner in which, and conditions under which, learners most efficiently and most effectively perceive, process, store, and recall what they are attempting to learn” (p. 43).

There are many areas of clinical practice open to registered nurses. All of the areas require considerable amounts of information processing, the ability to act on the information that has been processed and the ability to evaluate the outcome of the actions taken. All areas of nursing require the ability to analyze symptoms and patient responses to provided therapies. However, each area has its own unique environmental factors. For instance, the nature of the emergency department requires the ability to process incoming information quickly and act on that information quickly whereas on a skilled nursing unit one has more time to think over the information, formulate a plan and then act on that plan. Some nurses thrive in the atmosphere of not knowing what is coming at any given moment and being ready to respond spontaneously. Other nurses prefer to be able to move at a more relaxed pace as they care for their patients.

There is a lack of research to determine if there is a relationship between the learning style of registered nurses and their preferred clinical practice area. By focusing on the preferred learning style of registered nurses and determining if there is a relationship between their learning style and preferred clinical practice area, nurses could be placed in clinical settings that would be congruent with their goals and objectives. Utilizing this information would increase job satisfaction as well as clinical performance.

## **Methods**

The purpose of this study was to determine the relationship, if any, between perceptual modality learning style preference and the preferred area of clinical practice among registered nurses (RN) employed at one acute care hospital in the southeastern United States. The following research questions guided this study:

1. What is the relationship, if any, between the preferred area of clinical practice of registered nurses and their preferred perceptual modality learning style?

2. What is the effect, if any, of years of experience on the preferred perceptual modality learning style of registered nurses?
3. What is the effect, if any, of age on the preferred perceptual modality learning style of registered nurses?

A one-way Multivariate Analysis of Covariance (MANCOVA) was conducted to determine the effect of preferred area of clinical practice on the preferred modality preference of learning style of the sample population while controlling for the years of experience. This test allowed for the comparison of the means of the four independent variables, medical nursing, surgical nursing, critical care nursing, and women/children nursing with the seven dependent variables of learning style preference.

## Participants

The participants in this study were 77 practicing registered nurses employed at an acute care hospital in the southeastern United States. The sample was taken from 702 practicing registered nurses at the institution. The demographics of interest were age and years practicing as a registered nurse. There were 11 choices of practice on the demographic questionnaire. However, because of the small number in each area, like areas were combined resulting in four areas of practice, medical, surgical (perioperative), critical care, and women/children.

The demographic variables of interest in this study were age, years in practice, and preferred area of clinical practice. The age of the participants ranged from 24 to 67. The mean age was 45.5 (*SD* 11.35) (*N*=77). The years of experience ranged from 1 to 45 with the mean years of experience 19.5 (*SD* 11.90) (*N*=77). The preferred areas of clinical practice were medical nursing, 18 (23%), surgical nursing, 14 (19%), critical care nursing, 37 (48%), women/children nursing, (10%).

## Procedures

One instrument and a demographic questionnaire were used in this study. The instrument utilized was the *Perceptual Modality Preference Survey (PMPS)* developed by Cherry in 1981. The demographic survey was designed to capture demographic characteristics of interest in the study.

The *PMPS* is a product of the *Multi-Modal Paired Associates Learning Tests (MMPALT)*. The *MMPALT* was developed by Gilley (1975) to measure the ability to recall paired information in six perceptual modalities: print, aural, visual, interactive, haptic, and kinesthetic. The *PMPS* was developed by Cherry (1981) to compare the results of persons taking both the *MMPALT II* and the *PMPS* thereby comparing

objective data (*MMPALT II*) and self-reported data (*PMPS*). The *PMPS* was revised in 1997 and publicized by the Institute for Learning Style Research (Harvey, 2002). Harvey's study indicated strong construct validity using confirmatory factor analysis by estimating the chi-square ( $X^2$ ), Goodness of Fit (GFI), Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). Chi-square reported  $p > 0.05$  ranged from 81.20 to 142.48. All GFI were greater than 0.95. All estimates for the CFI were greater than 0.95 with the exception of interactive (0.91). The RMSEA for all modalities were acceptable fits with estimates of less than 0.08.

