An Investigation of the Relationship Between Teachers' Participation in 4MAT Fundamentals Training and Teachers' Perception of Teacher Efficacy

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Abstract

The relationship between teachers' participation in 4MAT learning style training and their perception of teacher efficacy was investigated three ways. Teachers who participated in 4MAT Fundamentals training were surveyed, observed, and interviewed. The Gusky and Passaro (1994) teacher efficacy scale was given to 120, K-12 teachers at 4MAT training sites. The survey was administered three times: before the workshop, immediately after the workshop and one month after the teachers had returned to their classrooms. The scale measured two teacher efficacy factors: (a) internal teacher efficacy-- perception of personal influence and impact on teaching and learning situations; and (b) external teacher efficacy -- perception of the influence and impact of elements that lie outside the classroom on teaching and learning situations. In addition, the teachers at one learning style training site were observed to determine how readily they adopted learning style terminology. Finally, six teachers were interviewed three times each to determine if factors found by Ashton (1984) to be associated with a high level of teacher efficacy were present.

Perceptions of internal teacher efficacy increased significantly from pre- to post workshop administrations. After the teachers had been in the classroom for one month, internal teacher efficacy scores were lower than immediately after the workshop but still significantly higher than before the workshop. The training had no significant impact on external teacher efficacy scores. An interaction was found between teachers' level of previous knowledge and the reported gain in internal teacher efficacy. Those teachers with little previous knowledge of learning style theory and methodology showed higher levels of gain in internal teacher efficacy immediately after the workshop and on the one-month follow-up survey.

The teachers' discourse during interviews and behavior during the workshops reflected all the elements Ashton outlined as associated with teacher efficacy: a belief in students' potential to learn and develop, awareness of the classroom as a social setting, and use of reflective behavior. These data also suggested that the maintenance of a high level of efficacy was influenced by the support of colleagues, modeling of instructional techniques, and validation of teachers' ideas concerning practice. It was also noted that teachers adapted 4MAT methodology idiosyncratically.

These findings suggest that knowledge of learning style theory and practice can be valuable to teachers. It appears that examining the impact of learning style training on teachers' attitudes and behaviors may provide meaningful insights into why interest in learning style concepts continues despite an inconclusive research base.

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Chapter 1
Introduction

. . .Besides the many individual differences in human psychology, there are also typical differences.

--C. G. Jung, *Psychological Types*, 1921.

The learning style construct is in a curious state. The concept continues to grow in popularity among practitioners even though it is supported by inadequate and fragmented research. On the one hand, the idea that individuals have unique styles of learning is compelling. It is widely acknowledged that many practitioners make intuitive adaptations in their classrooms, guided by idiosyncratic perceptions of student differences (Cronbach & Snow, 1981). Moreover, considerable theory as well as a reasonable amount of evidence points to the existence of learning styles. The concept's appeal to practitioners is reflected in the continued growth of private sector consulting firms that offer training in instructional methods based on learning style theory. On the other hand, the basic premise of aptitude treatment interaction (ATI) has yet to be upheld substantially by research or practice. In addition, the majority of learning style measures are beset with psychometric problems such that the inadequacy of existing measures makes it difficult to identify individual learning styles accurately (Curry, 1990).

Nonetheless, interest in learning style is increasing, and a significant number of teachers are attending workshops that purport to teach learning style methodology. As a result, it is important to understand this apparent

contradiction. At this point, little research has been focused on how training in learning style theory and its associated practice affects practitioners. Anecdotal reports from many teachers indicate they find such training valuable and often transformative (Jaoen, 1990; Orsak, 1990; Brunner & Majewski, 1990). For example, Ellison (1993) portrays at length how learning style ideas along with other curriculum innovations have transformed her classroom, helping her to "perceive and nurture the individuality and promise in all . . . children" (p. 8). If positive results occur when teachers adopt a style model, they must stem from changes in the direct or indirect interactions those teachers have with their students. Outcomes cannot change without a shift in teacher behavior, for ultimately practitioners control what happens in the classroom (Cohen, 1995). How does training in learning style theory and practice affect teachers' attitudes and behaviors?

History

The term "learning style" first appeared in research literature in the 1950's. Since then, educators have adopted it to describe a variety of "typical differences" in individual attributes and learning strategies that are believed to affect learning outcomes. Proponents of the learning style construct argue that students' predispositions shape their responses to instructional environments. Interactions between style and instructional variables are thought to have a significant influence on student motivation, task engagement, and cognitive processing (Curry, 1990; Snow & Lohman, 1984). As a consequence, style theorists claim an understanding of learning style is essential for designing instruction that addresses the learning needs of each individual.

Originally, most learning style theories were closely wedded to cognitive style paradigms derived from Witkin's (1976) work on field dependence and from studies on individual differences in reaction time, memory strategies, and modality strengths. As the concept of learning style gained acceptance, new learning style models evolved that were based on personality typologies and on expanded physiological measures (Dunn & Dunn, 1978; Kagan, 1965; Lawrence, 1983). Recent models have incorporated new research findings in neurophysiology that pinpoint differences in how the left and right brain hemispheres process information. At this point, no overarching definition integrates existing models, so that the learning style paradigm remains a collection of independent conceptions that focus in varying degrees on cognitive, affective and physiological characteristics.

Current Status

At present, a number of factors both influence and inhibit the inclusion of learning style theory in educational practice (Curry, 1990). Three main inhibiting factors have been identified: (1) The lack of integration among conceptions of learning style concerns many practitioners; they feel unable to sort out effectively where and when to use each model (Brandt, 1990, O'Neil, 1990). In practice, model integration occurs only when individual practitioners take the time to devise their own systems. As a result, use of learning style concepts continues to be idiosyncratic (Ellison, 1993). (2) The imprecise use of terminology creates confusion. No standardized nomenclature has been accepted, so that, for example, the characteristics of "tactual" in one model may match those of "kinesthetic" in another. (3) There exists a plethora of

psychometric instruments that claim to measure some facet of learning style. Many of these measures are insufficiently researched and as a result, have inadequate reliability and validity. Researchers are beginning to refine these measures, but basic work still needs to be done in this area. (Curry, 1990; Keefe, 1987, 1990).

Research offers ambiguous answers to the question of how the concept of learning style should be translated into effective practice (Brandt, 1990). Although research does indicate that instructional design based on style theory can result in student achievement gains (Eggins, 1979; Della Valle, Dunn, et al. 1986; Lieberman, 1988 & 1989; Snow and Lohman, 1984; Wilkerson & White, 1988), interpreting research results is problematic. Considerable variation in the focus and design of learning style studies exists because style theorists hold contradictory positions on whether instruction should be matched or mismatched to preferred learning style. As yet, no consensus has emerged on whether matching or stretching student style on a long term basis is the underlying mechanism behind gains in achievement. Moreover, testimonials from practitioners indicate that gains have occurred even when models were used in an incomplete or idiosyncratic manner (Andrews, 1990; Ellison, 1993; Klavas, 1991), suggesting that other important variables besides matching and mismatching style may be at play in classrooms based on learning style methodology.

There is also disagreement among learning style theorists on how best to use psychometric instruments that measure learning style. Some researchers view the construct as a powerful tool for matching students and instructional environments with increased efficiency. Those who favor a "goodness-of fit"

approach (Curry, 1990, Dunn & Dunn, 1978) continue to advocate for the use and improvement of diagnostic instruments to enable educators to prescribe student placements with accuracy. Other theorists recommend the use of testing only for self-knowledge and personal decision-making. They contend that one's style develops over time through interaction with a variety of educational settings. They further aver that knowledge of style cannot accurately predict how an individual will respond in every learning episode. Accordingly, they claim students' use of their preferred style will vary in response to environmental conditions. Consequently, these theorists caution educators against narrow placement decisions and advocate the use of multiple teaching methods coupled with opportunities for student choice among activities (Golay, 1985; Lawrence, 1993; McCarthy, 1987).

And yet, in spite of the confusion and controversy that surround the construct, interest in learning style persists among practitioners, researchers, educational agencies and the public. The construct is increasingly viewed as an integral part of many contemporary reform movements, especially those that stress honoring the predilections of all learners. In light of this, several professional organizations have judged the learning style construct sufficiently worthwhile to feed membership interest in this area. For example, monographs on learning style have been published recently by the Association for Supervision and Curriculum Development (Guild & Garger, 1985), the National Association of Secondary School Principals (Keefe, 1987), and the National Education Association (Reiff, 1992). As a result, familiarity with learning style concepts is widespread. In a 1990 issue of *Educational Leadership* devoted to learning style, the editor estimated that general

knowledge of style was "almost universal" with approximately 10% of schools applying theory consistently (O'Neil, 1990).

A small but thriving industry has developed to train teachers and school administrators in learning style theory and practice. The 1994 *Learning Style Network* newsletter listed over ten regional learning style centers in the United States backed by NASSP and St. John's University. Confidence in the 4MAT learning style model is sufficient that in North Carolina, all student teachers at the University of North Carolina at Chapel Hill have been trained in the 4MAT method since the late 1980's (personal communication, Jacque Dunbar, Director, North Carolina Department of Continuing Education, September, 1995). In 1995, more than 20,000 teachers participated in introductory or advanced training in one of several popular learning style models (personal communication, Excel, Inc., Barrington, Ill.; Learning Style Center, St. John's University, January, 1996). Over the last ten years, educators have published a number of articles reporting significant gains in student achievement and retention rates after instructional designs based on learning style theory were implemented. In 1987, special education teachers at Frontier Central High School in Hamburg, New York decided to institute a learning style program. Prior to this decision, only 25 percent of their students routinely passed annual mandatory competency exams. After employing the program for one year, the pass rate climbed to 66 percent. After the second year of styles instruction, the rate jumped to 91 percent (Perrin, 1990). Similarly, after the staff of an elementary school in North Carolina adopted the Dunn Learning Style Model, the school's average reading and mathematics California Achievement Test scores rose from the 30th percentile to the 75th percentile

over a two year period (Andrews, 1990). As a result, Keefe (1987) believes the style construct has the potential to provide "powerful leverage to analyze, motivate and assist students in school" (p. 42).

Focus of This Study

At this point, practitioner reports of achievement gains as well as testimonial reports remain relatively unexamined. They are either uncritically cited as evidence that a particular learning style model is effective (Dunn & Griggs, 1988) or they are overlooked by critics of learning style who tend to focus their attention on ATI research (Jongsma, 1990). Yet, these reports illustrate some of the ways that the adoption of a learning style paradigm may alter practice. These reports also suggest that examining systematically how training in learning style methodology affects practitioners may lead to a better understanding of the paradoxes that surround the learning style construct.

For instance, anecdotal reports indicate that training in a learning style model may prompt teachers to integrate systematically a number of new teaching strategies. One teacher, who became an advocate of style after using a learning style model for several years, commented that she viewed styles instruction as a "philosophical change from traditional to a mutual embrace of accountability: if students don't learn the way we teach, we teach the way they learn " (Marshal, 1990). Similarly, another practitioner stated that she would not have tried cooperative learning if she had not been exposed to a "learning style perspective" (Brandt, 1990). These educators appear to have constructed a new way of viewing teaching based on learning style ideas but unwedded to any particular model. Pat Guild, a learning style consultant, noted, "Teachers I

work with aren't using learning styles for learning styles sake: for them it's a framework for decision making. . . .They're always asking how to accommodate different learners and looking for strategies to try" (Brandt, 1990).

Anecdotal reports suggest, as well, that adopting a learning style model may increase practitioners' sense of control and gradually broaden their perception of their role in the classroom. Sykes, Jones, and Phillips (1990) reported that after participating in a school-wide learning style workshop, the faculty at their school became more responsive to student needs. The training they received made them feel better prepared to suggest new ways for students to study. These practitioners began to perceive themselves as facilitators who could help their students problem solve when they were having difficulty understanding material or keeping up with assignments. In this case, integration of a learning style model into practice, appears to have gradually altered student-teacher transactions both in and outside of the classroom.

At the fall 1995 conference of the Southeast Learning Style Center at George Mason University, I spoke with a number of teachers whose exposure to learning style theories prompted them to find new ways to work with the learning differences in their classrooms. In general, they came to the conference seeking ways to help specific children rather than for the purpose of evaluating the pro's and con's of various theories. They were prepared to be eclectic. For example, several teachers I encountered spread out among the various workshops at the conference to collect strategies for specific "problem" children they were currently teaching. In many ways, the approach of these practitioners resembles that of Throne (1994) who points out that the

"either/or" nature of educational theory fails to support her teaching practice adequately. Like those at the conference, Throne feels she needs an assortment of concrete teaching strategies to cope with the exigencies of daily practice; she hesitates to adhere strictly to any one theory of instruction because she has found that every theory inevitably fails to serve the needs of some child in her class. Consequently, when selecting teaching strategies she is guided by a dialectic between her experience in practice and the claims of theory.

It seems plausible, then, to assume that training in learning style theory may shift teachers' perception of classroom control in such a way that they feel more capable of responding to individual differences and, as a result, more willing to experiment with new teaching strategies. Learning style training may create a phenomenon similar to what Hodas (1993) calls the "Trojan Horse effect." In a discussion of how new technology influences school culture, Hodas points out that even though computers are "taken in" for one purpose, their very presence ultimately brings about changes in school structure and practice. Introducing teachers to learning style models may influence schools in much the same way. The idea of learning style is intuitively appealing and coincides with most practitioners' concerns for serving individual learners. As a result, the idea is readily taken in through the school gates. Once brought into the classroom, it may change teachers' perception of their ability to influence student learning and thus transform their practice.

