

Assessing the Impact of the 4MAT Teaching Model Across Multiple Disciplines in Higher Education

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Much attention has focused on learning styles and their impact on the teaching and learning process; however, little has been done to systematically incorporate learning style theory into actual teaching, nor to systematically examine its potential impact on student learning in higher education. As part of a Scholarship of Teaching and Learning (SoTL) project, six faculty members representing the university's Schools of Arts and Sciences, Business, Education and Professional Studies, and Engineering and Technology implemented the 4MAT model in their respective classes during the fall 2007 semester. 4MAT is a teaching methodology posited by Bernice McCarthy (1987) that is built upon the principles of learning styles and their relationship to the natural learning cycle. Use of the 4MAT Model in K–12 settings has been supported by research (Wilkerson & White 1988; Blair & Judah 1990). This article lends support to using 4MAT in a higher education setting. Faculty engaged in the SoTL project at the completion of the semester asked their students to complete a Likert scale survey comparing their redesigned courses to comparable college courses. A meta-analysis of these data indicated significant findings for six out of the eight comparative statements measured.

Keywords: Instruction, pedagogy, teaching methods, teaching style

In order to ensure equity in learning for all students, much attention has focused on learning styles and their impact on the teaching and learning process. The notion of learning style and its implications for teaching and learning in higher education is not new. 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. However, the literature is scarce regarding the extent to which teachers, 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.

OVERVIEW OF THE 4MAT TEACHING MODEL

Learning style models are often categorized as two-factor models (Witkin, Oltman, Raskin, & Karp 1971), three-factor

models (Childers 1985; Bandler & Grinder, 1975; Lemire, 1987; Sternberg, 1998), and four-factor models (Kolb & Boyatzis, 1993; Gregorc, 1979, 1982). The 4MAT teaching model (McCarthy, 1987) can be categorized as a four-factor learning style model, but also serves as a conceptual framework for teaching.

Grounded in the works of John Dewey (experiential learning), Carl Jung (theory of individualization), David Kolb (experiential learning theory), and Anthony Gregorc (Gregorc's style delineator), 4MAT extends beyond learning styles to create a balanced model for planning instruction. Representative of what Kolb calls "integrated learning" (Kolb, Boyatzis, & Mainemelis 2001), 4MAT provides a teaching model that cycles the learner through four major learning styles. 4MAT builds upon the four-factor learning style models of Gregorc and Kolb by integrating learning styles with brain-based processing strategies. 4MAT provides a systematic model of planning instruction that assumes that individuals learn in different yet identifiable ways and that engagement with a variety of diverse learning activities results in higher levels of motivation and performance. 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).

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An important construct upon which 4MAT is based is hemisphericity; the practice of systematically balancing teaching activities that equally address linear and holistic thinking. According to Springer and Deutsch (1993), the most widely researched and cited characteristics used to describe linear and holistic thinking are, for linear thinking: verbal, digital, sequential, rational, and logical; and for holistic thinking: nonverbal, visual-spatial, simultaneous, analogical, and intuitive.

The underpinnings of hemisphericity are that (1) individuals have at their disposal two complementary methods for approaching and processing information and experiences; (2) adequate engagement of both methods, described in the literature as linear and holistic thinking, results in deepened levels of personal understanding; and (3) engagement of both hemispheres of the brain, usually described as “whole brain” learning, has significant implications for designing instruction and understanding human learning (McCarthy, Germain, & Lippitt, 2002).

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 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.

Finally, 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.

4MAT sequences these four approaches in a framework that reflects the natural learning cycle. First, the teacher connects personal experiences of the learners to the targeted teaching concept. This is followed by systematic teaching of the content matter. Next, students are provided with guided practice and application. Finally, students are given opportunities to integrate and synthesize their new learning.

Similar to other models for instruction, such as the Gagné-Briggs Instructional Systems Design model (Gagné, Briggs, & Wagner, 1992), 4MAT is comprised of a series of sequential stages of instruction. Both models incorporate similar elements, such as gaining the student's attention in a personal way, reflection on prior learning, clarification of learning objectives, presenting content followed by guided practice activities, and providing students with feedback related to their performance (see Table 1 for a comparison of 4MAT's stages of instruction and Gagné-Briggs' instructional systems design).