## Results

The descriptive statistics results showed perceptual preference for medical nursing ( $n=18$ ) as follows: Print 3.11, *SD* 10.14, Aural 4.38, *SD* 10.33, Interactive 7.27, *SD* 8.49, Visual -2.11, *SD* 8.73, Haptic 3.33, *SD* 11.08, Kinesthetic 10.88, *SD* 12.95, and Olfactory -24.44, *SD* 8.73. Surgical nursing ( $n=14$ ) results were: Print -3.78 *SD* 12.36, Aural 4.5, *SD* 9.62, Interactive 9.35, *SD* 7.48, Visual, 2.64, *SD* 6.03, Haptic 7.78, *SD* 9.36, Kinesthetic 11.85, *SD* 15.40, and Olfactory -21.21, *SD* 9.59. Critical Care nursing ( $n=37$ ) results were: Print 6.08, *SD* 12.41, Aural 0.56, *SD* 11.22, Interactive 5.70, *SD* 8.86, Visual 2.89, *SD* 8.51, Haptic 6.68, *SD* 9.01, Kinesthetic 1.75 *SD* 14.83, and Olfactory -20.56, *SD* 11.35. Those preferring Women/Children nursing ( $n=8$ ) were: Print -.12, *SD* 13.05, Aural 3.75, *SD* 12.15, Interactive 10.50, *SD* 6.14, Visual -.87, *SD* 6.03, Haptic 5.50, *SD* 10.07, Kinesthetic 1.50, *SD* 12.82, and Olfactory -17.50, *SD* 3.96.

A one-way Multivariate Analysis of Covariance (MANCOVA) was conducted to determine the effect of perceptual modality learning preference on the preferred area of clinical practice for the 77 practicing registered nurses (RN) while controlling for years of experience. According to the analysis of data there appears to be no relationship between a preferred clinical practice area and preferred perceptual modality learning style of registered nurses after controlling for experience.

Nursing is a profession in which ongoing learning is required (Gallagher, 2006). There are continual advances in the treatment of disease processes as well as preventive healthcare. In addition, innovations in existing equipment along with development of new equipment to improve patient care are constantly being brought into the workplace with the expectation that incumbent nursing staff become proficient in the utilization of such equipment. Most healthcare organizations have an entire department dedicated to the ongoing education and development of its nursing workforce. Therefore, an understanding of how the practicing registered nurse learns is an important concept in the care of patients. Little research has been conducted on the learning styles of practicing registered nurses. The studies conducted have primarily looked at the learning styles of professional nursing students (Colucciello, 1999; Rakoczy & Money, 1995; Worrell & Profetto-McGrath, 2007).

No studies were found that specifically looked at the perceptual modality learning style of either nursing students or practicing registered nurses. This study specifically looked at nurses' stated preferred area of clinical practice and their self-reported learning modality preference. The results of this study suggest there is no significant relationship between the preferred area of clinical practice of a registered nurse and their preferred perceptual modality learning style.

This finding indicates that, as a group, professional nurses are varied in their perceptual modality style preference. This is a significant finding for the educator of practicing nurses. This result indicates varied methods should be utilized in the ongoing education and development of staff. This is consistent with the finding of Morse, Oberer, Dobbins, & Mitchell (1998). These educators noted that by making multiple learning modalities available for in-service programs, learners (registered nurses) who had previously been listless and inattentive became revitalized and eager to learn the material presented.

## **Recommendations**

This study examined the relationship between the preferred area of clinical practice of registered nurses and their preferred perceptual modality learning style. The results of this study suggest there is no relationship between the areas of interest. This finding suggests that practicing registered nurses (RN) have varying learning style preferences across the preferred areas of medical, surgical, critical care, and women/children nursing. Additional studies are needed to further evaluate the learning styles of practicing registered nurses. Derived from the findings of this study, future research might: 1. Replicate the study to examine a variety of health care disciplines; 2. Replicate this study using a multi-site sample to increase the validity and reliability of the study; 3. Replicate this study to compare results of the *Perceptual Modality Preference Survey (PMPS)* with a cognitive learning styles instrument; 4. Conduct the study using a cognitive learning style instrument only; 5. Include gender, ethnicity as additional variables.

Keefe (1987) indicated that learners vary in their preference of learning styles. It is important for those responsible for teaching practicing nurses to understand that they may have to employ a variety of teaching styles to achieve maximum effectiveness when working with this population. Based on the results of this study and review of the literature, organizations should revise their obligations to their professional nursing staff and evaluate their accountability for determining and utilizing a variety teaching styles to meet the complex needs of registered nurses.