The purpose of this study was to investigate the relationship between teachers' participation in 4MAT learning style training and teachers' perception of teacher efficacy. Three questions were asked:

1) Does participation in 4MAT learning style training influence teachers' level of internal and external control?

2) Do teachers adopt and use learning style terminology and practice during and after a 4MAT training?

3) Is teachers' discourse consistent with the criteria delineated by Ashton (1984) as being associated with trainings that contribute to a high level of teacher efficacy: a belief in students' potential to learn and develop, awareness of the classroom as a social setting, and use of reflective behavior?

Chapter 2
Learning Style Models: Theory and Research

Analyzing the conceptual basis of the learning style construct is challenging because the field is in what Keefe (1990) refers to as a "multiparadigmatic stage" (p.57). If represented schematically, the field of learning style would resemble a crazy-quilt Venn diagram, a frequently baffling configuration of overlapping and divergent theories and practices, both explicit and implicit. Research on learning style has identified over thirty variables that differ among learners and that may influence individuals' response to instructional treatments (Keefe, 1987: Messick, 1976). However, research has yet to clarify the relative importance of these variables for instructional design. Moreover, causal relationships between identified learner differences have not been systematically explored. Some researchers (Claxton & Murrell, 1987; Curry, 1990; Ingham, 1989) postulate that many learning style variables may, in reality, be surface indicators of deeper psychological and physiological characteristics. As a result, they hypothesize that apparently unrelated attributes may actually stem from a relatively small number of key factors. There is some speculation among theorists that future research on brain functioning may uncover the underlying physiological basis of learning style differences.

Another curious phenomenon that appears when examining the field of learning style is a remarkable uniformity among the recommendations for practice generated by the various models in spite of their divergence in

conceptualization. This uniformity lends credence to the idea that learning style models may be identifying a core group of factors but labeling them differently. For example, Dunn (Dunn & Dunn, 1992) includes in her inventory a category that she terms "likes to work with an authority figure." Lawrence (1993), using Jungian typology as his reference point, portrays certain types as liking to work with mentors who are competent. McCarthy (1987) identifies a learner type that seeks out expert knowledge. The practice that accommodates all these learners is essentially identical.

However, not all identified elements of learning style have generated a pedagogical model. Therefore, after reviewing tenets that are shared commonly among many models, several specific learning style models will be reviewed. These models were chosen because they included teaching methodology and because: (1) they were included in the October, 1990 issue of *Educational Leadership* that reviewed the main models currently being used by school systems; (2) they were referred to often on an electronic bulletin board devoted to learning styles (EDSTYLE@MAELSTROM.STJOHNS.EDU); and (3) they were featured in the learning style monographs published by ASCD, NEA, and NASSP.

Attribute Treatment Interaction (ATI)

All learning style models are founded on the premise of interactional effects between learner and instructional treatment. Interaction is defined as present when a situation "has one effect on one kind of person and a different effect on another" (Cronbach & Snow, 1981, p. 3) Since the 1950's many fields of psychology as well as the sciences have witnessed an increased study

of interaction. Interaction has become a fundamental concept in genetics, comparative psychology, personality psychology, social psychology, psycholinguistics, and experimental psychology (Cronbach & Snow, 1981). Following the lead of Cronbach and Snow (1981), many educational researchers have attempted to define important interactions that influence school achievement.

In the 1960's and 1970's, ATI research appeared to be fertile ground for advances in educational psychology. However, results from investigations of interaction were disappointing. Even though the importance of interaction was upheld, it became apparent that to test for interactions in educational settings was extremely complex. For one thing, interactions did not always prove to be stable. For another, researchers could not always measure variables of interest reliably or easily. As a result, research findings did not readily clarify relationships that seemed intuitively to be interactional in nature and strongly related to instructional outcomes.

Because interactions in learning are complex and multivariate, Cronbach and Snow concluded in 1981 that lab-like experiments might not be sufficient to secure enough findings to provide the basis for learning theories. Instead, they proposed that understanding molar behaviors such as learning would require research that was "representative of instructional complexity and duration, and that concerns itself with what students do in typical situations" (p. 390). Keefe (1990) contends that much of learning style research has followed this approach by doing research in school settings and by building theory on the basis of classroom realities.

While the outcome of ATI research overall was disappointing, interactional effects were verified in experiments that focused on strong variables for which good measures existed. For example, research indicated that anxiety level, field dependence, need for structure, and prior knowledge interacted with instructional treatment (Cronbach & Snow, 1981; Keefe, 1990). Research results in these areas led to two important conclusions that undergird all learning style models. First, teachers need to have a repertoire of teaching strategies so that they can be flexible in their classroom practice (Woolfolk, 1995). They must be aware of student characteristics and have a sense of how different instructional models may affect different types of learners. Second, a mismatch between learner and method can lead to "mathemathanic" effects, interactions that either prevent new learning or decrease achievement (Cronbach & Snow, 1981, p. 391). In light of this finding, mismatched instruction is seen as potentially counterproductive (Snow & Lohman, 1984).

Ironically enough, the history of ATI research also works against the acceptance of current learning style models. Because many ATI research outcomes were equivocal, some critics of learning style see current attempts to shape pedagogy on learning style concepts as merely a rehash of old ATI ideas (Jongsma, 1990; Kavale and Forness, 1987). Their perspective often prohibits a thoughtful analysis of research on contemporary learning style models with the result that criticism of the learning style field often fails to be instructive.

The Influence of Piaget, Vygotsky, and Situated Cognition

Interest in Piagetian and Vygotskian theories of learning has promoted interest in learning style among many practitioners. Even though Vygotsky's

and Piaget's works do not specifically focus on style, their emphasis on the importance of interaction between learner and environment for intellectual development is consistent with learning style concepts. Almost all prominent learning style models associated with teacher training assume a developmental approach. Their theorists advocate understanding of learning style elements, not just because they believe accommodating difference will make learning more efficient, but also because they contend that styles driven classrooms create an environment where all children can develop appropriately (Dunn & Dunn, 1992; Lawrence, 1993; McCarthy, 1987). In this regard, learning style theorists see the development of a personal learning style as being intimately linked to individuation.

Some research findings in situated cognition have reinforced researchers' perceptions of the importance of understanding cognitive style. Although most research in situated cognition has not been designed to verify the existence of learning style, some studies have indicated that cognitive style must be considered to explain the dynamics of classroom learning. For example, Allardice and Ginsburg (1984) observed the behavior of elementary school aged children with math difficulties. They questioned the students to learn what informal math concepts they had grasped and recorded math strategies the children employed. Ultimately, they concluded that the children's poor math performance could not be attributed to a lack of informal math concepts, ability to learn, or ability to invent math strategies. As a result, they encouraged other researchers to re-examine the idea of cognitive style, the "personality of cognition," noting that "the difficulty of obtaining conclusive

evidence in this area does not indicate that the phenomenon is unimportant " (p. 217).

Diversity

Although learning style models concentrate on different factors, they share three important tenets. First, style theorists generally assert that different styles of learning are of equal worth; there are no inherently inferior styles. Even though the characteristics of one style may inhibit student performance in one setting, style theorists argue that those same characteristics will promote success in another situation. Thus, all styles can be thought of as having social value (Guild & Garger, 1985;Lawrence, 1993). A second underlying assumption of the field is that style and ability are separate constructs. Students of equal ability may prefer to learn in different ways, just as students of unequal ability may adopt the same style. A corollary of this is the assumption that continually mismatched educational treatments and individual learning styles will prevent students from realizing the potential of their cognitive ability. Finally, the field of learning style assumes that diversity should be honored and as a result, is often linked with multiculturalism and other diversity based educational movements. The Southeast Learning Styles Conference theme of "Honoring Diversity VIII" underscores the long-standing concern that researchers in learning style have had for finding methodology that accommodates learner differences.

The Dunn and Dunn Learning Style Model

Theory

The Dunn and Dunn learning style model is the basis of a highly publicized learning style program. Now associated primarily with Rita Dunn, the model was developed in the late 1960's by Rita and Kenneth Dunn. At that time, Rita Dunn, a special education and education administration professor at St. John's University, ran a three-year pilot program for slow learners. Six hundred teachers-in-training, eight college professors, twenty classroom teachers, and five public school administrators worked together to facilitate learning for children who had not responded well to traditional teaching. While Dunn's program was being instituted, individualization was in its infancy, so the staff tested many different learning packets, programmed learning units, and games. After three years, it became apparent that "selected methods often were highly effective with some youngsters, but produced only minor gain in others" (Dunn & Dunn, 1978). The Dunns also witnessed an unexpected phenomenon: methodology repeatedly seemed to be a more critical variable for motivating students than did the topic chosen for the curriculum. This finding went against the prevailing instructional ethos which stressed relevancy and encouraged tapping student interest for curriculum content.

After examining pertinent educational and industrial learning research, the Dunns developed the *Learning Styles Inventory (LSI)* (Dunn, Dunn, & Price, 1989), a measure of learning style that reflected eighteen characteristics thought to affect learning. Subscribing to the diagnostic/prescription model of special education, they felt that a diagnostic instrument was essential and that

instruction should be matched to student style needs. From 1970 to 1974, using the assistance of graduate students and colleagues at St. John's University, the Dunns tested and revised the instrument. The *LSI* was released in 1974, but was revised in 1975, 1979, 1985, 1987, and 1989. The instrument now contains 22 subscales.

The 22 subscales of the *LSI* reflect areas that research literature indicates might be of importance for learning, and so, are scored independently. The Dunn model has no overarching theory other than the belief that students prefer different instructional settings and social arrangements for learning and respond differently to environmental factors such as room temperature, lighting, and sound level. In a recent book on using styles for teaching (Dunn & Griggs, 1995), Dunn states that there is a correlation between the *LSI* and cognitive style tests. As a result, Dunn claims the *LSI* can also determine a student's preference for global or analytical thinking. However, no explanation of this link is given in the current test manual.

The four major areas included by the *LSI* are:

- environmental factors -- sound, light, temperature, and design (informal or formal);
- emotional/psychological factors -- motivation, persistence, responsibility, structure
- sociological factors--self-oriented, colleague-oriented, authority-oriented, pair-oriented, team-oriented, varied work arrangement
- physical factors--perceptual preference, need for intake of food while learning, mobility needs.

Research

The Dunn's conceptualization of learning style has generated a loyal following as well as a number of sharp critics. Evaluating the Dunn's work is problematic. On the one hand, the Dunns have extensive practical experience in education and have spearheaded the effort to bring learning style concepts into the educational mainstream. They have also developed instructional materials and methods that are highly regarded by many teachers. On the other hand, they make exaggerated claims for their learning style measure that occasionally approach misrepresentation. In addition, they continue to adhere to the rigid stance that individuals' learning styles must always be matched in the classroom even though there is little long term research to support their position.

Unfortunately, those who promote the Dunn model appear to work against their own cause. Claims are continually made by Dunn and her associates for the *LSI* that appear to be unfounded. Neither the research literature nor test reviews in established journals portray the *LSI* as a strong instrument. Yet, Dunn states in her latest work (Dunn & Griggs, 1995) that "In a comparative analysis of the style conceptualization and psychometric standards, . . . the Dunn, Dunn, and Price *LSI* was the only one rated as having good or very good reliability and validity (Curry, 1987)" (p. 28). A study of the source of these claims suggests that these positive statements have been taken out of context to render them more supportive than they were originally meant to be. A prime instance of this kind of exaggeration of support is the use of Curry's discussion of the *LSI*. In 1987, Curry analyzed the current state of the learning style paradigm, listing learning style measures that had "some

published evidence of reliability and validity" (p. 10). The *LSI* was among them. She also advised in her article that "all potential users of learning style measurement systems are cautioned to read deeply and critically about the learning style conceptualizations they propose to use." (p. 17) Reviewers of the *LSI* in the 1992 Mental Measurement Yearbook concur that the *LSI* is a weak instrument with inadequate reliability and validity. One reviewer goes so far as to state that "the manual is written to sell rather than inform" (Hughes, 1992, p. 461). Ferrel's 1983 factor analysis of the *LSI*, as well, failed to reveal a well-defined construct.

A search of recent doctoral and master's dissertations indicated that many studies are still using the *LSI* to examine learning differences between different populations. Statistical differences are almost always found between groups on some dimension of the test. However, interpreting the meaning of those differences is almost impossible because there is no solid evidence of a correlation between reported preferences on the *LSI* and student behavior. Nor is there any clear indication of the frequency with which learners choose their preferred way of learning. One recent study (Hall, 1993) found a significant discrepancy between what students reported on the *LSI* and what they identified in interviews as their optimal learning environment.

A few studies indicate that attention to style as defined by Dunn can lead to achievement gains at least on a short term basis. However, again, since the criteria for subject selection in these studies are based on the *LSI*, how to interpret the research findings is uncertain. Moreover, a large percentage has been done under the auspices of St. John's University so that questions of adequate external validity and independence have been be raised. A small

number of studies have been done by independent researchers (Degregoris, 1986; Jarsonbeck, 1984; Wheeler, 1980). For the most part, these studies show positive results when short term instruction of specific content is linked to learning style. These studies all have a similar design: students who have a strong preference on one factor on the *LSI* are randomly divided into two groups and then given what the Dunns feel is either matched or mismatched instruction for that style factor. Once instruction is completed, achievement gains are measured and compared for statistical significance. Statistically significant results have occurred in these studies, but as Cohen (1989) points out, practical significance and effect size are generally not reported.