In studies conducted in elementary and secondary settings, the use of 4MAT increased learner motivation and improved academic performance (Blair & Judah, 1990; McCarthy et al., 2002; Wilkerson & White, 1988). Statistically significant gains in content area learning have been found in the areas of mathematics (Szewczyk, 1987; Lieberman, 1988; Lieberman, 1989), science (Benerzra, 1985; Young, 1986; Bowers, 1987; Lisokie, 1989) and music (Appell, 1991). In higher education settings, 4MAT has been successfully applied in a variety of disciplines, including engineering (Harb, Durrant, & Terry, 1991), law (Kelly, 1990), and tourism (Paraskevas & Sigala, 2003). However, no studies have simultaneously applied the model across diverse university disciplines in higher education as proposed by Svinicki and Dixon, in their multidisciplinary conceptualization of Kolb's experiential learning model (1987).

METHOD

In response to an invitation from our university's Center for Teaching Excellence and Leadership Development (CTELD) to participate in a Scholarship of Teaching and Learning (SoTL) project, six faculty from diverse disciplines were trained in 4MAT. The trainer, who was certified in teaching the 4MAT model, was one of the faculty participants.

TABLE 1
Comparison of 4MAT and Gagné-Briggs Models of Instruction

<i>4MAT Model of Teaching</i>	<i>Gagné-Briggs Instructional Design Model</i>
Connect. Connect content knowledge to a concept in a personal way.	Gain Attention. Present a problem or new situation.
Attend. Guide students to reflection and analysis of their experiences.	Stimulate Recall of Prior Learning. Activate previous knowledge or skills.
Image. Employ a nonverbal medium to assess students' understanding of the concept.	Inform Learner of Objectives. Create a level of expectation for learning
Inform. Provide students with content knowledge pertaining to the subject.	Presenting New Content. Present content.
Practice. Provide students with hands-on activities for practice and mastery.	Providing Learning Guidance. Provide information or activities to ensure that students understand and remember new content.
Extend. Require students to organize and synthesize their learning in some personal and meaningful way.	Eliciting Performance. Provide students with an opportunity to practice what they have learned.
Refine. Analyze relevant applications of learning (ongoing throughout model).	Providing Feedback. Provide students with feedback on practice.
	Assess Performance. Assess student learning.
Perform. Provide opportunities for students to synthesize learning through sharing with others.	Enhancing Retention and Transfer. Assure generalization of learned skill to new situation.

Following the training, 4MAT was systematically implemented by the six participating faculty members. The purpose of this project was to evaluate the usefulness of 4MAT across varied disciplines in higher education, as well as to

assess its impact on both undergraduate and graduate student engagement in the learning process.

Participants

Six faculty members representing each of our university's four schools (Arts and Sciences, Business, Education and Professional Studies, and Engineering and Technology) participated in this study. Faculty experience ranged from four to more than 20 years of teaching in higher education. A total of seven courses (five undergraduate and two graduate-level classes) were targeted for this project. These included courses in business organizational behavior and management, special education, teacher education, physical education, psychology, and technology education. Table 2 provides a list of schools, faculty, departments, and courses that were selected for this project.

A total of 165 students participated in this study. Overall, more than 90% of our undergraduate students are from within the state. Approximately 80% of these students commute to the campus, which confirms our mission as a regional university. About 40% of our students are first-generation college students. The university typically enrolls male and female students in roughly equal numbers. Minorities represent approximately 15% of our student body. Approximately one-third of our students are enrolled part-time. Full time enrollment is 22% of the total graduate enrollment; and graduate enrollment represents 19% of the total university enrollment (NEASC Report 2008).

Course Redesign and Data Collection

Prior to participation in 4MAT training, each faculty's learning style was assessed using the Learning Type Measure or LTM (About Learning 1994). The Teaching Style Inventory or TSI (About Learning 2005) was also completed by each

TABLE 2
List of Participating Schools, Faculty, Departments, and Courses

<i>School</i>	<i>Faculty Member</i>	<i>Department</i>	<i>Course</i>	<i>Number of Students</i>
Arts and Science	RW	Psychology	Psychology of Early Childhood	28
Business	DF	Business	Business Organizational Behavior	49
	DF		Organizing and Managing for Quality	26
Education and Professional Studies	JB	Physical Education and Human Performance	Lifespan Motor Development	19
	JN	Special Education	*Instructional Planning in Special Education	16
	SS	Teacher Education	*Action Research in Teacher Education	9
Engineering and Technology	PF	Technology and Engineering Education	Technological Systems	18

Note: *Courses with an asterisk are graduate-level course.

faculty member at the beginning of this project to determine each instructor's individual 4MAT teaching style.