## References

- Adams, A., Bond, S., & Hale, C. A. (1998). Nursing organizational practice and its relationship with other features of ward organization and job satisfaction. *Journal of Advanced Nursing, 27*, 1212-1222.
- Cherry, C.E. (1981). *The measurement of adult learning styles: Perceptual modality*. (Doctoral dissertation). University of Tennessee, Knoxville.
- Colucciello, M. L. (1999). Relationships between critical thinking dispositions and learning styles. *Journal of Professional Nursing, 15*(5), 294-301.
- Dunn, R. & Dunn, K. (1998). *Practical approaches to individualizing staff development for adults*, Westport, Ct.: Praeger.
- James, W. B., & Blank, W. E., (1993). Review and critique of available learning-style instruments for adults, *New Directions for Adult Continuing Education, 39*, 47-56.
- Gallagher, L. (2006). Continuing education in nursing: A concept analysis. *Nurse Education Today, 27*, 466-473. Harvey, M.D. (2002). *A confirmatory factor analysis of the perceptual modality preference survey* (A master's thesis). Auburn University, Auburn, Alabama.
- Keefe, J.W. (1987). *Learning style theory and practice*. Reston, Va.: National Association of Secondary School Principals.
- Morse, J.S., Oberfer, J., Dobbins, J., & Mitchell, D. (1998). Understanding learning styles: Implications for in-service educators. In R. Dunn & S.A. Griggs (Ed.). *Learning Styles and the nursing profession*, (p. 27-40).
- National Advisory Council on Nurse Education and Practice (NACNEP). (2008). *Meeting the Challenges of the New Millennium*. Retrieved from <ftp://ftp.hrsa.gov/bhpr/nursing/sixth.pdf>.
- Rakoczy, M., & Money, S. (1995). Learning styles of nursing students: A 3-year cohort longitudinal study. *11*(3), 170-174.
- Sarasin, L. C. (1999). *Learning style perspectives: Impact in the classroom*. Madison, WI: Atwood.



Worrell, J. A., & Profetto-McGrath, J. (2007). Critical thinking as an outcome of context-based learning among post RN students: A literature review. *Nurse Education Today*, 27, 420-426.

**Author's Notes**

Dr. Billie A. Crannell was the Director of Professional Practice and Development at East Alabama Medical Center, Opelika, Alabama. Dr. Maria Martinez Witte is an Associate Professor in Adult Education at Auburn University, Auburn, Alabama.

# Assessing the Impact of 4MAT for College

Joan Nicoll-Senft, Ph.D.

Central Connecticut State University

## Abstract

This study focused on 4MAT for College, a course based on the principles of 4MAT, a framework for teaching and learning built upon the principles of learning styles and their relationship to the learning cycle (McCarthy, 1987). Kirkpatrick's model for summative evaluation was used to assess the impact of 4MAT for College on 51 students (Kirkpatrick, 1998). Findings suggest that students benefited academically from 4MAT for College. Results pertaining to knowledge and skills gained by students were analyzed using paired mean sample t-tests. Statistical analysis of students' knowledge of their learning styles indicated significant findings for each comparative statement measured.

## Introduction

Recently reported census data verified that for the first time in our country's history the majority of children (50.4%) recently born in the United States are minorities (U.S. Census Bureau, 2012). Not surprisingly, this trend towards an increasingly diverse population is also evident in college enrollments. Between 2009 and 2020, the U.S. Department of Education predicts a 46% increase enrollment for students who are Hispanic and 25% increased enrollments for students who are Black or Asian/Pacific Islanders (Hussar & Bailey, 2011).

In rates of college completion, the U.S. ranks in the bottom half in the most recent international comparisons (Aud, et al., 2006). College completion rates vary by race/ethnicity. The National Center for Education Statistics (2012) reported that Black and American Indian/Alaska Native students have the lowest graduation rate (39% each), while Hispanic students fare slightly better with a 50% graduation rate. Asian/Pacific Islander students and White students had the highest graduation rates at 69% and 62% respectively.

Our increasingly diverse population, coupled with decreasing college completion rates, underscores our nation's need to identify effective higher education retention practices. Burkum, Habley, McClanahan, & Valiga (2010) identified 94 retention practices employed by colleges, but found that the contribution of any single practice was small – accounting for just over 3% of the variance in institutional retention rates. Despite the vast array of interventions, the majority of the practices targeted increasing academic skills and performance of their students. Academically-focused retention practices, specifically freshman seminars, tutoring programs, advising interventions

and comprehensive learning assistance centers, were the most highly rated practices among all institutions (Burkum, Habley, McClanahan, & Valiga, 2010). However, research has demonstrated that many traditional study-skills programs have been ineffective for large numbers of students (Cutolo & Rochford, 2007).