On the other hand, thoughtful analyses of Dunn's learning style theories are not to be found. Yet, in spite of this dearth of well-developed criticism, opponents of learning style ideas continually cite a small number of inconclusive research articles as evidence damning enough to end all discussion of the Dunn model. This summary dismissal has inhibited productive discussion and promoted contentiousness. An example of the poor quality of the reports from Dunn's critics is the meta-analysis of studies matching modality strength with instructional method done by Kavale and Forness (1987 & 1990). In their analysis, the researchers included only two of the Dunn studies , and they failed to restrict their study to research based on a consistent definition of modality. Because researchers define modality preferences in different ways, it seems ill-advised to rely on general analyses of ATI modality research either to support or affirm Dunn's position.

There are no long term, controlled studies of the Dunn model, although there are many reports of school systems having success when they adopt styles

based methodology. Virtually no careful analyses of these cases have been reported in the literature. Dunn and her supporters uncritically claim that these studies prove that matching learning style to teaching style is a highly effective instructional design. However, a close examination of these case studies reveals a number of variables that could be affecting student achievement. Consequently, it is not evident that a match of style to instruction is the primary factor contributing to improved student performance in these case studies.

The case of Brightwood Elementary School in North Carolina exemplifies the difficulties inherent in determining the cause of achievement gains in systems where a learning style model is adopted. In 1990, Andrews, principal of Brightwood, reported that his school's overall achievement levels increased dramatically after the Dunn model was adopted in 1986 (Andrews, 1990). Andrews decided to implement the Dunn model after he heard of another principal's success in using it to turn around high school underachievers. In conjunction with his staff, Andrews studied different models and finally decided to adopt the Dunn model because of its "extensive research base."

In the spring of 1986, the *LSI* was administered to all the students who would be attending Brightwood the following fall. At the beginning of the 1986 school year, teachers were encouraged to choose voluntarily "any practices that made sense to them from among a long list of possibilities" (Andrews, 1990, p. 309). Andrews determined that positive results occurred almost immediately because discipline referrals declined dramatically after just a few weeks of program implementation. During the third year of the program,

the number of discipline problems dropped to 10% of what it had been. In addition, the PTA became very involved in the program, raising money to send teachers to trainings and assisting in the production of instructional materials.

Klavas (1994) also reported on the Brightwood study, giving more details on the methodology used by the teachers. The results of the 1986 *LSI* indicated that the student body had a large percentage of students who needed greater mobility and who were what Dunn refers to as tactual learners, those who master difficult material with their hands (as opposed to kinesthetic learners who master material through movement and activities). The substantive changes that were made in the classroom involved introducing material first tactually or kinesthetically. Initial instruction was followed by visual and auditory activities. In addition, teachers gave students the choice of working anywhere in the classroom they wished as long as they met certain classroom rules. Students were also allowed to opt for group or independent learning. The *LSI* revealed that one class had a large majority of students who learned best in the afternoon. For those students, the day's schedule was altered so that difficult skills work was in the afternoon instead of the morning. Andrews reported that this scheduling change transformed the behavior and achievement of the class.

What is noticeably lacking from both these articles is any report of a careful matching of style to instruction, as well as any clear record of what techniques teachers were employing from the "long list of possibilities." Moreover, no systematic observations were made of the children to determine what choices they were making or if their choices were consistent with the instructional preferences they listed on the *LSI*. Given the unclear record of

what exactly occurred at Brightwood, the reports of Andrews and Klavas cannot be used as support for the proposition that matching instruction to style accounts for the achievement gains that were reported. However, what seems more important to ask at this point is not whether matching style to instruction is validated by these reports, but how training in the Dunn model triggered so many positive changes at Brightwood. Why did a learning style framework encourage the staff at Brightwood to broaden their repertoire of teaching strategies and provide a more active learning environment?

Derivations of the Dunn Model

A number of learning style concepts have been developed by Dunn's students. The most noteworthy is the Carbo *Reading Style Inventory* that purports to match students with an appropriate elementary reading program. These derivations exhibit strengths and weaknesses similar to those of the original model: poor reliability and construct validity, but strong support from teachers who have instituted their recommended practices. Teaching strategies associated with the Carbo model, for example, have been credited with significantly improving reading scores of Chapter 1 students in a pilot study in Pine Bluff, Arkansas. Perhaps what is most intriguing about this study is the superintendent's comment that his "17-year veteran teacher had never obtained such success in reading with students before" (American Association of School Administrators, 1991, p.40).

Jungian Personality Types /The Myers-Briggs Type Indicator

Theory

After World War II, Isabel Myers began work on translating Carl Jung's concept of personality type as it was presented in *Psychological Types* (1921) into a practical psychological instrument. After twenty years of research, Myers produced the *Myers-Briggs Type Indicator (MBTI*), a self-report test that she hoped would enable individuals to learn more about their personality type and, as a result, gain insight into their behavior. Myer's careful efforts resulted in an instrument that has proven to have excellent psychometric properties; the *MBTI* has good internal and test-retest reliability. In addition, extensive studies of construct validity have shown that the test is a strong measure of Jungian personality types (Buros Mental Measurements Yearbook, 1989; McCaulley & Myers. 1985).

When the *MBTI* was published by Educational Testing Service in 1962, researchers across the country grew interested in studying its potential as a psychological instrument. In 1975 the test was taken over by Consulting Psychologists Press in Palo Alto, and subsequently became widely known among counselors and therapists. At this same time, the Center for Applications of Psychological Type was established in Florida by Dr. Mary McCaully, a psychologist at the University of Florida. This Center continues to be a major source of information on research on type and, through affiliation with faculty at the College of Education at the University, has promoted research in the use of Jungian type concepts in education. Annually, the Center hosts a conference on type and education, and throughout the year it

runs workshops on type for educators throughout the United States. In addition, a number of private consulting firms train professionals to use type concepts in counseling, management, and education. A number of these consultants use various aspects of the *MBTI* to instruct educators in learning style theory based on Jungian personality types.

Jung identified eight possible personality types by combining different observed patterns of behavior. Myers added another dimension based on several of Jung's incomplete works, so that, in the end, the *MBTI* identified sixteen possible personality types. The sixteen types are formed by a matrix (Table 2) that combines how individuals perceive and judge information with how they choose to interact with their environment (Myers & Myers, 1993). Table 1 provides a description of type dimensions as defined by Myers (1962).

TABLE 1

Dimension	Definition
Attitude	*Attentional orientation toward environment*
(E) Extroversion:	Outwardly directed. Attuned to people and action in environment.
(I) Introversion:	Inwardly directed. Attuned to inner world of concepts and ideas
Function	*Perceptual function (information processing mode*)
(S) Sensing:	Prefers observable facts and details. Focus on immediate and practical aspects.
(N) Intuitive:	Looks for relationships and possibilities in observable information. Focus on future.
Function	*Judgment function (decision-making orientation)*
(T) Thinking:	Objective, impersonal decision-making style relying on observable facts.
(F) Feeling	Considers impact on other persons. Subjective style of decision-making.
Attitude	*Attitude or orientation to life*
(J) Judging:	Prefers an ordered, planned, and structured lifestyle. Likes organization and closure.
(P) Perception:	Prefers a spontaneous, flexible lifestyle.

Table 2

Matrix of Jungian Personality Types

Sixteen Personality Types			
ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESFJ	ENFJ	ENTJ

Research

Once the *MBTI* was established as a reliable instrument, educational researchers employed it for the study of motivational patterns and work habits in instructional settings. Lawrence (1993) spearheaded the collecting of research data in the 1970's. Zeisset (1985), Golay (1985), and Murphy (1992), as well, have worked extensively on applying type concepts to educational practice. Their theories rest on three bodies of research on the *MBTI.* Because Myers is no longer living and was never affiliated with any particular university, questions of bias and external validity are rarely raised concerning this research. In addition, unlike doctoral research on the Dunn model, prolific research has been generated on the *MBTI* at a wide variety of institutions. As of October 1995, there were 4,798 entries in the *Bibliography for the MBTI*, a

collection of research articles published by the Center for the Application of Type (McCaulley,1995).

Using the *MBTI*, researchers have identified patterns in type distribution within professions and educational institutions. McCaully and Natter (1974) used the profiles of hundreds of teachers and students at all levels to publish tables showing type distributions at different levels of instruction and in different disciplines. High concentrations of one particular type or type characteristic among different student groups led researchers to postulate that practice in various school environments worked against some personality types and supported others. Myers herself tested 500 adults who had not finished 8th grade and found that 99.6% of them were ES's (Lawrence, 1993). Similarly, McCaulley (1985) found that a high percentage of "gifted" students tested as either INFP's or INTP's. This caused her to question whether most schools were actually testing for giftedness in general or testing for a certain type of person. Correlations between type and learner characteristics, such as achievement level and grade point average, were also examined.

A second body of research that undergirds style theories based on Jungian typology is a compilation of studies that measured the actual behavior of different types of students. Designed to verify that identified types perform according to predicted theory, these studies (Eggins, 1979; Hoffman, Waters, & Berry, 1981; Smith & Irey, 1974) have both validated the *MBTI* as an instrument and given insight into the ways that different types of learners function in educational settings. For example, Carskadon (1979) monitored the reactions of forty undergraduates who were asked to give a five-minute talk before six judges with only five-minutes notice. In this experiment, Carskadon

correlated student behavior with the I/E dimension. The study showed that extroverts stood closer to judges (p <.05), had fewer seconds of silence (p <.01) and after the talk remembered more names of the judges to whom they were introduced at the beginning of the experiment (p <.001).

Using 130 published studies from this research base, Lawrence (1994) compiled a table summarizing the empirical evidence for how different types respond to learning situations and methods. Learning preferences were organized in several ways: by the four main dimensions of type theory (I-E, S-N, T-F, P-J), by type quadrants (ES, IS, IN, EN), by mental process combinations (ST, SF, NF, NT) and by perception and attitude combinations (SP, SJ, NP, NJ). For example, individuals who have the SP combination as part of their type have been shown to prefer structured exploratory observation and hands-on instruction; those with the SJ combination prefer structured, didactic, sensory-rich instruction; those with the NP combination like low structure and inductive activities; and those with the NJ combination like moderate to high structure, and "serious" instruction (Lawrence, 1993).

Links between teacher type and personality type have also been examined. Researchers speculated that teachers' type preferences might affect how they presented information and managed their classrooms. Using the McCaully and Natter statistics as a starting point, Thompson (1984) interviewed public school teachers and coded their responses by the four mental process combinations, ST, SF, NF, NT. By cataloguing teachers' preferred instructional strategies and their goals for their students, she found that the teachers she studied varied in line with type theory in terms of how they conceptualized the teacher's main role, how they shaped curriculum and

how they paced daily activities. Lyons (1985) investigated the relationship between teacher scores on the *MBTI* and teaching style further by observing teacher behavior for a year and by asking teachers to complete self-analysis journals. Like Thompson, she found that the teachers' behavior reflected patterns of difference according to their personality types.

Lawrence (1993), as well, studied teacher characteristics by having observers record and code different teaching behaviors. Continuing this line of research, Murphy (1992) grouped teachers by type and had them write teaching plans or test items. The resulting lesson plans and test questions consistently showed unique features by type. For instance, teachers whose type was strongly influenced by the F function wrote questions that focused on the social and moral ramifications of their subject matter, whereas those with strong T functions tended to design questions that demanded the analysis of broad cause and effect patterns This experiment was duplicated twenty times with consistent findings. The combined results of these studies indicated that teachers differ by type in their conception of the role of the teacher, their system for appraising methodology, and their criteria for judging successful teaching.

As with the Dunn model, the literature on type is replete with anecdotal and case study reports that show knowledge of type to be a powerful problem-solving tool. Lawrence (1993) reports on a number of school interventions based on type concepts that led to a decrease in discipline problems or increased student participation and motivation. For instance, a middle school in Florida was able to eliminate many of its discipline problems by using type as a guideline for altering class composition and teacher assignment. Hanson

et al. (1991), Mamchur (1984), and Bradley (1988) also report success in using type to understand student problems and to match students with appropriate school programs.

Therefore, research on type and education provides substantial information on student and teacher characteristics. However, few controlled comparison studies have been done to determine whether applying type theory to instructional design can improve student achievement, motivation, or attitude. Meisgeier et al (1994) state that the potential of type theory to influence effective educational reform is hampered by the fact that "it is difficult to convince educators because the research base lacks sufficient evidence to establish the efficacy of type educational interventions" (p. 265).

Overall, the *MBTI* offers solid information on how teachers and learners often respond to different instructional methods and settings. How best to employ this knowledge for instructional design is still speculative. As a result, supporters of type theory are fairly modest in their claims of what using instructional strategies based on Jungian type concepts can achieve in the classroom. For the most part, the use of type theory is seen as a fluid process that is employed by teachers as need arises. Proponents of the theory, (Lawrence, 1993; Moore, 1994; Murphy, 1992) recommend possible ways that teachers can work with difficult students or plan variety in class projects but do not promote one approach as definitive. Moore (1994), for instance, suggests that teachers design student projects using the four Jungian functions (S, N, T, F) as a guide and provides examples of what she has tried and found successful. However, she qualifies her recommendations by pointing out that

much still remains to be learned about how best to take advantage of current knowledge on Jungian type and classroom learning.