Upon completion of the 24-hour 4MAT training (summer 2007), each faculty member selected a course she or he taught to redesign using the 4MAT teaching model for implementation in the fall 2007 semester. Each faculty member was paired with another project participant to provide ongoing feedback during this process. Additionally, faculty met on a monthly basis during the fall 2007 semester to plan, share resources, and solve problems.

A four-point, post-then-pre Likert scale survey (Rockwell & Kohn, 1989) was developed and administered to students in each of the redesigned courses at the end of the fall 2007 semester. The survey asked students to compare their learning experiences in their current class with other similar college courses. Areas targeted by the survey included: students' ability to understand course content; students' motivation to complete course assignments and homework; and students' overall interest in the course content.

Another source of data was drawn from faculty impressions assessed via a four-point, post-then-pre Likert scale survey at the end of the fall 2007 semester. Questions focused on each faculty member's use of (1) teaching strategies that reflected diverse learning styles; (2) active engagement of students in the classroom; (3) verbal as well as nonverbal approaches to teaching; and (4) informal and formal assessment strategies.

A final data source consisted of a focus group interview that took place in the spring, after 4MAT implementation. The interview was facilitated by a teacher education faculty member who was familiar with the 4MAT model but was a non-participant in the 4MAT project. Five of the six faculty involved in the project participated in the one hour focus group interview that was audio taped for later transcription and analysis. Questions included faculty responses to (1) whether their thinking about teaching had changed as a result of implementing the 4MAT project, and if so how; (2) what types of pedagogical techniques were implemented that were different as a result of the project; (3) what pieces of the 4MAT model stood out in terms of fostering student learning; (4) how the anchor concepts of the model were identified and developed using the model; (5) how the faculty viewed their students as a result of utilizing the model; and (6) how the faculty assessed the impact of the model in terms of knowledge and dispositions for both themselves and their students.

RESULTS

Analysis of faculty Learning Style Inventories (LSI) indicated that all four of the major learning styles were represented by the six faculty members participating in the project. Results of the Teaching Style Inventory (TSI) revealed that each faculty member taught primarily in her or his own learn-

ing style. This correlation of learning and teaching style was confirmed for each of the six faculty participating in this project.

Student comparisons of the post-then-pre Likert surveys were meta-analyzed using paired mean samples t-tests for six of the seven courses in the study. Significant positive changes ($p = .05$) occurred in six of the eight comparative statements for all courses. Comparative statements indicating significant positive gains were (1) I can usually connect course content to my life outside of school; (2) it is typically easy for me to pay attention in class; (3) class activities deepened my understanding of course content; (4) I am usually motivated to complete homework and class assignments on time; (5) I am usually provided with opportunities to practice the skills I have learned and; (6) I have opportunities to extend my learning in this course to real life situations. The two remaining comparative statements that indicated positive but not significant changes were (1) I am usually able to remember key course concepts, and (2) I typically enjoy coming to class.

When survey statements were compared by course, significant positive changes ($p = .05$) occurred in five of the six courses. All statistical analyses for individual courses are shown in Table 3.

Faculty impressions of their teaching prior to and after 4MAT training and implementation were also assessed using a four-point post-then-pre Likert scale survey. Areas of greatest growth were (1) understanding of diverse approaches to teaching and learning; (2) use of effective verbal and nonverbal activities and media to foster student learning; and (3) understanding of the central concepts and structures of the discipline and their ability to create meaningful student learning experiences. The three areas measured that indicated no growth were (1) basing instruction on knowledge of subject matter, students, community, curriculum goals; (2) reflection of professional practice and effects on students; and (3) building relationships with colleagues and community to support student learning. Table 4 provides a list of competency statements and a summary of faculty responses.

Each faculty member experienced varying challenges related to this project, such as identifying course concepts, prioritizing course content, and integrating nonverbal learning activities. In our ongoing discussions during this process, we collectively found that certain aspects of 4MAT were easier for some of us to implement than others, due to factors such as our own learning and teaching styles as well as the unique nature of each course. Although all of us excelled in the areas of 4MAT directly related to our learning and teaching styles, many of us struggled with the task of designing activities outside of our predominant learning style. The following are brief accounts of the challenges that using 4MAT presented to four participating faculty, each representing one of 4MAT's learning styles, and how they were overcome.