## Literature Review

In order to ensure equity in learning for an increasingly diverse college student population, much attention has focused on learning styles and their impact on the teaching and learning process. Despite its critics, the notion of learning style and its implications in higher education is not new (Reynolds, 1997). Claxton and Murrell (1987), in their seminal monograph on learning styles in higher education, proposed that matching learning styles and instructional methods leads to improved learning. This matching approach, perhaps the most common means of using learning styles to positively impact learning, is difficult to implement especially in higher education settings (Dunn & Griggs, 2000). Not surprisingly, the literature is scarce regarding the extent to which instructors, particularly in higher education, have systematically incorporated learning style theory into their teaching. This notion is substantiated by Gardner (1983), who asserts that serious consideration is rarely paid to the existence of differences in learning styles and their impact on teaching and learning, with few attempts being made to systematically incorporate learning styles into teaching.

Since traditional talk and chalk pedagogy persists in many of today's college classrooms, another approach to implementing learning style instruction in higher education is to provide learning style instruction to college students. Claxton and Murrell (1987) and Garcia-Otero and Teddlie (1992) reported that students' self-awareness of their learning styles resulted in increased academic success in college courses. More importantly, Nelson, et al. (1993), Ingham (2003), and Rochford (2004) demonstrated that students' knowledge of their learning style preferences improved college students' rate of retention.

### *Overview of 4MAT*

The 4MAT teaching model is a conceptual framework of teaching and learning that is grounded in the works of John Dewey (experiential learning), Carl Jung (theory of individualization), and, most directly, David Kolb (experiential learning theory) (McCarthy 1987). Its premise is that individuals learn primarily in one of four different, but complementary ways based on how they perceive and process information (McCarthy & McCarthy, 2006).

4MAT identifies four interrelated learning styles based on a continuum of how we perceive and process new information. Our individual learning style results from where we naturally fall on these continuums. McCarthy has identified these four learning styles as Imaginative Learners (Type One Learners); Analytic Learners (Type

Two Learners); Common Sense Learners (Type Three Learners); and Dynamic Learners (Type Four Learners). The following is a brief description of these learning styles from both learning and teaching perspectives:

- ❖ *Imaginative Learners (Type One)* learn best through personal experience. They benefit from opportunities to find meaning in what they are learning and they enjoy discussing their beliefs, feelings, and opinions with others. They are reflective in nature and learn primarily through dialogue. They are skilled at perspective taking and are sensitive to the needs of others. As teachers, Imaginative Learners are facilitators, emphasizing personal connections to the content via whole class discussions, group sharing, and listening. Their priority in the classroom is individual student development.
- ❖ *Analytic Learners (Type Two)* approach learning in a logical, organized manner by examining details and specifics. As students, they often excel in a traditional classroom setting. Analytic Learners enjoy reflecting on new ideas and connecting new learning to other information they know to be true. Logical in nature, they enjoy formulating theories and models. They strive for precision and prefer teachers that do so as well. As teachers, Analytic Learners are scholars, emphasizing the content through well organized and logical lectures, note taking, and readings.
- ❖ *Common Sense Learners (Type Three)* learn by doing. When presented with new information they immediately focus on practical applications. They are active learners, preferring to get right to work in the classroom. They dislike assignments that do not have an obvious purpose or application. They learn best when provided with hands-on, experiential learning opportunities. As teachers, Common Sense Learners are coaches focusing on providing students with opportunities to practice new skills.
- ❖ *Dynamic Learners (Type Four)* are active learners. They enjoy taking risks and learn primarily through self-discovery. They like to connect their learning to things that matter in their lives. They enjoy synthesizing information and applying their learning in new ways. As teachers, Dynamic Learners challenge their students by creating real life learning experiences in their classrooms, and believe that curricula should be flexible and geared to individual student interests.