The 4MAT System

Theory

4MAT, a teaching model that translates concepts from learning style theory into instructional strategies, was developed by McCarthy in the 1970's. The model is based on Kolb's (1984) theory of experiential learning and on the findings of brain hemisphericity research.

Even though Kolb (1984) based his learning theory from research in management and organizational development, his construct was rooted in the ideas of theorists who influenced progressive educational thinking. Linking elements from the work of Dewey, Lewin, Piaget, and Vygotsky, Kolb formulated a complex theory of learning that rested on the critical force of experience and assumed, as did Vygotsky, that "learning from experience is the process whereby human development occurs" (p. xi). His goal was to make meaningful connections between theory and practice by focusing research on understanding how the influence of social experience, especially that of social interaction and social norms, affects cognitive processes. Because his area of expertise was in management and organizational systems, the bulk of his research examined how individuals perceived and processed information in either employment or college settings. He studied, for instance, how the choice to study engineering, as well as the actual practice of engineering, shapes and is shaped by certain kinds of cognitive structures. According to

Kolb, individuals choose engineering because it is a "fit" in terms of how they prefer to work. As those individuals continue to study in the field, the constraints of the field further hone a particular way of perceiving and thinking. As a result, the individuals become even more adapted to the "way of thinking" that dominates engineering.

The thrust of Kolb's argument is that learning should be seen as an adaptive, transactional process that both influences and is influenced by the learner. Drawing from Lewin's work on the power of subjective experience, Kolb concluded that "feelings as well as thoughts are facts in a learning process." He pointed to the expanded repertoire of applied technologies that were found effective in management training. His and others' research showed that learning tasks such as structured exercises, simulations, cases, games, and observations had proven to be powerful learning tools because they created "personal experiences for learners that serve to initiate their own process of inquiry and understanding (Kolb, 1984, p. 11).

Kolb also pulled from the work of Piaget, focusing on Piaget's explication of how intelligence "grows" out of interactions between individuals and their environment. However, whereas Piaget saw the individual progressing from phenomenalism and egocentrism to a higher state that involves constructivism and reflection, Kolb postulated that all four states are equipotent poles of two dimensions or "modes of knowing." These dimensions are involved in learning throughout the life span and thus, are continually involved in a dialectic that produces learning. According to Kolb, learning always involves a cycle that begins with concrete experience, and moves through abstract conceptualization and experimentation to assimilation.

This end point was conceived by Kolb to be a form of ownership similar to the state of mastery Vygotsky envisioned when he outlined how an individual moves from a zone of proximal development to a state of competency.

In order to facilitate practice, Kolb adapted Jung's type theory to delineate a system of adaptation in learning. He distinguished two ways of taking in experience and two ways of transforming that experience (similar to the S-N and T-F functions that Jung described). Believing that interactions between physiological and environmental factors force individuals to differ in the degree they use each adaptive mode, Kolb postulated that individuals develop different habits or styles of learning that are shaped by their preference for one way of perceiving and one way for processing or transforming information. To facilitate instruction, Kolb created a simple learning style inventory that identified four possible types of learners based on this adaptive process.

Modifying Kolb's construct, McCarthy formulated a teaching model for elementary and secondary instruction. To frame the underlying structure of her model, she classified four types of learners:

Type l -- *Imaginative learner*, the individual who seeks personal meaning and judges content in relation to values. For this learner social interaction is important. (Closely parallels Jungian F function.)

Type 2-- *Analytic learner*, the individual who seeks intellectual competence and judges things by factual verification. (Closely parallels Jungian T function.)

Type 3-- *Common sense learner*, the individual who seeks solutions to problems and judges content by its usefulness. (Closely parallels Jungian S function.)

Type 4 -- *Dynamic learner*, the individual who seeks hidden possibilities and judges things by gut reactions. (Closely parallels Jungian N function.)

The hemisphericity research that was revolutionizing neuropsychology in the 1970's also influenced McCarthy's learning style model. At that time, research investigated the behavior of "split-brain" individuals, epileptic patients who had undergone surgical division of the corpus callosum, the neural fibers connecting the left and right brain of the neocortext. The refinement of this surgical procedure coincided with the development of advanced electrical imaging techniques that allowed researchers to see the actual pattern of energy exchange as neurons fired in the brain. Because these scanning procedures were non-invasive, research on human subjects was expanded to include normal, healthy individuals. An explosion of new information on brain function resulted.

McCarthy determined that two findings from this research were particularly relevant to education. Split-brain research suggested that the hemispheres of the brain served different functions, responded to different stimuli, and, though always working together, appeared to have distinct domains of expertise. A corollary to these findings was that different kinds of experience encourage the growth of dendrite structures in different hemispheres. So that, for example, while listening and playing music by ear produce activity in the right hemisphere, learning to read music and attend to rhythm generate development in the left hemisphere in most individuals.

Secondly, more and more evidence pointed to measurable individual differences in the development of neural systems and the employment of those systems.

At this same time, Gregorc's (1984) research on style confirmed what Kolb and McCarthy had found. Also influenced by Jung and Lewin, Gregorc employed the principles of phenomenology to research learning style ideas, and, subsequently observed and interviewed 40 successful students and adults, aged 13 to 65. In a manner similar to that of the researchers who collected data through behavioral observations to validate the *MBTI*, Gregorc kept accounts of his subjects behavior in order to determine if definite patterns appeared. He concluded that the behaviors he noted were not just surface idiosyncrasies but reflected deeper psychological constructs that were born out by consistently different patterns of action. Gregorc suggested that the individuals he observed literally had different minds from each other; they made meaning, as Bruner (1994) would define it, in significantly different ways.

In her own research, McCarthy compared the achievement of three groups of students: one group was matched for style (as determined by Kolb's learning style inventory) for half a day and then purposely mismatched for the other half of the day, a second group was given matched instruction for the entire day, and a third group received no special instruction. McCarthy fully expected the matched group to achieve the greatest gain. Instead, the group receiving instruction that was both intentionally matched and mismatched performed the best. Continuing research along this line of inquiry, she finally concluded that although it was essential for a students' style to be matched part of the time, complete matching was unnecessary and possibly

counterproductive. She hypothesized that a synergistic relationship might occur when content is experienced in a variety of ways. McCarthy postulated, as well, that confidence in learning translates into a willingness and need to "stretch" into other styles.

As a consequence, McCarthy developed the eight step 4MAT wheel, an instructional system that moves students through activities appropriate for the four types of learners as well as through activities that encourage left or right brain development. In addition, the wheel represents what McCarthy calls "the natural learning cycle"--the progression from experience to abstraction and experimentation to assimilation. As teachers move around the wheel, they employ a variety of instructional strategies thereby providing the opportunity for each learner's style to be both matched and stretched. (McCarthy, 1987, p. 123). 4MAT's cyclical design encourages teachers to adopt a number of roles; beginning with the role of motivator/witness, they successively switch to information giver, facilitator/coach and evaluator/remediator. In addition, as the cycle is completed, traditional and non-traditional materials are integrated in a systematic fashion.

In 4MAT's training literature, the 4MAT system is described as a meta-model, a way of organizing units of information around a central or underlying concept. For example, according to the 4MAT method, historical facts should be taught around a theme such as conflict or rebellion. In addition, the model is thought to be appropriate for structuring other educational practices such as Bloom's taxonomy, Mastery Learning, and cooperative learning. In fact , successful implementation of 4MAT requires that teachers be cognizant of a number of teaching strategies.

The teaching cycle consists, then, of the following eight steps:

Quadrant 1: Imaginative Learners:

Focus is on creating a personal connection for the learner to the concept being taught by

1. (right mode) Creating an experience that emphasizes the concept.
2. (left mode) Analyzing that experience.

Quadrant 2: Analytic Learners:

Focus is on presenting the details and logic of the concept by

3. (right mode) Integrating the concept using non-verbal tasks.
4. (left mode) Studying the actual facts and work on skills.

Quadrant 3: Common Sense Learners

Focus is on promoting student experimentation and mastery by

5. (left mode) Working with prepared materials to self-test knowledge and skill level.
6. (right mode) Allowing students to create materials and experiment more freely with the concept, while focusing on the practical applications.

Quadrant 4: Dynamic Learners

Focus is on letting student teach it to themselves and someone else by

7. (left mode) Having students analyze their creations for relevance and originality.
8. (right mode) Having students apply learning personally and share with each other.

Wanting to avoid what she termed "insidious" labeling of school children, McCarthy decided against designing a diagnostic measure for children (Leflar, 1983). She felt that the best use of 4MAT was “to enlarge the teacher's skills, equipping the teacher with multiple methods of instruction in order to reach students of each learning style." (Leflar, 1983, p. 17) However, because research on Jungian type theory demonstrated a link between learning style and teaching style, McCarthy designed the *Learning Type Measure* to promote teachers' understanding of their personal style. The purpose of the *LTM* was to provide a mechanism for teachers to gain insight into the assumptions they make about learning. Because of her beliefs, however, McCarthy restricts the use of the *LTM* to trainings, and the cover of the *LTM* carries the caveat, "The *LTM* is not intended as a psychological instrument. Rather, it is a gauge of personal inclinations toward one or another approach to learning" (Excel, 1994).

Quite brief, the *LTM* has two parts. On Part A, there are fifteen items on a four point Likert scale that determine the general learner type. On Part B there are eleven forced choice dichotomous items that relate to whether one tends toward action or observation when learning. The test is self-scoring and results in a profile that is plotted on a four quadrant grid to provide visual representation of type as a relative preference. The internal reliability for the

four types ranges from .76 to .89 on Part A and is .86 on Part B. At this point test-retest is .67 for Part A and .91 for Part B To a certain degree scores on Part A are expected to change over time, as a result of personal development and environmental influences (St Germain & Leiberman, 1993). Factor analysis has shown that four distinct factors do underlie the test. Tie scores for types are rare, less that a 1% occurrence. The *LTM* has also been shown to correlate highly with Kolb's *Learning Style Inventory* and the *MBTI* (Excel, Inc., 1993). Thus, the *LTM* seems adequate for what it purports to do, namely to "facilitate understanding of 'self' insituational circumstances."

Research

4MAT has two distinct strengths: (1)Unlike the Dunn model, 4MAT is based on learning theory that is generally respected among educators; (2) Although modest in number, independent, long-term controlled, comparison studies have been carried out using the 4MAT model. In these studies, the practice associated with 4MAT was compared to the practice recommended by standard textbooks. All but one of the eight studies available, reported significantly greater gains in achievement and long term retention in the 4MAT group (Appell, 1991; Bowers, 1987; Sanborn, 1994; Spatz, 1987; Szewczyk, 1987)) Several of these studies monitored results over a substantial amount of time. Leiberman (1988, 1989) reported that students in the Fairfax County schools who were taught by 4MAT had a greater knowledge of geometry at the middle school and high school level than did students in control groups. They also evidenced greater knowledge of math application and a better overall attitude. Both data analyses involved studies that ran for 18 weeks.

Wilkerson and White (1988) reported in *The Elementary School Journal* that third grade students taught according to the 4MAT system for a one month science unit showed greater gains in achievement and retention than a control group. Fifty students were randomly selected and assigned to either the experimental or the control group. The groups were similar with regard to gender, race, socioeconomic status, IQ, and California Achievement Test scored for reading and math. Each group was taught a one month unit on simple machines. One group was taught by the 4MAT method. The other was taught according to the recommendations of the published science text. All the activities suggested by the textbook were included in the instruction. The two teachers involved each delivered half the lessons to each group. The 4MAT students had significantly better overall achievement (p <.05, effect size using Cohen's ***d*** = .78) and long term retention as measured on an unannounced test 35 days later (p <.01, effect = .91)

Vaughn (1991) did not find significantly higher quantitative achievement gains when the 4MAT model was compared to two gifted pull-out programs that based instruction on Bloom's taxonomy. Given the overlap between 4MAT's conceptualization and other learning models such as Bloom's taxonomy, it may be that the school's curriculum already included enough techniques similar to those of 4MAT to nullify the benefits of the 4MAT model. In this same vein, a number of teachers in a study of 4MAT's use in Ontario (Sangster & Shulman, 1988) mentioned that they felt they were already employing many of the learning strategies recommended by 4MAT. These comments suggest that achievement gains from learning style models may be greatest in systems that rely on fairly traditional instructional designs.

So far, little research has been done comparing 4MAT systematically to other innovative instructional methods.

Level of teacher satisfaction with 4MAT and facility of implementation have also been researched. In the main, studies of teacher and student satisfaction with 4MAT are generally positive. Sangster and Shulman (1988) interviewed 572 students and 31 teachers who had used the 4MAT system in two school systems in Ontario Their study showed that over 90% of the teachers involved had interest in teaching other 4MAT units and 77% would teach the unit designed for the experiment again. Student response was also favorable with 71% finding the 4MAT course more enjoyable than their regular instruction. Sixty percent said they learned more and 62% wanted to participate in more classes that used the 4MAT system. Ault (1986) investigated the use of 4MAT in two general studies courses at a small college in Ohio. Student attitude showed statistically significant improvement and teachers reported greater satisfaction with their teaching.

It is important to remember, however, that 4MAT, strictly speaking, is not a learning style model as much as it is an instructional model. Research findings are really measuring whether McCarthy's contention that enlarging teachers' skill by equipping them with multiple methods of instruction produces gains in achievement. 4MAT research focuses no attention on calculating how much time instruction is matched or mismatched to student style. Thus, what this research base appears to support is the power of organizing a variety of instructional strategies around the framework of learning style ideas.