TABLE 3
Student Course Comparisons

Comparative Statements	<i>*Business Organizational Behavior (DF)</i>	<i>Organizing and Managing for Quality* (DF)</i>	<i>*Instructional Planning in Special Education (JN)</i>	<i>*Action Research in Teacher Education (SS)</i>	<i>*Lifespan Motor Development (JB) Previous</i>	<i>Psychology of Early Childhood (RW) Previous</i>	Technological Systems (PF)
	<i>Previous Courses This Course</i>	<i>Previous Courses This Course</i>	<i>Previous Courses This Course</i>	<i>Previous Courses This Course</i>	<i>Courses This Course</i>	<i>Courses This Course</i>	
*I can usually connect course content to my life outside of school.	2.35 3.85	2.81 3.69	3.31 3.75	3.22 3.78	3.31 3.53	3.23 3.36	**
*It is typically easy for me to pay attention in class.	2.24 3.92	2.73 3.62	3.06 3.94	3.33 4.00	3.05 3.42	3.04 2.77	**
I am usually able to remember key course concepts.	2.57 3.63	2.92 3.62	3.25 3.38	3.33 3.89	3.26 3.42	3.13 3.00	**
*Class activities typically and more often than not deepened my understanding of course content.	3.20 3.97	2.77 3.73	3.37 3.75	2.89 3.56	3.47 3.79	3.27 3.14	**
*I am usually motivated to complete homework and class assignments on time.	2.73 3.96	2.69 3.77	3.25 3.38	3.33 3.89	3.47 3.37	3.63 3.40	**
*I am usually provided opportunities to practice the skills I have learned.	2.47 3.96	2.81 3.77	3.06 3.69	3.44 4.00	3.00 3.42	3.05 3.36	**
*I have opportunities to extend my learning in this course to real life situations.	2.45 3.90	2.81 3.81	3.12 3.81	3.22 4.00	3.26 3.63	3.32 3.32	**
I typically enjoy coming to class.	2.08 3.98	2.85 3.79	3.12 3.44	3.00 3.44	3.26 3.26	2.91 3.09	**

Note: *Courses and comparative statements with an asterisk are significantly different from the pre-semester means at $\alpha = .05$.

**Data not available.

Imaginative Learner SS (Type One): Designing Action Research in Elementary and Early Childhood Education

This three-credit graduate level course is the first of a two-semester capstone sequence required for the M.S. degree, in which students design action research projects having implications for the education of young learners in their own professional settings. Professor SS had been teaching at the university for 19 years and was chair of her department at the time of the study.

Professor SS's significant challenge was preparing the Connect portion of each lesson's concept in ways that would intellectually tap each student's schema for comprehending a concept, and not result in her graduate students viewing the Connect activities as "fluff." She was apprehensive that the graduate students would not recognize that the Connect activities were in fact ways to creatively stimulate their capacity to foster imaginative connections to learning concepts. However, her concern that students would not recognize the value of these activities proved to be unfounded based on the positive reactions shared by many students at the end of each class session, as well as in evaluation data collected at the end of the semester. Additionally, a few of her students inquired if she planned to continue to teach using the 4MAT model as they continued into the spring semester. When asked why they wanted to know that, all replied, because we really like

the way you get us into the learning at the beginning of each class, and we look forward to how you will do this differently next time.

Another challenge Professor SS experienced in implementing 4MAT was her initial concern about whether students would be able to appropriately learn and practice the skills needed to conduct successful action research projects in their classrooms. As she developed and implemented class activities and witnessed how students were aptly conceptualizing their knowledge and skills, it became apparent that students were, in fact, able to generalize their Connect experiences to their own action research projects. One example occurred when her students were learning the stance of a successful action researcher through reading and analyzing several vignettes representing different opinions about the value of research. As they worked through the varying perspectives, they were able to accurately demonstrate their comprehension of these stances through making connections to their own literature reviews and syntheses. Experiencing a variety of Connect activities around specific concepts related to planning action research projects appeared to increase students' depth of understanding and skill implementation.

Most satisfying to Professor SS was how students seemed to continuously enjoy anticipating the next Connect activity. One of them, in fact, expressed interest at the end of the fall semester in learning more about 4MAT so she might

TABLE 4
Faculty Self Assessment

<i>Competencies</i>	<i>Before 4MAT</i>	<i>After 4MAT</i>	<i>Change</i>
I understand the central concepts and structures of my discipline and can create meaningful student learning experiences around them.	3.4	4.0	+.6
I can provide learning opportunities that support my students' intellectual, social, and personal development.	3.6	3.8	+.2
I understand diverse approaches to learning and can create instruction adapted to student diversity.	2.8	3.8	+1.0
I use a variety of instructional strategies that develop students' critical thinking, problem solving, and performance skills.	3.4	3.8	+.4
I create a learning environment that encourages positive social interaction, active engagement, and self-motivation.	3.8	4.0	+.2
I effectively use verbal and nonverbal activities and media to foster student learning.	3.0	3.8	+.8
I base my instruction upon knowledge of subject matter, students, community, and curriculum goals.	3.6	3.6	0
I understand and use a variety of formal and informal assessment strategies.	3.2	3.6	+.4
I reflect on the effectiveness of my professional practice and evaluate the effects of my choices and actions on my students.	3.8	3.8	0
I build relationships with school colleagues and the larger university community to support student learning.	3.4	3.4	0

incorporate it into her own teaching with her students in the elementary classroom.