When properly sequenced, these four learning styles provide a natural framework for teaching and learning. Use of the 4MAT teaching model has been supported by research in elementary and secondary and more recently in higher education classrooms (Wilkerson & White, 1988; Blair & Judah, 1990; Nicoll-Senft & Seider, 2010). Representative of what Kolb calls integrated learning, 4MAT's teaching model cycles the learner through four major learning styles (Kolb, Boyatzis, and Mainemelis, 2001). Building upon Kolb's original conceptualization of learning styles, 4MAT also integrates learning style with brain-based processing strategies. 4MAT

provides a systematic model of planning instruction which assumes that individuals learn in different, yet identifiable, ways and that engagement with a variety of diverse learning activities result in higher levels of motivation and performance.

#### *4MAT for College*

4MAT for College moves beyond enhancing students' self-awareness of their learning strengths and weaknesses, towards a framework students can use to adapt to the variety of teaching styles and disciplines required of today's college students. Students enrolled in a 4MAT for College first-year seminar course begin the semester by identifying their learning style and then learning about and applying specific strategies they can use to improve their academic achievement, especially in situations when their learning style conflicts with their professor's teaching style. Students also learn how the 4MAT teaching model can be used as a flexible framework that follows their natural learning cycle and to improve their writing, reading comprehension, and study skills.

There are currently three curricular models for first-year programming at a particular east coast university: first year seminars (topic courses specifically designed for first-year students); learning communities (linked courses with a common theme); and a one credit first-year experience course paired with a discipline-based course. Since the fall of 2009, all full-time first-year students at this university have enrolled in a first-year course. For the past three years, 4MAT for College has been offered as a first-year seminar that is open to all first-year students; however, given its focus on learning styles and their relationship to teaching, it is of most interest to education and psychology majors.

### **Method**

#### *Participants*

The data used for this study were collected from a total of 51 (18 male, 33 female) first-year students enrolled in 4MAT for College during the fall 2010 and 2011 semesters (25 students from the fall 2010 semester and 26 students from the fall 2011 semester). Nearly three quarters of these students were elementary or secondary education majors (73%).

Demographically, over 90% of the 12,000 undergraduate students were from within the state. Approximately 80% of these students commute from an off-campus location, which confirms the school's identity as a regional university. About 40% of the students enrolled were first-generation college students. Approximately one-quarter (22% in 2011) of students were enrolled part-time. The university enrolls male and female students in roughly equal numbers and minorities represent approximately 15% of the student body (NEASC Report 2008).

## Research Design

Kirkpatrick's model for summative evaluation was used to assess the effectiveness of 4MAT for College on the academic achievement of first-year college students (Kirkpatrick, 1998). Widely recognized as a model to evaluate effectiveness of organizational training, Kirkpatrick's model provides a flexible paradigm for measuring the effectiveness of training in an educational setting. According to Kirkpatrick's model, evaluation progresses through four levels: level one: reaction to the training; level two: learning (knowledge and skills); level three: behavior (application of learned knowledge and skills); and level four: results.

The first level of evaluation (reaction to the training) represents the participants' response to information learned. Student satisfaction with the course content and materials was assessed via a standard course evaluation form. Administered at the end of the semester, this form asked students to respond to 13 statements about the course using a five-point Likert scale ranging from strongly agree to strongly disagree.

Level two (learning) pertains to knowledge and skills gained by the training participants. A post-then-pre Likert scale survey, administered at the end of the semester, assessed students' content knowledge and skills learned as a result of 4MAT for College (Rockwell & Kohn, 1989). According to Rockwell and Kohn (1989), a retrospective pretest at the end of the semester is more accurate than a traditional pre-post format because it is answered in the same frame of reference as the posttest. The Likert survey developed for this purpose asked students to compare their knowledge both before and after enrolling in 4MAT for College in nine areas, including knowing how to effectively learn during a lecture, successfully participating in group learning activities, studying, and using strategies to improve their writing and reading skills.

Level three (behavior) addresses each participants' independent application of newly acquired knowledge and skills. To assess whether students' behaviors actually changed as a result of 4MAT for College, students were asked to respond to a transfer of learning survey at the end of the semester that asked them to report on the extent to which they used the knowledge and skills learned in 4MAT for College. Specifically, students were asked to respond to questions that asked them how frequently throughout the current semester they did the following: attempted to determine another professor's learning/teaching style, implement 4MAT strategies to improve their academic performance in a class, and apply the 4MAT framework for learning to improve their writing, reading comprehension, or study skills.

The fourth and final level of Kirkpatrick's model (results) focuses on impact and results. The impact of 4MAT for College was evaluated by compiling a list of student assignments where students successfully applied their new knowledge and skills.