Practice Recommendations

There is considerable overlap among the recommended practice of various learning style models. Following is a comparison of the practice associated with each of the models just reviewed. Recommendations for practice are taken from Dunn's writings on classroom activities and organization (Dunn & Dunn, 1978), the reports of educators who have written extensively on using Jungian type concepts in their classrooms (Moore, 1994; Zeisset, 1985), and 4MAT training materials (Excel, Inc., 1994).

Environmental Arrangement

The Dunn model: Dunn recommends a classroom with informal as well as formal areas; separate areas of individual and group work; media corner for project work; enough open space to accommodate mobility needs of high mobility students; areas with different level of light; snacks available for those who need them.

The Jungian model: Proponents of Jungian type recommend a classroom with screened off, informal area for group or individual quiet work; area for extroverts to meet and talk in groups while working on projects; open design, study carrels, opportunities for movement and physical activities.

4MAT: While 4MAT does not highlight environmental arrangements, the training sessions model the use of room space that Excel, Inc. feels is most effective. The classroom has tables for group work, areas in the corner for independent work; wall space with poster size paper to record and formulate ideas, one area large enough for drama or role playing.

Sociological Patterns:

The Dunn model: Students work alone, in small groups, or in pairs. Circle activities are encouraged on the elementary level. Students can work individually on learning activity packets.

The Jungian Model: Students work as a whole group cycling through different activities part of the time; also work in learning centers; choice between individual and group work. Students complete projects that involve individuals taking on different roles and assignments.

4MAT: In quadrant 1, and 4 students work in group configurations or as pairs. In quadrant 2 and 3, they work individually. The whole group cycles through the same basic overall plan, but within quadrant 3 and 4, students work either in groups or individually on various projects or experiments.

Emotional/Personality:

The Dunn model: To accommodate varying motivational and structural needs, teachers employ contracts and time lines to set deadlines and goals. They allow less persistent students to take frequent breaks as long as their work is completed on time.

The Jungian Model: Teachers contract with students for final deadlines and intermediate deadlines. They are careful to allow extroverts time to talk out their answers before they give their final answer as well as providing time

for introverts just to listen and be quiet. They establish opportunities to take breaks from concentration.

4MAT: Teachers alternate between activities that are structured and open to accommodate the needs of learners who like traditional instruction and those who like innovation and discovery. As teachers move around the cycle, they take on different roles and thus provide different kinds of emotional and personal support.

Physical/Perceptual Needs:

The Dunn Model: Teachers introduce topics globally and analytically; devise contract activity packages that use different modalities and can be used in different sociological groupings; use video and audio tapes, have electronic board so students can physically match items; do culminating projects and activities that utilize knowledge gained from activity packages; develop programmed learning programs for those that prefer to work alone and are motivated.

The Jungian Model: Teachers provide sensing (S) students with games such as Jeopardy to learn facts, card games, string-across activities for bulletin boards so they can actively match concepts, words etc., crafts that have a set procedure and result in a usable end product; provide intuitive (N) students with what if questions, art exploration, newspaper writing, poems on bulletin board, divergent thinking exercises; provide thinking (T) students with activities that require drawing conclusions from graphs, explaining the why of things; materials that reflect Bruner's concept attainment, Suchman's inquiry training strategy, Hilda Taba's interpretation of Data model; provide feeling

(F) students with questions about the impact of particular historical events on people involved, activities that reflect Kohlberg's dilemma strategy teaching, team games, and circle discussions.

4MAT: Teachers use activities that employ left and right brain activities; include activities that require different modality strengths; provide type one learners with opportunities to discuss the why of each concept they are learning, the personal and moral issues connected to the concept.; provide type two learners with activities that require abstract conceptualization and access to expert knowledge; provide type three learners with opportunities for hands-on activities and experimentation; provide type four learners the opportunity to innovate, think globally, and work on self-designed projects.

When the instructional strategies associated with these models are juxtaposed, it is apparent that the classrooms of teachers employing any of these learning style models would be very similar. They would also resemble those of teachers who subscribe to constructivist ideas of instructional design. The practice of each of these learning style conceptions results in an instructional setting that is more active and learner centered than the learning environment associated with traditional classrooms.

The Status of Learning Style Measures

Among those who support a learning style construct, there seems to be an abiding interest in being able to measure style with a psychometric instrument. Some theorists, like McCarthy (1987), and Lawrence (1993) advocate the use of instruments for self-awareness and others, like Dunn, look to instruments for diagnostic information. However, a review of existing

measures reveals a scarcity of well-developed instruments with which to measure student learning style, especially on the elementary school level.

Dunn's *LSI* (Dunn, Dunn, & Price, 1989) and inventories modeled after it remain the primary instruments for K through 5th grade. The problems associated with these instruments have already been discussed, but it is important to note that research is continuing on these measures. Postings from researchers who are currently studying these instruments can be seen at least once a month on a learning style list service out of St. John's University. Interest in these kinds of inventories remains high because of the many anecdotal success stories that surround the use of Dunn's conception of learning style. However, the weak theoretical foundation of Dunn's model raises serious doubts about the possibility of improving its psychometric dimensions. How can one validate a construct that doesn't exist? It seems unlikely that these instruments, or instruments that are based on this same format, will be able to establish psychometric rigor.

Researchers continue, as well, to explore the application of Jung's theory to children in school settings. For this purpose, the *Murphy-Meisgeier Type Indicator for Children (MMITC*) (Meisgeier & Murphy, 1987) was developed for children in grades two through eight. Because it is a relatively new instrument, the extent of its usefulness is still being determined. Although it shares the same theoretical base as the *MBTI*, it has yet to prove as valid. There is some discrepancy between the type distributions that studies have identified using the *MMITC* and the *MBTI* (Suen, 1995). The distribution of types should be equivalent if the *MMITC* is capturing the same construct as the *MBTI*. In addition, its utility as an instrument is attenuated by the very nature

of Jungian theory. Since a child's preferences develop over time, Jungian theorists assume that children will often be undecided on what their preference is. The authors of the *MMITC* have taken this theoretical point into consideration in their design of the *MMITC* by having a "U" for undecided as a rating on each scale. This is an appropriate rating in line with theory, but it has the unfortunate result of providing a practitioner with incomplete information. Studies so far have shown that in almost all groups that have been tested on the *MMITC*, at least one third of the respondents have an undecided factor in their type designation (Suen, 1995). This lack of information, while theoretically correct, limits the usefulness of the measure. Moreover, the *MMITC* is designed to be administered by a trained professional, usually in small groups or one on one; it is impractical to give routinely to a student population.

However, Oaklan, Glutting, and Horton (1996) have just authored the *Student Style Questionnaire (SSQ)* for grades three through twelve. The *SSQ* purports to be an easy to administer measure of student styles based on Jungian concepts. Eight styles are covered: extroverted or introverted (I-E), practical or imaginative (S-N), thinking of feeling (T-F), and organized or flexible (J-P). The *SSQ* results provide "information for teaching, encouraging or motivating students." (advertisement, Harcourt Brace & Co.) It is still too early to know if the *SSQ* will meet the high expectations promised by its promotional literature.

For the middle and secondary school level, The NASSP developed what they term a "first level assessment " instrument, the *Learning Style Profile* (*LSP*) (Keefe & Monk, 1990). The test reflects Keefe and Monk's definition of the learning construct as a gestalt of cognitive, affective, and environmental elements. As such, the test essentially adapts test items and scales from other

measure of cognitive and personality traits as well as environmental factors similar to those used by Dunn. Unfortunately, the reliability of the *LSP* averages around .63. This low reliability accounts for the authors' modest claims for *LSP*'s use. They assert that "the reliabilities are acceptable for short tests specifically intended to collect initial diagnostic information (Keefe & Monk, 1990, p. 2) The *LSP* was normed on over 5,000 students in more than 40 schools throughout the United States and thus, represents a commendable effort to unify the learning style construct. The manual is quite straightforward and cautions are given because of the limited reliabilities of the test. However, in spite of the authors' good intentions, the *LSP* fails to provide a practitioner with a powerful instrument..

In a similar fashion, Curry (1983) examined adult learning style measures and proposed a synthesis of nine models, a composite instrument she felt had the potential to provide a workable learning style profile. She combined measures that had extensive research, such the *MBTI*, with less well researched instruments. She postulated that further research would either strengthen and refine the instruments that were less well developed or demonstrate that they were superfluous. It was also her supposition that research would indicate that an onion-like relationship existed among the measures-- cognitive personality traits being the most stable and instructional format preferences the least. Table 4 lists the instruments chosen by Curry and the factors she felt they represented.

Table 3

Instructional Preference

1. *Instructional Preference Questionnaire* by Stritter and Friedman
2. *Learning Preference Inventory* by Rezler
3. *Grasha Riechmann Student Learning Style Scales* by Reichman and Grasha

Information Processing Style

1. *Learning Style Inventory* by Kolb
2. *Cognitive Preference Inventory* by Tamir, Elstein, and Molidor
3. *Inventory of Learning Processes* by Schmeck and Ribich

Cognitive Personality

1. *Embedded Figures Test* by Witkin
2. *Myers Briggs Type Indicator* by Myers and McCaulley
3. *Matching Familiar Figures Test* by Kagan

Curry's proposed model has been picked up by other researchers. Claxton and Murrell (1987) added a fourth dimension to Curry's model: social interaction preference. Testing college students, Melear (1989) used the model to examine the relationships between the *LSP* and the *MBTI*. He questioned whether the *LSP* merely assessed style on a more surface level than the *MBTI*. Currently, a number of doctoral students are testing the utility of Curry's model for minority students by gathering normative data from Native American and Hispanic students (personal communication, Irene Sanchez, doctoral candidate,

University of New Mexico, September, 1995). No conclusions about this model can be formed at this point, but the idea of combining the best of separate instruments seems to hold some promise.

Along with this interest in psychometric measurement, there is also a continuing discussion of alternative ways of measuring learning styles. Some authors have brought up the need to differentiate between trying to measure a trait that is additive and normally distributed and trying to identify a factor that may not be additive. Myers (with McCaulley, 1985) addressed some of the difficulties of fitting the square peg of Jungian type theory into the round hole of established psychometric procedures when discussing the issue of reliability. She argued that internal consistency on the *MBTI* would vary by individuals' age and achievement level because awareness of one's preferences increases with individuation. Moreover, among people of comparable age, high achievers will have a stronger sense of self. Therefore, the reliability section of the *MBTI* manual contains over four pages of charts showing reliability figures by a number of group characteristics. In addition, Myers pointed out that many estimates of reliability such as tetrachoric correlations assume a normal distribution and therefore some distortions will result when used in a construct that assumes a bimodel distribution on four different factors. Myers deep concern that Jungian theory be accepted and integrated into modern American Psychology, spurred her to make the *MBTI* meet accepted standards; however, she always voiced concern that representing Jung's theory in a psychometric framework would mask its complexity and richness (Myers & Myers, 1993).

Other type theorists have also discussed the difficulties inherent in working in a paradigm whose underlying assumptions differ from those of

Jungian type theory (McCaulley, 1995; Newman, 1995; Rytting, 1996). The relationship between trait and type theory is much debated. Some argue that trait theories and typologies are complementary ways of conceptualizing personality, much the same way that light can be conceived of as either a wave or a particle, depending on the investigator's perspective (Newman, 1995). However, differentiating between type and trait may be necessary and vitally important because there is evidence that "different statistical methods may be required for trait and type research. . . . Whereas traits are viewed as merely additive . . . type facets combine in a variety of significant ways." (Newman, 1995, p. 40).

The complexity involved in adopting traditional psychometric procedures to learning style conceptualizations may contribute in part to the poor quality of so many of the measures. Curry comments that many theorists in the learning style field have rushed "prematurely into print and market with only early and preliminary indication of factor loading based on one data set."(1987, p. 4) As Nagy (1995) points out concerning the *LSP*, many current learning style inventories are better thought of as research instruments. Although these instruments may be good beginning efforts at attempting to measure the construct, they have too many unclarified elements to justify their commercial use.

Dunn (Dunn & Dunn, 1978), for example, does not account for the varying distribution patterns of the factors in her inventory. Some factors on the *LSI* are bimodel and some have an unclear or irregular distribution. Need for dim or bright light reflects this confusion. Apparently, some children will mark light level as very important to them. However, research using the *LSI*

(Price, 1980)) shows that many children will note a lack of preference one way or the other in terms of lighting. In the Brightwood study, for instance, 23% of the children needed low light; 13% needed bright light and 63% had no preference. Thus, this factor is not bimodel--it does not represent a point on a continuum between bright or dim. How this factor is distributed remains ambiguous. The effect of light level may be very important for some children; however, this example brings up the issue of whether an inventory like the *LSI* can capture reliably a factor that is not conceptualized as bimodally or normally distributed. In addition, as Nagy (1995) aptly asks when reviewing these kinds of preferences on the *LSP*, one has to wonder if the expense of a standardized test is necessary to gather this kind of information.

Addressing the issue of educational measurement, Moss (1994, 1996) argues that more traditions of assessment need to be incorporated in education. She cites ethnography, hermeneutics, phenomenology, critical theory and postmodernism as possible assessment systems. Although her concern is primarily with documenting achievement or performance, many of her arguments seem relevant here. It may be that traditional psychometric methodology is not the most appropriate vehicle for measuring style differences effectively. In line with this, Gardner (1993) avers that pencil and paper tests are not adequate for evaluating the seven forms of intelligence that he has proposed. He suggests instead a performance based assessment.