Analytic Learner *RW* (Type Two): Psychology of Early Childhood

This three-credit undergraduate course provides a broad overview of the psychology of early childhood development, from birth to age six. A junior-level course, it serves as an

elective for psychology majors and is a required course for elementary education majors. Students enrolled in this course typically have future career aspirations in early childhood or elementary education. Course content revolves around the study and observation of young children with emphasis on the development, origins, and dynamic processes of behavior within this birth through six age range. Professor *RW* was in her fourth year of teaching in higher education at the time of her participation in this project.

As an Analytic (Type Two) Learner, *RW* was more likely to take a linear approach to course development and teaching. Perhaps Professor *RW*'s greatest challenge in using 4MAT was how to augment her current teaching practices using the Connect and Image activities of 4MAT. One way she addressed this was to consult often with Professor *JB*, a fellow 4MAT project participant who was familiar with her content area. As a result of this collaboration, *RW* was able to incorporate a variety of creative activities into her teaching. One such activity was used to introduce a unit that focused on the difference between maturation and development. The Connect activity she developed as a result of 4MAT involved having the students decorate balls with a variety of objects and then roll them across the floor. Students then were able to reflect on the factors that affected each ball's unique path and eventually make stronger connections to the overall unit's content.

Professor *RW* was also challenged by the prospect of incorporating 4MAT into a course heavy with content. Implementing a sequence of 4MAT activities took more time than lecturing, often making it difficult to include all of the 4MAT teaching activities she had planned. For example, in one class, she followed up a lecture with an activity in which the students were presented with a variety of images and asked to select one that metaphorically symbolized the cognitive development of children at various ages. In doing so, she was able to witness how her students expressed their understanding of various early childhood theories and stages in their own words, not merely repeating what they had read or learned during class lectures. Professor *RW* came to recognize the importance of incorporating a variety of pedagogical approaches to teaching developmental psychology.

Common Sense Learner *JB* (Type Three): Life Span Motor Development

This three credit undergraduate class examines changes in motor behavior across the lifespan, the processes that underlie these changes, and the factors that affect them. A senior-level course required by all physical education majors, its emphasis is on the young learner, task analysis, and developmentally appropriate instruction. A prerequisite for this course is acceptance into the professional program for teacher certification. Professor *JB* was in her sixth year of teaching in higher education at the time of her participation in this project.

As a Common Sense (Type Three) teacher, prior to 4MAT, this professor's focus tended to be on skill building and practice. Using 4MAT enabled her to develop activities that helped students to refine, extend, and perform their learning. With some planning, she found that it was possible to engage students in class activities that provided them with opportunities to work in small groups to produce and share their own learning. She found that these activities helped her students feel more comfortable with the material and resulted in their being more self-directed and "owning" the content. As the semester progressed, she often found her students offering comments such as "learning is fun here" or "what activity are we going to do today?"

Professor JB described her teaching as making connections to course content in many directions; in her words, she is a "spider web teacher." She realized, as a result of 4MAT training, that her former style of teaching frustrated and confused her more linear Analytic (Type Two) Learners. She recognized that using 4MAT could provide her the needed structure to plan instruction in a more linear fashion and facilitated a more focused "flow" for course content.

A related challenge was Professor JB's ability to identify a manageable number of concepts to teach. She recognized the need to focus on fewer concepts and reorganize course content accordingly, thus enabling her students to be more focused. Professor JB felt that she was most successful in designing and implementing Connect activities that provided her students with a personal connection to course concepts, and eventually to the content to be taught. Although in the past she had created some interesting activities, none of these were nearly as powerful as those she designed using 4MAT. For example, she introduced a unit on worldview by having the students' examine characteristics of volcanoes, salad dressing, and bread. She felt strongly that these types of activities provided her students with a solid foundation for learning.