## Results

According to Kirkpatrick's model for summative evaluation, the first level of evaluation, reaction to the training, is the participants' response to information learned. Student satisfaction results, compiled from course evaluations, indicated that students either strongly agreed or agreed with each statement. Overall students' rate of strongly agreeing or agreeing with each of the 13 statements ranged from 89% to 100%. Table 1 provides a list of course evaluation questions and a summary of student responses. Students' reactions to 4MAT for College can be summed up in a statement by Colleen, an elementary education major, who was enrolled in 4MAT for College during the fall 2011 semester:

The information I learned from 4MAT for College is the most beneficial information a first-year student can have; you really learn about what it takes to be a good college student. Understanding your learning style and ways that you learn best, ways to study, and tools to succeed are new things that will stick with you throughout your life. The things I learned from 4MAT for College are not things I would have learned in any math, science, or psychology class – you learn how to help yourself study and learn in ways that work.

Level two of Kirkpatrick's model, learning, pertains to knowledge and skills gained by the training participants. Results pertaining to knowledge and skills gained were measured by post-then-pre Likert surveys. A list of competency statements and students' pre and post scores are provided in Table 2. Student responses were analyzed using paired mean sample t-tests. Significant positive changes ( $p = .05$ ) occurred in all of the nine comparative statements.

Level three of Kirkpatrick's model, behavior, addresses participants' independent application of their newly acquired knowledge and skills. Application of knowledge and skills results was measured via a student transfer of learning survey. The majority of students (87%) reported using the knowledge and skills acquired about their learning styles in their other classes either frequently (39%) or sometimes (48%). Only 2% of students reported never using specific learning strategies about learning in their other classes.

Finally, level four of Kirkpatrick's model, results, addresses participants' independent application of their newly acquired knowledge and skills. Student learning outcomes were measured by compiling a list of student assignments where students had successfully applied their newly acquired knowledge and skills. Over twenty occurrences of improvement were reported by students in their reflective journals. Self reported improvement areas included test scores, lab reports, papers, and increased participation in class activities and discussions. Table 3 provides representative examples of students' reports of successful applications of the knowledge and skills acquired through their 4MAT for College course.

## Discussion

The results of this study are consistent with previous research and provide additional evidence to support the theory that students benefit academically from an increased awareness of their individual learning strengths and weaknesses (Claxton & Murrell, 1987; Garcia-Otero & Teddlie, 1992). Student feedback on the course was overwhelmingly positive. Students also reported gaining practical knowledge about their learning styles and how to use this information to be successful in college.

Statistically significant gains were found in each of the nine comparative statements that were used to measure student learning. The areas to note are those that evidenced the strongest increases for students, including students' understanding of their own learning style, the ability to understand and identify the learning style of others, and how to best adapt to various learning situations. These findings are comparable to previous studies that measured the impact of learning style instruction on academic achievement of college students (Claxton and Murrell, 1987; Garcia-Otero Teddlie, 1992).

Students also reported independently using specific learning strategies in their college classes. It should be noted that although students were encouraged to use these strategies in other classes, this was not a specific requirement of their 4MAT for College course. A majority of students (87%) reported using the knowledge and skills acquired about their learning styles in their other classes either frequently or sometimes. Only 2% of students reported never using specific learning strategies about learning in their other classes.

Arguably the most difficult aspect of measuring the effectiveness of learning style instruction in higher education is its impact on academic achievement. Course selections for any given semester vary based on scheduling, credit load, and academic major, making the identification of specific course assignments to target for research purposes unfeasible. Therefore, data pertaining to students' use of learning style instruction was collected informally from students via ongoing student journal log entries. Although it is difficult to quantify these results, the anecdotal evidence collected from students documents that their individual applications of learning style instruction in multiple classes and assignments was successful. These findings add to a growing body of research suggesting that learning style instruction can not only positively impact the academic achievement of college students, but also increase college retention rates (Nelson, et al, 1993; Ingham 2003; Rochford, 2004). The impact of learning style instruction on academic achievement is evidenced by Jessica, a secondary education major:

As a college student, 4MAT for College was imperative to my future success. Now I am aware of the things that don't work for me. 4MAT for College has changed the way I look at learning and opened my eyes to many new strategies that will be pertinent throughout college. I definitely needed an eye opener and a



new plan for studying because it was very clear to me that what I had been doing was not working for me and that was really reflected in my grades. I can genuinely say that 4MAT 4 College will help me through college and I will continue to use it in my future classes.