Some learning style theorists, as well, have explored other ways of assessing style preferences. For example, Grasha (1984) suggested observing a number of learning episodes to document patterns in how an individual likes to acquire information and skills. Using a slightly different approach, Doyle

and Rutherford (1984) questioned whether testing and then matching or mismatching instruction to style is the most productive avenue for utilizing information about learning and teaching styles. "An alternative and perhaps more general use would center on how learner and teacher styles are acted out in classrooms. . . it is in classrooms that the conditions which foster achievement are jointly constituted and carried out by teachers and students" (p. 24). Sidestepping the issue of matching and mismatching instruction, much as McCarthy has done, may be the most appropriate way to capitalize on knowledge of learner differences. Whether this approach will dominate the learning style field is not yet clear. In any case, theorists in the learning style field have yet to produce consistently reliable measures. Unfortunately, this proliferation of substandard measures discredits the learning style paradigm in the minds of many educators (O'Neil, 1990).

Teacher Efficacy

Teacher efficacy has emerged over the last two decades as an important variable related to student achievement and teacher implementation of innovation (Ashton, 1984). Derived from attributional theories concerning achievement, this characteristic has been widely researched. Although definitions vary slightly among researchers, in general, the term "refers to the extent to which teachers believe that they have the capacity to affect student performance" (Ashton, 1984). Practitioner reports on learning style suggest that changed levels of teacher efficacy may contribute significantly to the improved levels of achievement that are noted after a learning style model is

adopted. Therefore, examining the impact of learning style training from the perspective of teacher efficacy may provide insight into the reported effectiveness of learning style methodology.

Definitions of Teacher Efficacy

Broadly defined, attributional theory is the study of how individuals' feelings and behaviors are affected by the causes they ascribe to their or others' behaviors (Antaki & Brewin, 1982). A number of constructs have developed from the field of attributional theory that researchers have applied to educational environments. Of these, two seem particularly pertinent for examining the learning style paradigm: Rotter's (1966) conceptualization of locus of control as applied to teacher efficacy and Weiner's (1974) attributional model of achievement-related behavior.

The locus of control construct evolved from social psychology research that demonstrated an important relationship between individuals' behavior and their perceptions of whether or not events were under their personal control (Lefcourt, 1982). As the construct was researched in social settings, it became apparent that individuals' conception of external or internal causality had a significant influence on their expectancy of the causality of future events and thus, their subsequent behavior. Locus of control was not conceptualized as a trait or typology, but as a malleable attribute that differed in response to changing circumstances (Lefcourt, 1982).

In order to measure individuals' perception of personal control, Rotter developed the I-E Scale (Rotter, 1966). As Weiner (1990) points out, the I-E

scale "took on a life of its own" and was related to hundreds of different variables. Because of locus of control's specificity, researchers subsequently developed scales patterned after Rotter's but more closely tied to particular situations. In line with this, educational researchers developed measures to assess teacher's sense of control in school settings. Linked to previous ideas concerning teacher expectation, research on control in education generated a substantial body of inquiry.

Two of the earliest studies on teacher efficacy were done in conjunction with analyses of factors contributing to the success of innovative school programs. Berman et al. (1977) from the Rand Institute devised a brief measure of teacher efficacy based on Rotter's conception of locus of control. Teachers were asked to respond on a Likert scale to two questions concerning their perception of their effectiveness as a teacher. Berman discovered that "above all, teachers' sense of efficacy emerged as a powerful explanatory variable. . . . Indeed the regression coefficients of the effects of a sense of efficacy are among the strongest relationship identified in our analysis" (p. 136). In a study of factors contributing to reading achievement gains among minority elementary children in Los Angeles, Armor et al. (1977), also from the Rand Institute, used this same measure and found, interestingly enough, that teachers' sense of efficacy appeared to be a more important variable than the particular reading program that was instituted.

Ashton, Webb, and Doda (1983) conducted a major study on teacher efficacy as a follow up to the findings on the Rand studies. Using a combination of qualitative and quantitative measures, they studied the "nature, antecedent, and consequences" of teacher efficacy. They concluded that

teachers differ in their level of efficacy, and these differences are reflected in teachers' behavior and students' performance. Other studies, as well, have verified a relationship between teacher efficacy and instructional effectiveness (Brophy & Evertson, 1977; Gusky, 1988; Lee & Gallagher, 1986; Trentham, Silvern, and Brogdon, 1985).

In a later paper, Ashton (1984) outlined factors her original study suggested facilitated or inhibited the development of a high level of efficacy in teachers. Based on these findings, she made recommendations for teacher preparation programs that seemed likely to increase a sense of efficacy. One of her strongest recommendations was that such a training program should foster commitment to conceptions of ability that recognize the human potential for learning and development. She commented that "teachers' belief in intelligence as a stable trait is one of the most serious obstacles to increasing their sense of efficacy" (p. 30). If teachers see "low ability" as something that is hopelessly fixed, they will be less likely to exert effort because they will judge their students as unable to achieve. Because teachers' assumptions are often founded on misconceptions, Ashton suggested that trainings that heighten teachers' awareness of classrooms as interactional social settings can be very potent forces in changing teacher behavior. In addition, she recommended the use of training techniques that make teachers more reflective about the epistemological assumptions they hold. Ashton's research indicated, as did that of Lortie (1975) and Jackson (1968), that many teachers are surprisingly unreflective about their work.

As the concept of teacher efficacy gained importance, researchers increasingly studied characteristics that might influence teacher efficacy.

Educators examined years of experience, grade level, perceived level of student ability, and gender; of these only grade level has proven to be consistently significant. It is postulated that elementary school teachers have a stronger sense of personal control because they have smaller classes and can see the impact of their work more directly (Gusky, 1982). Ashton found that teacher efficacy varied by setting with more democratic settings producing greater empowerment. However, there has been little follow-up work done on this aspect of efficacy so the relationship between administrative structures and teacher efficacy is not well documented. Other evidence suggests that teachers believe they have less control over students considered to be of low ability (Cooper, Burger, & Seymour, 1979). However, Hillman (1984), using a researcher designed efficacy scale (reliability = .91), found no relationship between teacher efficacy and student achievement level. It seems highly likely that a number of factors work together to determine a teacher's level of efficacy. At this point, however, research has consistently demonstrated relationships only between teacher efficacy and the two control dimensions first conceptualized by the Rand studies, and between efficacy and instructional level.

Weiner's attributional theory of achievement-related behavior, as well, appears relevant to this study. Weiner (1974) adapted the locus of control construct to examine how achievement behaviors were influenced by perceptions of outcome causality. He postulated that individuals explained achievement success or failure in terms of factors that varied by stability as well as locus. As such, stability might be as important a determinant of future behavior as locus. Thus, in some contexts, he suggested that whether a student

credits a stable or unstable factor with producing failure may prove more important than whether that factor is internal or external. Unstable factors have the potential to be controlled, thus offering the individual the potential for an improved outcome. For example, the future behavior of students will be affected differently if they ascribe failure to effort (unstable) instead of ability (stable) even though both are internal attributes. There is little they can do to alter their ability, but they can expend a greater effort on future tasks (Weiner, 1974).

A number of researchers have applied Weiner's theories to studies of achievement. As a result of their work, a substantial amount of evidence has accumulated that indicates that causal perceptions influence learners' persistence, intensity, and choice of behavior when involved in achievement tasks (Bar-Tal, 1982). Both personal predispositions and external factors influence learner's conception of causality. Of relevance here is the finding that teachers' conceptions of causality, stated implicitly or explicitly, have a powerful effect on student perception and attitudes concerning achievement (Cooper, 1979; Good & Brophy, 1974; Hargreaves, 1972). Research indicated that the impact of teachers' causal perceptions was mediated through their expectations regarding their students future level of achievement (Bar-Tal, 1982). Moreover, their level of expectation was reflected in their behavior and varied in terms of the quality and type of verbal appeals, instructions, and direct references to causality that students received (Blumfield et al., 1977).

Finding that students' causal perceptions were more similar to those of their teachers than those of their parents, Bar-Tal and Guttmann (1981) suggested that adjusting teacher attitudes would affect student performance.

Dweck (1975) formulated studies in which students were repeatedly told in a training session that their failure on a task stemmed from lack of effort. Following the training period, the students showed a significantly greater tendency to emphasize the role of effort in failure and to exhibit persistence in task performance. Andrews and Debus (1978) demonstrated, as well, that following a training in which effort was stressed as the major component of failure, students increased their effort on tasks and made achievement gains. Weiner and others (Graham, 1990; Peterson, 1990; Weiner, 1990) extended this line of inquiry to examine how teachers' use of praise and blame led students to attribute outcomes to ability or effort. Graham (1990) examined praise and blame as attributional cues and found that students interpreted different patterns of praise and blame as indications of whether an outcome was related to effort or ability.

Influence of Learning Style Training on Efficacy

There appear to be a number of ways that training in learning style theory and practice might affect teacher efficacy. For instance, an analysis of 4MAT Fundamentals training shows that many of the elements that Ashton (1984) identified as critical for increasing teacher efficacy are included in 4MAT introductory level workshops. First of all, the underlying theme of the workshop is that there are many ways to learn and everyone is capable--the opposite philosophy of a unitary trait theory of intelligence. Moreover, the workshop is highly experiential with all steps of the model being both mirrored in the instructor's performance and enacted by the teachers. By starting with a session in which teachers determine their own learning style and analyze how

their style effects their judgment of student ability, instructors of the 4MAT workshops foster reflective behavior. During the training, teachers discuss at length their reactions both to teaching and learning through a variety of instructional activities.

Lawrence (1993) includes many self-reflective activities in teacher workshops on Jungian type. In a fashion similar to that of the participants at the 4MAT trainings, teachers in Jungian type workshops do exercises that help them become more aware of the assumptions they hold concerning teaching and learning. Since almost all workshops contain a variety of types, ample opportunity is given to contrast one's own assumptions with those of others. In addition, Lawrence reports that teachers often gain a new understanding of student behavior when they are taught to interpret it through the lens of Jungian type theory. Often the techniques he suggests are not intuitively obvious. Teachers at the workshop must abandon previously held notions. At one workshop he recommended that a problem child in one teacher's class be put in charge of organizing some aspect of classroom activities. The child's teacher was incredulous, "'He can't even manage his own behavior, so how could he be made responsible for anything else?'" (Lawrence, 1993, p. 155). Ultimately, the teacher was willing to take Lawrence's advice and subsequently found that the child's behavior changed dramatically for the better.

In an interview in *Educational Leadership* (Brandt, 1990), Guild, a learning style consultant who uses learning style models eclectically, also mentions promoting self-reflection in her generic learning style workshops.

> It can be embarrassing, sometimes, to ask practicing educators why they are using a particular technique or program, because they often can't give

> you a good reason. Learning styles provides that kind of legitimate criteria. . . . Many of these teachers (those trained in learning style) use a variety of reading programs. . .They're always asking how to accommodate different learners. . . . (p.11).

Thus, even those consultants who integrate a number of models appear to be fostering self-reflective behavior.

Anecdotal reports from teachers who have received training in learning style practices indicate that teachers may alter their causal attribution after exposure to learning style theory. Brightwood Elementary's principal reported,

> After years of blaming the children's socioeconomic status, low family expectations, and broken homes for their poor school achievement, imagine our feelings when we began to suspect that the traditional methods we had been using to teach might have been one of the main causes of their academic failure (Andrews, 1990, p. 308).

Clearly, before adopting the Dunn learning style model, the staff at Brightwood credited largely external, uncontrollable attributes for causing their students' poor academic records.

Not only do reports suggest that teachers change their perception of what underlies poor performance, they highlight, as well, the frequency with which teachers instruct their students in learning style theory and its implications for achievement. In essence, the students in these classes go through a training very similar to that created in the experimental studies of Dweck and Andrews and Debus. In a learning style based classroom, learners are encouraged to think of their failures as resulting from a mismatch in their learning style, a

condition that can be changed in the future. If students fail to pick the right time of day to study the first time around, they can pick another time of day during the next opportunity to study. Thus, the students are given a way of exerting control over the learning situation. Sykes, Jones, and Phillips (1990) document a teacher counseling procedure that occurred after their school instituted a learning style model. When students were having problems, the staff helped them assess when and how to study in their preferred style. In this fashion, new explanatory structures for achievement were set in place after a learning style model was introduced. This same dynamic is stated explicitly by Carbo (1990),

> Informing each student and his or her teachers and parents about the student's strengths increases everyone's expectations for the child's performance. Teachers and parents gain insights into how the student learns and, therefore, into how to teach the youngster. Students who have been failing begin to believe that they are not stupid, that they can learn (p. 28).

Conclusion

The learning style construct is challenging to evaluate. Models differ in their approaches and claims; and, anecdotal reports are written by teachers with varying degrees of training in diverse learning style methodologies. However, in spite of these inconsistencies, it appears reasonable to assume from existing literature that exposure to learning style ideas and methodology can influence how teachers select instructional activities, organize their classroom settings,

assess the capabilities of their students, and reflect on their own ability as teachers. At this point, the degree and form of that influence is not well documented because almost no discussion of the learning style construct has focused systematically on the impact on teachers of participation in the learning style workshops that are offered by educational consulting firms.