Dynamic Learner JN (Type Four): Instructional Programming for Students with Exceptionalities

Professor JN, who also served as the 4MAT trainer for this project, chose to incorporate the 4MAT model into a three-credit graduate-level course that leads to special education certification. In a typical semester, approximately one-third of the students enrolled in this course are experienced general education teachers. Another third of the class is made up of students who recently received a general education teaching certificate in either elementary or secondary education and are pursuing a master's degree prior to beginning their teaching career. The remaining are post baccalaureate students with little or no training or experience in teaching.

This course focuses on designing individualized education programs and subsequent lesson plans in academic and nonacademic areas to meet the needs of exceptional students. At the time of this project, Professor JN was in her fourth year

of teaching in higher education. Prior to the implementation of 4MAT, this course was taught using a problem-based format, with students applying course content to various classroom scenarios. However, Professor JN recognized that this was challenging for many students who struggled with the task of absorbing course content and then applying their newly acquired knowledge and skills without prior practice opportunities. Eventually, she came to realize that her previous course structure was geared more towards Dynamic Learner (Type Four) activities and was painful for some students, specifically Analytic Learners (Type Two) who think more linearly and generally dislike group work.

Utilizing the 4MAT model provided a framework for Professor JN to present her course content to students more systematically; she did this using mini lectures, supplemental reading materials, and the use of cooperative learning activities. She also provided in-class opportunities for her students to practice their newly acquired knowledge and skills prior to group work application activities. Professor JN appreciated that 4MAT helped her to build on her strengths, such as incorporating real-life small group activities that were connected to actual classroom situations.

Analysis of Focus Group Interview Data

An audio tape of the focus group interview was transcribed verbatim via word processing software by a graduate assistant. Prior to any data analysis, accuracy of the transcription was confirmed by the first author by listening to the audio-taped recording while simultaneously reviewing the written transcription. The focus group transcript was then independently analyzed by both authors using thematic analysis methods with grounded theory structures (Strauss & Corbin, 1998). Initially, both authors independently coded the transcript for broad themes pertaining to the impact of 4MAT on teaching and learning. This process revealed more than 30 open codes. The open codes were then examined to identify predominant themes. Predominant themes were those identified by at least three or more interviewed faculty.

For the first question that asked *whether their thinking about teaching had changed as a result of implementing the 4MAT project, and if so how*, a recurrent pattern of responses revealed a theme characterized by change in faculty conceptions about teaching and learning. These included new realizations about the importance of (1) the use of visual and other creative nonverbal learning activities (professors offered examples of how they utilized various pictures and images, role plays, or simulations, and engaged students in building models using materials to portray course concepts; (2) helping students make personal connections as a key learning goal (professors facilitated discussions and associated writing activities in which their students made personal connections to identified course concepts; (3) being disciplined in sustaining the momentum true to the 4MAT model, despite the allure of simply telling students what they need to know; and (5)

clearly identifying a few powerful anchor concepts (like a preamble that grabs the reader at the beginning of a book) upon which to build.

For the second question regarding *the types of pedagogical techniques implemented that were different as a result of the project*, a pattern of responses revealed a theme regarding how the use of 4MAT elicited deeper student engagement in learning. Faculty responded enthusiastically about a number of new ways they engaged students in learning. These included developing group and individual projects in response to questions, having students create simulations, role plays, and investigative projects.

In response to the third question about *what pieces of the 4MAT model stood out in terms of fostering student learning*, an emergent theme was how faculty encountered challenges in learning to teach differently (particularly with the Connect activities). These challenges were seen as worthwhile in terms of how these established “hooks” positively influenced student learning. Faculty analogized the Connect activity to an “anchor” to which students were connected to learning. It also helped linear learners see where they were going because it forced instructors to be clearer about the learning goals. The refining and extending pieces of the 4MAT model were also expressed by faculty as being challenging to plan and implement; however, the activities associated with these appeared to facilitate students’ ownership of their work. Another theme that emerged from data highlighted the importance of recognizing, appreciating, and responding appropriately to behaviors influenced by diverse student learning styles.

In response to the fourth question about *how the faculty developed activities to anchor course concepts*, a pattern of responses revealed faculty’s conceptions of the importance of carefully identifying key course concepts in their disciplines that might increase the likelihood of deeper learning for students. Faculty shared strategies that they used to identify concepts from their various disciplines that were influenced by course goals and objectives. Course concepts were identified following the 4MAT model and presented to students through the use of combinations of tactile, visual, and kinesthetic activities. There was agreement that this aspect of 4MAT forced faculty to think more deeply about their course content. One professor mentioned that identifying the key concepts for learning using 4MAT helped her be less abstract in her teaching and seemed to calm her students’ anxiety about what would be covered on the test.