## **Implications**

This research has several implications pertaining to the first-year experience. Foremost, this study suggests that students can benefit academically from learning style instruction. First-year students should be made aware of their learning strengths and how to capitalize on them as well as how to compensate for their learning weaknesses. Opportunities for this type of instruction are vast and include formal course work or informal seminars offered to students transitioning from high school to college, or as part of first-year experience programming at the college level.

Secondly, this study supports the need to critically exam the pedagogical methods too often relied on to deliver instruction in many college classrooms. Ensuring that students graduate from our colleges in a timely manner is critical to our country's economy (Cutolo & Rochford, 2007). College faculty and administrators must ensure that college teaching evolves and changes to best address the growing needs of an increasingly diverse student population.

Finally, further replication and dissemination of learning style instruction, such as 4MAT for College, is necessary to assess the reliability of these results in similar and divergent college environments, as well as to measure the long term potential impact of learning style instruction on retention and achievement in students beyond their first year of college.

## **Conclusion**

The purpose of this study was to assess the impact of 4MAT for College on the academic achievement of first-year students. Overall, these results suggest that students benefited academically from a curriculum that focused on learning styles and related application of learning strategies in a higher education setting. These findings underline the importance of the development and implementation of coursework targeted to teaching learning style instruction for students transitioning to college or as part of their first-year experience programming. These findings also call for a critical examination of college teaching in light of our increasingly diverse student population and declining college completion rates.

## **Notes**

The development of 4MAT for College was made possible by a sabbatical with further support to study its impact on student learning provided by a Faculty Development Grant. For more information, please contact the author or About Learning, the publisher of 4MAT at [www.aboutlearning.com](http://www.aboutlearning.com).

## References

- Aud, S., Hussar, W., Johnson, F., Kena, G., Roth, E., Manning, E., Wang, X., and Zhang, J. (2012). *The Condition of Education 2012* (NCES 2012-045). U.S. Department of Education, National Center for Education Statistics. Washington, DC. Retrieved June 11, 2012 from <http://nces.ed.gov/pubsearch>.
- Blair, D., & Judah, S. (1990). Need a strong foundation for an interdisciplinary program? Try 4MAT. *Educational Leadership* 48(2), 37-38. Burkum, K, Habley, W. McClanahan, R., & Valiga, M. (2010, June). Retention: Diverse institutions = diverse retention practices? Paper presented at the annual meeting of the AIR Forum, Chicago, IL.
- Claxton, C., & Murrell, S. (1987). *Learning styles: Implications for improving educational practices*. ASHE-ERIC/Higher Education Report No. 4. Washington, D.C.: George Washington University.
- Cutolo, A., & Rochford, R. (2007). An analysis of freshman learning styles and their relationship to academic achievement. *College Quarterly*, 10(2), 1-17.
- Dunn, R., & Griggs, S. (2000). *Practical approaches to using learning styles in higher education*. Westport, CT: Bergin.
- Garcia-Otero, M., & Teddlie, C. (1992). The effect of knowledge of learning style on anxiety and clinical performance of nurse anesthesiology students. *American Association of Nursing Anesthesiology Journal*, 60(3), 257-260.
- Gardner, H. (1983). *Frames of mind, the theory of multiple intelligences*. New York, NY: Basic Books, Inc. Gregorc, A.F. 1979. Learning/teaching styles: Potent forces behind them. *Educational Leadership*, 36, 234-236.
- Hussar, W.J., & Bailey, T.M. (2011). *Projections of Education Statistics to 2020* (NCES 2011-026). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing.
- Ingham, J.M. (2003). *Impact of learning styles on engineering students*. In R. Dunn & S.A. Griggs (Eds.), *Synthesis of the Dunn and Dunn Learning-Style Model research: Who, what, when, where, and so what?* (pp. 175-180). Jamaica, NY: St. John's University, Center for the Study of Learning and Teaching Styles.
- McCarthy, B. (1987). *The 4MAT System: Teaching to learning styles with right/left mode techniques*. Barrington, IL: About Learning Inc.