Chapter 3
Methodology

The purpose of this study was to investigate the relationship between teachers' participation in 4MAT Fundamentals Training and teachers' perception of teacher efficacy. Three questions were asked:

1) Does participation in 4MAT learning style training influence teachers' level of internal and external control.

2) Do teachers adopt and use learning style terminology and practice during and after a 4MAT training?

3) Is teachers' discourse consistent with the criteria delineated by Ashton (1984) as being associated with trainings that contribute to a high level of teacher efficacy: a belief in students' potential to learn and develop, awareness of the classroom as a social setting, and use of reflective behavior?

Denzin (1970) indicates that using a combination of investigative methods strengthens reliability and validity because the limitations of one method are often offset by the strengths of another. Consequently, this study employed three data collection strategies -- field observations, semi-structured interviews, and survey administration. All data collection was done at introductory level workshops of the 4MAT learning style model. These workshops were chosen because of their availability and because of the willingness of Excel, Inc. to permit this research. Introductory level trainings

were selected because they follow a set agenda and curriculum and have been offered to over 30,000 teachers nationally.

The 4MAT Training Procedure

The introductory training for 4MAT, Fundamentals Training, provides 15 to 18 hours of instruction in 4MAT theory and practice. Fundamentals workshops are led by 4MAT instructors who are certified by Excel, Inc., the private educational consulting firm that publishes 4MAT materials. In addition, all trainers return yearly for recertification or "renewal" sessions. Since the directors of Excel, Inc. control access to 4MAT training materials, they are able to regulate the content and curriculum of the training sessions. All the information covered in Fundamentals Training is contained in a course book given to each participant at the initial session of training. A detailed description of the Fundamentals Training program appears in Appendix A.

Exploratory Studies

To develop research questions, I completed three exploratory studies. Acting as a participant observer, I enrolled in two 4MAT training programs, Fundamentals Training and Level II, where I informally interviewed workshop teachers during the training. In addition, I attended a two day learning style conference in Eastern Virginia, sponsored by Southeast Learning Styles Center, Fairfax County Public Schools, and George Mason University. Again, I informally interviewed teachers and observed teachers responses to workshop activities. These exploratory studies are reported in Appendix B.

Quantitative Study of Efficacy

Participants

Participants were teachers who taught on the kindergarten through twelfth grade level. Workshops were held on three consecutive days. Two workshops were held during June and October, 1996 in southern Wisconsin in medium-sized cities. Teachers from surrounding rural areas also attended. The enrollment for these workshops totaled 42. Another workshop was held in mid-July in Ohio, again in a medium-sized city; the enrollment was 22. One workshop was held in a suburban area of Northern Virginia in late July, 1996 and had 29 participants. One workshop was spaced over three days with each session at least two weeks apart in a rural district, for the purposes of this study, called Forest County. Involving 27 teachers, this workshop began in late August and ended in late October. All workshops were led by trainers certified by Excel, Inc. Total enrollment was 120.

Instrumentation

In order to measure teacher efficacy, a scale based on Rotter's (1966) locus of control concept was used. Recently revised and revalidated by Gusky and Passaro (1994), the efficacy scale employed for this study was originally developed by Gibson and Dembo (1984), and later modified by Woolfolk and Hoy (1990).

Gibson and Dembo (1984) devised a teacher efficacy scale that was context specific and in line with current thinking on locus of control. The initial scale had 53 items that reflected characteristics research literature had

reported as related to teacher efficacy. This instrument was administered in several pilot studies and then subjected to factor analysis as well as multitrait-multimethod analysis. To further validate the instrument, teachers who were rated low and high on the scale were observed and their behavior coded to determine if the scale had captured the efficacy construct. After initial trials were run with the scale, the number of items found reliable was reduced to 16. Factor analysis revealed two clear factors: a sense of personal teaching efficacy and a sense of general teaching efficacy. For instance, a teacher might feel personally effective, but still feel that teachers in general are limited by external events.

Woolfolk and Hoy (1990) continued the development of the Gibson and Dembo scale, taking the 16 most reliable factors, two items from the Rand questionnaire (Berman, 1977) and 4 questions that pertained to preservice teachers, the object of their study. Factor analysis showed that the scale captured the same two factors identified by Gibson and Dembo, but obtained higher reliability coefficients, a Cronbach's alpha of .74 for the TE scale and .82 for the PE Scale (Woolfolk & Hoy, 1990).

To define the teacher efficacy construct more clearly, Gusky and Passaro (1994) evaluated the Gibson and Dembo scale. They noted that all the items in the Gibson and Dembo scale that started with the word teacher were external and negative, whereas the items that started with "I" tended to be internal and positive. They rewrote test items so that the scale would be more evenly split between questions that reflected internal and external factors for both teachers personally and teachers in general. For example, a Gibson and Dembo item that read, "When I really try, I can get through to most difficult

students" (P-I) was changed to "When teachers really try, they can get though to most difficult students" (T-I). The Gusky and Passaro scale contained 21 items: 5 P-I items, 5 P-E items, 5 T-I items, and 6 T-E items. Responses to the items were made along a 6-point Likert scale from "strongly agree" to "strongly disagree" (Gusky and Passaro, 1994). Reliability coefficients remained the same as those of the Woolfolk and Hoy version.

Factor analysis demonstrated that two factors were again measured, but that they corresponded more closely to internal and external causality than to personal and teacher efficacy. The teachers tested, 342 experienced and prospective teachers on the K-12 level, did not "distinguish between their personal ability to affect students and the potential influence of teachers in general" (p.637). The scale captured two distinct factors that correlated only modestly. However, Gusky and Passaro concluded that rather than personal and teaching efficacy, the factors were better thought of as (1) how personally powerful teachers feel within the classroom in terms of producing outcomes and (2) how powerful they view the impact of elements that lie outside the classroom that may be beyond their direct control.

In addition to confirming Gibson and Dembo's findings that teachers' sense of efficacy varies along two dimensions, Gusky and Passaro (1994) defined more precisely the nature of those dimensions. Gusky and Passaro also contend that their work reinforces Ashton's conclusion that teacher efficacy is multidimensional. Their scale taps only two factors but other research, as previously mentioned, indicates that teacher efficacy may be influenced by a number of variables. The multidimensionality of the efficacy construct must be considered when interpreting efficacy scores obtained with this measure.

The Gusky and Passaro scale and the factor item loadings are presented in Appendix C.

Procedure

The Gusky and Passaro scale was administered to each participant three times:

1) Pre-workshop. The Gusky and Passaro scale was administered at the workshop before the training began. In addition, teachers were asked to report: years of experience, grade level, ability level of their students, and whether or not they had previous exposure to learning style training.

2) Post Workshop. The Gusky and Passaro scale was administered at the workshop following the end of the last training session.

3) One-Month Follow-Up. The Gusky and Passaro scale was administered by mail one month after the workshop or one month after the beginning of the school year if the training took place during summer vacation. In addition, teachers were asked to rate their use of 4MAT techniques.
The three survey forms are presented in Appendix D.

The pre-workshop survey was given to participants immediately prior to training, either directly by the researcher or indirectly through mailings, depending on the location of the training. The post workshop administration was accomplished in the same fashion. The one-month follow-up was administered by mail after the participants had at least one month of classroom time to employ 4MAT techniques. For those participants who took a summer training, this requirement meant that they did not receive the one-month follow-up survey until the first week of October. All participants were also

sent a postcard to return separately from their survey, so that a record could be kept of those who had responded. Participants who did not respond to the initial one-month follow-up survey were sent a second survey. In addition, non-respondents who could be identified were telephoned.

As previously mentioned one Virginia training, called Forest County for the purposes of this study, had an altered training schedule. Instead of meeting 15 to 18 hours in succession over three days, the Forest County workshop met on three individual days over a span of two months. However, the Gusky and Passaro scale was still administered before the first and after the third day of training. The one-month follow-up was mailed to the participants during the first week of December. Because teachers at this training were practicing 4MAT techniques in-between training days, the survey data from this group were analyzed separately.

Survey Analysis

Results from the teacher efficacy scale were analyzed using repeated measures (ANOVA) factorial design to compare teacher characteristics by efficacy scores. The analysis examined several variables that have been included in previous studies on teacher efficacy even though much of this research has been inconclusive.

1. Grade level: Elementary, middle, and secondary
2. Location: Wisconsin 1, Wisconsin 2, Virginia, Forest County, and Ohio.
3. Ability of students: High ability, average ability, low ability, and mixed ability.

4. Use of 4MAT after one month: Regular, now and then, almost never.

5. Knowledge of learning style theory prior to the workshop: Yes, no.

6. Years of experience: 0-5, 6-10, 11-15, 16-20, 21+

Each test administration provided scores on two distinct factors, so the survey results for each factor were analyzed separately. Accordingly, a score reflecting sense of personal internal control, Internal (I), and a score reflecting the weight given to external factors that affect teaching, External (E), were tabulated for each administration, generating three scores of each factor. The chart below illustrates the research design.

		INTERNAL	
	Pre-workshop Score	Post Workshop Score	One-Month Follow-up
Years			
Level			
Ability			
Location			
Knowledge			
Use			

		EXTERNAL	
	Pre-workshop Score	Post Workshop Score	One-Month Follow-up
Years			
Level			
Ability			
Location			
Knowledge			
Use			

Qualitative Study of Impact of Learning Style Training

At the Forest County training site, the instructor followed an altered schedule because unexpected time constraints developed for the faculty. Instead of meeting for three days consecutively, the workshop met on August 21, October 11, and October 30, 1996. Although the content of the training remained identical to that of the other trainings surveyed, the format allowed the participants to integrate workshop material into their practice after every session. This spaced presentation of 4MAT Fundamentals Training provided the opportunity to interview participants after every session to explore how they had integrated workshop concepts into their practice.

Participants

Twenty-seven faculty from a small rural system in Virginia took part in the training. Because of the small size of its system, Forest County has no middle school. Instead, students stay at one of two elementary schools through 7th grade and then move on to a consolidated high school. At this training, 14 of the teachers came from the high school and 13 came from the elementary schools.

Procedure

All three days of training were observed and described. In addition, six teachers were interviewed three times each, once after each day of training. A structured interview technique was employed to determine in what ways the participants had been influenced by the training.

The teachers interviewed were randomly selected within discipline areas from a voluntary interview sign-up sheet. An effort was made to include teachers from different disciplines. Of the six interviewed, two taught on the high school level, two taught on the upper elementary, and two taught on the lower elementary. Those selected taught English, art, science, social studies, math, and 3rd grade.

The interview questions were altered slightly for each day of training to account for the new information acquired each day. The following interview questions were used.

After the first day:

1. What was your previous experience with the learning style construct?
2. Why did you sign up for the training?
3. How did you feel about this phase of training? Did it have an impact on you? If so, how?
4. Of what was presented, what was new to you? or meaningful?
5. Do you have plans to implement any of the activities you experienced in the training? If so, which ones?
6. As a result of the training, did you see any of your students in a different light? How so?
7. Did the training make you see anything you have been doing as a teacher in a different light?

After the second day:

1. Since I last saw you, did you use any of the 4MAT information in your teaching? What, if anything, did you do? What did you think about the results?
2. How did you feel about this phase of training? Did it have an impact on you? If so, how?
3. Of what was presented, what was new to you? or meaningful?
4. Do you have plans to implement any of the activities you experienced in the training? If so, which ones?
5. As a result of the training, did you see any of your students in a different light? How so?
6. Did the training make you see anything you have been doing as a teacher in a different light?

After the third day:

1. How did you feel about the process of writing a lesson plan in the 4MAT model? Did you implement any of the lesson plan you created for the final session?
2. Did the final session have in impact on you? How so?
3. Did you have any new thoughts about your students behavior in light of the training since I last saw you?
4. Any final thoughts about your teaching now that you have completed the workshop?
5. How would you rate this workshop on a scale of 1 to 10?

Data Analysis

After being recorded and transcribed, the interviews were analyzed to identify patterns and themes relating to teacher efficacy. Special attention was paid to Ashton's criteria for training factors that foster a high level of efficacy. A summary of the findings is presented in the results chapter.

Field notes were taken and typed for all sessions of the 4MAT training in Forest County. Again, the data were examined to identify patterns. In this case, the focus of the research was on how and if the participants' discourse changed over the course of the workshop. Did their use of learning style terminology increase? What kinds of questions were asked? What were their concerns? Did they begin to report using learning style practice in their classrooms? A summary of these field notes is presented in the results chapter.

Chapter 4
RESULTS

The purpose of this study was to investigate the relationship between teacher's participation in 4MAT Fundamentals Training and teachers' perception of teacher efficacy. Three questions were asked:

1) Does participation in 4MAT Fundamentals Training influence teachers' level of internal and external control?

2) Do teachers adopt and use learning style terminology and practice during and after 4MAT training?

3)Is teachers' discourse consistent with the criteria delineated by Ashton (1984) as being associated with trainings that contribute to a high level of personal efficacy: a belief in students' potential to learn and develop, awareness of the classroom as a social setting, and use of reflective behavior?

Data Collection

Three different methodologies were used to gather data: survey administration, field observations and semi-structured interviews.

Survey Data Collection

The survey results from the four sites that attended training for consecutive-days were analyzed separately from the Forest County results. Because the Gusky and Passaro Likert scale runs 1 to 6, strongly agree (1) to

strongly disagree (6), as a score decreases, the factor represented by that score is actually increasing. Conversely, as a score increases, the level of that factor is decreasing. The researcher-made surveys were reverse scored in order to maintain this pattern, so that comparisons could be made to the Gusky and Passaro data.