When asked the fifth question about *how the faculty viewed their students as a result of utilizing the model*, a pattern of responses revealed a theme around how using 4MAT resulted in students enjoying learning. Faculty commented that, for the most part, students appeared to enjoy and have fun learning, even when put into situations that may have been somewhat unconventional. Faculty viewed their students as consistently making personal and intellectual connections to concepts, and shared evidential examples of how

their students looked forward to coming to class to see how they would next experience learning.

To the last question regarding *how faculty assessed the impact of 4MAT in terms of knowledge and dispositions for themselves and their students*, a predominant theme emerged related to ambiguity regarding hard evidence for student learning as a result of 4MAT implementation. However, anecdotal evidence shared among the faculty pertaining to student learning appeared strong and convincing. Some faculty felt uncomfortable with a lack of clear assessment data for student learning other than the surveys utilized for the project; however there was unanimous agreement on the strength of their own learning about how the model helped them to teach more effectively. Unfortunately, many of the student assessments used during this project in individual courses were developed or revamped using the 4MAT model, therefore making direct comparisons of student learning from previous semesters impossible. An effective technique was used by one faculty participant who asked students to rate the extent to which they felt they mastered the course objectives. These were not graded but produced important information both to the student and instructor about teaching and learning that had occurred. An additional successful assessment technique that was used was to solicit frequent open-ended feedback from students about what they felt they had learned up to that point in the semester.

Overall, faculty participants stressed that 4MAT served as a reminder to them that students should be able to use their knowledge and skills in the real world, to think in new and different way, and especially to recognize that their 4MAT experiences were practice for real life. Finally, there was consensus that faculty who engaged in future 4MAT work needed to carefully pre-identify those areas they felt were most key to assess in terms of impact on student achievement.

DISCUSSION

This project responds to the call for faculty to be both knowledgeable about, and accountable for, how learning styles can influence the teaching and learning process. Faculty in this project explored the use of the 4MAT teaching model to enhance student learning and fostered increased faculty interest and collaboration across disciplines pertaining to course design and assessment of student learning.

Similar to the results of studies in elementary and secondary settings, our application of 4MAT increased learner motivation and engagement, and provided students with greater opportunities for practice and application of their learning in settings outside of the classroom. Notably, student behaviors that are typically frustrating to higher education faculty indicated statistically significant improvement, such as not paying attention in class and not completing homework assignments.

As previously stated, at the beginning of this project, all participating faculty taught primarily in their own learning

styles. The 4MAT model of teaching expanded our capacities to teach outside of our learning styles, thus increasing our ability to reach a wider variety of student learning styles and ultimately deepen the learning experience for all of our students. Not unlike the process of spackling when preparing a surface for painting, 4MAT has enabled us to address and repair the “holes” and “cracks” in our teaching.

Overall, faculty involved in this project were pleased with the result of their efforts to increase student learning using the 4MAT teaching model. However, confounding factors, presented some challenges. These included finding and coordinating time to (1) participate in 4MAT training, (2) rethink how to teach course concepts using the model, (3) meet with colleagues for sharing and critique, (4) find appropriate activities and materials to implement the Image and Attend components of 4MAT, as well as (5) reflect upon the impact of expanding one’s own well-trenched thought processes. Despite these factors, the SoTL project work supported by the university enabled the faculty participants to find ways to work together as well as to individually implement their projects.

Faculty participants in this project had the opportunity to showcase and discuss their work in a colloquium attended by more than 50 university faculty and administrators at the culmination of the spring 2008 semester. It is this type of public forum that validates the importance of the nature of this work and fosters interest in teaching for excellence in a university setting. Showcasing our implementation of the 4MAT model at the colloquium exposed other university instructors to thinking about the efficacy of their own teaching and optimally, for some, was the impetus to learn more about how to impact student learning using 4MAT. Utilizing the 4MAT model within the context of a SoTL project that included ongoing opportunities for collaboration is evidence that faculty in higher education can successfully collaborate to improve pedagogical approaches to meet the diverse learning styles of students across different disciplines.