- McCarthy, B., & McCarthy, D. (2006). *Teaching around the 4MAT cycle: Designing instruction for diverse learners with diverse learning styles*. Thousand Oaks, CA: Corwin Press. NEASC . 2008. NEASC Report Central Connecticut State University.
- Nelson, B., Dunn, R., Grigs, S.A., Primavera, L., Fitzpatrick, M., Bacilious, Z., & Miller, R. (1993). Effects of learning style intervention on college students' retention and achievement. *Journal of College Student Development*, 34(5), 264-369.
- Nicoll-Senft, J., & Seider, S. (2010). Assessing the impact of 4MAT teaching model across multiple disciplines in higher education. *College Teaching*, 58, 19-27.
- Reynolds, M. (1997). Learning styles: A critique. *Management Learning*, 28(2), 115-33.
- Rochford, R.A. (2004). Improving academic performance and retention among remedial students. *Community College Enterprise*, 10(2), 23-36.
- Rockwell, S.K., & H. Kohn (1989). Post-Then-Pre Evaluation. *Journal of Extension* 27(2), 1989.
- U.S. Census Bureau (2012). *Most children younger than age 1 are minorities*. Washington, D.C.: Author.
- Wilkerson, R., & White, K. (1988). Effects of the 4MAT system of instruction on students' achievement, retention, and attitudes. *The Elementary School Journal*, 357-36.

### **Author's Note**

Joan Nicoll-Senft is an Associate Professor of Special Education at Central Connecticut State University where she teaches courses in education, including a first-year seminar for education majors. A certified 4MAT trainer, she has initiated several Scholarship of Teaching and Learning (SoTL) initiatives at her university pertaining to learning styles and their impact on instruction. Her research interests include the development, implementation, and assessment of innovative teaching methodologies for students with and without disabilities in K - 12 and in higher education settings.

Table 1

*Summary of Student Course Evaluations for 4MAT for College*

	Strongly Agree	Agree	Agree	Strongly Disagree	Not Applicable
The course contributed in increasing my knowledge and competence in this area.	50	45.45	4.55	0	0
The instructor was well prepared and organized in each class session.	63.64	31.82	0	4.55	0
The instructor was interested in students learning the content.	68.18	31.82	0	0	0
The text used for this course was appropriate.	50	31.82	13.64	0	0
The materials distributed during the course enhanced my learning.	40.91	40.91	13.64	0	0
The methods and style that the instructor used to teach this course met or exceeded my expectations.	31.82	63.64	4.55	0	0
The instructor motivated me because of his/her excitement and interest in the subject matter.	50	40.91	0	9.09	0
The assignments were meaningful and worthwhile.	22.73	50	22.73	4.55	0
A written description of course grading policies was distributed at the beginning of the course.	59.09	36.36	4.55	0	0
The instructor has been available to me for individual consultation.	31.82	54.55	4.55	4.55	0
The instructor promoted an atmosphere that allowed for discussion, comments, and questions.	63.64	36.36	0	0	0
Feedback during class and on assignments	50	40.91	4.55	4.55	0

Table 2

*Assessment of Student Competencies Pertaining to 4MAT for College Course Content*

Competencies	Before 4MAT	After 4MAT	Change
I understand my strengths and needs as a learner.	2.59	3.82	+1.23*
I am aware of the learning differences of others.	2.06	3.8	+1.74*
I know how to adjust to the variety of teaching methods found in college classes.	1.88	3.59	+1.71*
I know how to best learn during a lecture.	2.29	3.35	+1.06*
I know how to be successful in group learning activities.	2.88	3.71	+.83*
I know how to prepare and study for a test.	2.35	3.24	+.89*
I use strategies that increase my ability to remember and understand what I read.	2.35	3.41	+.83*
I know how to use a variety of strategies to improve my writing.	2.35	3.53	+1.18*
I feel that I can reach out to my college community for assistance.	2.47	3.76	+1.71*

\*Comparative statements with an asterisk are significantly different from the pre-semester means at  $\alpha = .05$

Table 3

*Examples of Students' Applications of 4MAT for College*

Course (post)	Assignment	Strategy	Grade (pre)	Grade
Geography	Test	Flash cards	"not well"	A
History	Exam	4MAT study skills	"lower grade"	B+
Math	Quiz	Stretching plan	68	83
Math	Quiz	Note cards	57	76
Psychology	Test	Note cards	69	80
Psychology	Final Exam	Stretching plan	D	A
Psychology	Quiz	Note cards	16	66
Psychology	Test	Stretching plan	C	A
Psychology	Exam	Note taking	"not well"	"much better"
Theater	Quiz	Note cards	40	87