REFERENCES

- About Learning. 1994. *The learning style inventory*. Wauconda, IL: About Learning, Inc.
- About Learning. 2005. *The 4MAT teaching style inventory*. Wauconda, IL: About Learning, Inc.
- Appell, C. J. 1991. The effects of the 4MAT system on instruction, academic achievement and attitude in the elementary music classroom. Unpublished doctoral dissertation.
- Bandler, R., & Grinder, J. 1975. *The structure of magic*. Palo, Alto, CA: Science and Behavior Books
- Benezra, S. H. 1985. Bernice McCarthy’s 4MAT learning style adaptations in middle school life science. Unpublished manuscript.
- Blair, D., & S. Judah 1990. Need a strong foundation for an interdisciplinary program? Try 4MAT. *Educational Leadership* 48(2), 37–38.
- Bowers, P. S. 1987. The effect of the 4MAT system on achievement and attitudes in science. Unpublished doctoral dissertation. The University of North Carolina at Chapel Hill.
- Childers, J. H. 1985. Neuro-linguistic programming: Enhancing teacher-student communications. *Humanistic Education and Development*, 24(1): 32–39.
- Claxton, C. S., & P. M. Murrell. 1987. *Learning styles: Implications for improving educational practices*. ASHE-ERIC/Higher Education Report No. 4. Washington, D.C.: George Washington University.
- Gagne, R. M., Briggs, L. J., & W Wagner. 1992. *Principles of instructional design*. 4th ed. Chicago, IL: Holt, Rinehart and Winston.
- 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.
- Gregorc, A. F. 1982. *Gregorc style delineator: Development, technical and administrative manual*. Columbia, CT: Gregorc Associates.
- Harb, J. N., Durrant, S.O., & R.E Terry. 1991. Use of the 4MAT system in engineering education. Proceedings of the Twenty-First Annual ITEE Frontiers in Education Conference, West Lafayette, IN, 612–616.
- Kelly, C. 1990. Using 4MAT in law school. *Educational Leadership* 48 (2): 40–41.
- Kolb, D. A., & R. E Boyatzis. 1993. *Learning skills profile*. Boston, MA: McBer & Company.
- Kolb, D. A., R. E Boyatzis, & C. Mainemelis. 2001. Experiential learning theory: Previous research and new directions. In *Perspectives on cognitive, learning, and thinking style*, eds. R.J. Sternberg and L.F. Zhang, 193–210. Mahwah, NJ: Lawrence Erlbaum.
- Lemire, D. S. 1987. The consulting school counselor and student learning style assessment. *Guidance Clinic*, 8–12.
- Lieberman, M. 1988. Report on the Fairfax County area III 4MAT geometry project. Fairfax, VA.
- Lieberman, M. 1989. Report on the Fairfax County area III 4MAT pre-algebra project. Fairfax, VA.
- Lisoskie, P. S. 1989. Experimental teaching of right and left hemisphere methodology using biology as a content area. Unpublished master’s thesis.
- McCarthy, B. 1987. *The 4MAT System: Teaching to learning styles with right/left mode techniques*. Barrington, IL: About Learning Inc.
- McCarthy, B., C. Germain, & L. Lippitt. 2002. *The 4MAT research guide*. Wauconda, IL: About Learning Inc.
- McCarthy, B., and D. McCarthy. 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.
- Paraskevas, A. & M. Sigala. 2003. Teaching hospitality and tourism management: A matter of style. *Journal of Teaching in Travel and Tourism* 3(4): 1–18.
- Rockwell, S. K., & H. Kohn. 1989. Post-then-pre evaluation. *Journal of Extension* 27(2): 19–21.
- Springer, S. P., & G. Deutsch. 1993. *Left brain, right brain*. New York: W.H Freeman.
- Strauss, A., & J. Corbin. 1998. *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks, CA: SAGE Publications.
- Sternberg, R. J. 1998. *Thinking styles*. New York, NY: Cambridge University Press.
- Svinicki, M., & N. M. Dixon. 1987. The Kolb cycle modeled for classroom activities. *College Teaching* 35(4): 141–146.
- Szewczyk, L. 1987. Effects of 4MAT, an experimentally-based teaching method upon achievement and selected attitudinal factors of high school geometry students. Unpublished doctoral dissertation.
- Wilkerson, R., & K. White 1988. Effects of the 4MAT system of instruction on students’ achievement, retention, and attitudes. *The Elementary School Journal*, 357–368.
- Witkin, H. A., P.K. Oltman, E. Raskin, & S.A. Karp. 1971. *Manual for the group embedded figures test*. Palo Alto, CA: Consulting Psychologists Press, Inc.
- Young, D. B. 1986. Administrative implications of instructional strategies and student learning style preferences on science achievement of seventh grade students. Unpublished doctoral dissertation. The University of Hawai’i.