The four consecutive-day sites generated 77 usable pre-workshop surveys, and 76 post-workshop surveys. Of the 93 who began the Fundamentals Training, several failed to complete the training, completed the survey incorrectly, or chose not to participate in the study. From the 77 who completed the first survey, 41 returned usable one-month follow-up surveys.

The Forest County training had 27 participants on the first day. By the third day, the enrollment had dropped to 23. Because of participant error, 17 usable post-workshop surveys were received. Of the one-month follow-up surveys that were returned, 15 were usable.

Field Observation Data Collection

In order to observe the Forest County training, I sat in on all sessions and completed all activities as if I were a fellow participant. However, because I was introduced at the beginning as a researcher, some of the participants seemed to feel I was connected with 4MAT and asked me questions as if I had privileged information. The appearance that I was affiliated with 4MAT was further reinforced when the Forest County, Director of Instruction asked me to assist late arrivals with the *LTM*. As a result, even though I was trying to be in a position to hear and receive participant feedback as an equal, I may not

always have been viewed by the teachers attending the workshop as a participant on the same level.

Interview Data Collection

Six teachers were interviewed: Thomas, an upper elementary social studies and math teacher; Rob, primarily a high school art teacher but also the art instructor for the elementary school on a limited basis: Sam, science teacher for 4th-7th grades; Mary, a high school English teacher; Elvia and Sylvia, both third grade teachers. Of the six interviewed, two were very forthcoming about admitting that they would probably not implement the 4MAT system but would, instead, adapt ideas from it. Two were definite that they planned to continue with the 4MAT wheel and two assumed they would use it now and then, again with the idea that they would adapt it to their needs.

Data Analyses

Question 1: Does participation in 4MAT Fundamentals Training influence teachers' level of internal and external control.

This question was answered through analysis of the survey results. Because teacher efficacy as measured by the Gusky and Passaro scale has two independent factors, internal and external teacher efficacy, each factor was analyzed separately.

Internal Efficacy

An analysis was computed of the change in level of internal efficacy, the participants' sense of personal control as a teacher, between pre- and post workshop survey administrations (I_1 and I_2) for those who attended the consecutive-day trainings ($N = 76$) using repeated measures ANOVA. A main effect was found with an increase in the level of internal teacher efficacy ($p < .000$). The effect size using Cohen's ***d*** **(*d*=m_1 - m_0/ *sp)*,** was 1.14.

A similar analysis of the Forest County data ($N = 17$), showed a main effect for Internal ($p < .02$, effect = .84) as well as an interaction with the teacher characteristic of previous knowledge ($p < .004$). Those who had previous knowledge ($N = 10$) did not experience a significant increase in their sense of personal control as a result of the workshop (effect = .07); whereas, those who had no previous knowledge ($N = 7$) showed a dramatic increase in Internal (effect = 2.38).

An analysis of Internal at pre- and post workshop and one-month follow-up (I_1, I_2, and I_3) for participants at the consecutive-day workshops ($N = 40$) yielded a main effect with an increase in the level of Internal ($p < .000$). Newman-Keuls post hoc comparison of the three means indicated that I_1, I_2, and I_3 were all significantly different from each other at the .05 level. The plot of the means showed that a sharp increase occurred in the level of Internal at the close of the workshop (effect = 1.21) followed by a decrease in Internal after one month of practice; even so, the level of Internal on the one-month follow-up survey was significantly higher than the pre-workshop score. The effect size between I_1 and I_3 measured .58.

An interaction was found between internal efficacy and years of experience (p <.04). The teachers who taught 11-15 years (N =7) showed a large initial gain in Internal (effect = 1.92), but their level of Internal returned to a point only slightly higher than their pre-workshop level; only a small gain was made after one month in the classroom. The 0-5 years group (N = 8) evidenced the most dramatic increase and maintained that increase at a high level after one month. The effect size between pre-workshop and one-month follow-up was 1.84. Participants with 6-10 years of experience (N = 5) showed a small gain after the workshop was completed (effect = .50), only to return to pre-training level after one month in the field. Those in the 16-20 year range (N = 7) also returned to their original level of Internal after one month's duration. The teachers with 21+ years of experience showed a moderate increase that stayed constant (effect = .34). Examination of the efficacy scores suggests that the greatest initial gains in efficacy were in those groups that started with the lowest initial measure of internal efficacy. Group mean scores for I_1, I_2, and I_3 and plots of the data are presented in Figures 1, 2, and 3.

Figure 1

Factor	N	I_1	I_2	I_3	Standard Error
1)0-5 Years	8	28.37	22.125	23.187	.9973305
2)5-10	5	23.2	21.8	23.6	1.2615
3)11-15	7	30.85	25.42	29.28	1.06
4)16-20	7	25.57	21.14	25.28	1.06
5)21 +	12	25	24.33	24.04	.8143
6) Unknown	2				

Figure 2

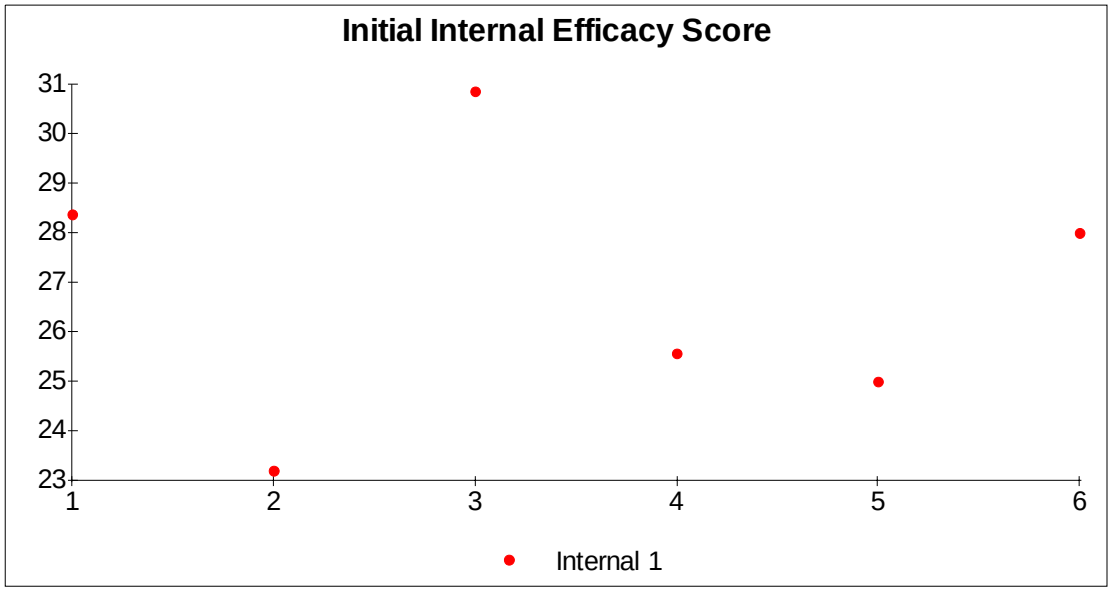
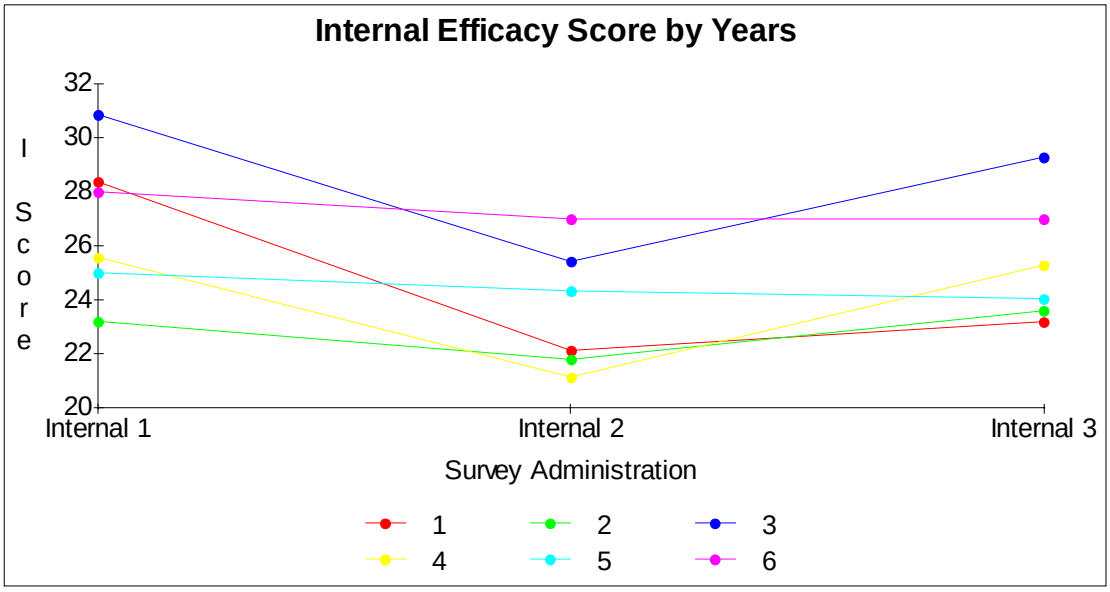


Figure 3



When all three scores of Internal (I1, I2, and I3) were considered for the Forest County sample (N = 15), there was a main effect for Internal by previous knowledge (p <.02, effect size between I1 and I2 = 1.04, effect size between I1 and I3 = .65). A Newman Keuls post hoc comparison showed that only I1and I2 were significantly different from each other. An interaction occurred between previous knowledge and level of Internal (p<.003). The level of internal efficacy declined after the teachers returned to the classroom to a point less than post workshop level but still greater than the teachers' initial internal efficacy score. However, since the one-month follow-up score is not significantly different from the pre- or post workshop scores, it is unclear

whether the effect of the training was maintained. The effect size of the change between pre-workshop and one-month follow-up was .65.

When the interaction was examined, it became evident that those with previous knowledge (N = 9) made virtually no gain in internal efficacy. Those without previous knowledge made their most dramatic gain immediately after the workshop (effect size = 2.74), but still maintained a significant increase after a month in the field (effect size = 1.66).

Because previous knowledge had such a powerful impact on the Forest County results, the consecutive-day data (N = 40) were examined to investigate the relationship between the level of previous knowledge and years of experience. A one-way ANOVA indicated that previous knowledge was not equal among the years taught categories, although small cell sizes make determining the significance of these differences difficult. Teachers with the greatest gain in internal efficacy were in the two experience categories that had the least previous knowledge. Consequently, previous knowledge may underlie the interaction with years of experience in this case.

This supposition seems further supported by the results of a one way ANOVA of years of experience by previous knowledge in the Forest County data. The analysis indicated that teachers' previous knowledge in that group was almost equal in each category of experience. In the Forest County data, no interaction was found between years taught and gain in internal efficacy (p <.80), suggesting that when the factor of previous knowledge is evenly balanced, the importance of years taught for gain in Internal is diminished. However, the 0-5 years of experience group in the consecutive-day data retained more gain in internal efficacy than did the 11-15 years of experience

group, even though both had low levels of previous knowledge initially. Therefore, the effect of years of experience cannot be completely disregarded; the impact of years of experience may have been less than that of previous knowledge but still of some importance.

In addition, the interaction in the consecutive-day data must be viewed with some caution because the level of internal efficacy itself may have influenced whether or not teachers completed and returned the one-month follow-up survey. When the initial internal efficacy level was compared by years of experience for the consecutive-day data (N = 77) using one way ANOVA, the initial level of Internal was almost uniform between groups. Moreover, it was lower than the average found in the Gusky and Passaro data. When the initial internal efficacy level of those teachers who returned the one-month follow-up survey (N = 41) was analyzed, a higher Internal score was found than the pre-workshop level reported by the larger group initially, although not at the .05 level of significance. Teachers with 6-10 years of experience who returned the follow-up survey had a pre-workshop level of internal efficacy that was significantly higher (p< .04) than the level in the comparable pre-workshop category in the larger group. Teachers who had a stronger sense of initial internal efficacy returned more questionnaires at I3. In general, those teachers with higher pre-workshop internal efficacy scores made the least gains in efficacy. Therefore, the high efficacy score in the 6-10 category for the follow-up data may have contributed to an interaction that would have disappeared if more follow-up surveys had been returned from the teachers who completed the pre-workshop surveys.

A comparison of pre-workshop and one-month follow-up efficacy scores from the consecutive-day teachers (I1 and I3, $N = 41$) investigated interactions when the post workshop data were removed. Once again, as would be expected, a significant main effect was found ($p < .007$, effect size = .62). No interactions were found.

In the Forest County data, an interaction between internal efficacy and Level was found when the pre-workshop scores were compared with those of the one-month follow-up ($p < .04$). The upper elementary teachers (the equivalent of middle school teachers, $N = 3$) experienced an increase in internal efficacy that was quite dramatic, (**d** = 3.12). However, no similar pattern was shown for Level in other data. Given the small group size, these results have little meaning, but do suggest that a study with equal numbers among level categories might be worthwhile.

External Efficacy

A comparison of external teacher efficacy scores (E1 and E2) was done on the pre- and post workshop data from the consecutive-day trainings. A main effect showing a decrease in the level of External was found ($p < .03$, $N = 76$, ***d*** = .33) indicating that the teachers were giving less credit to external events as determinants of learning outcomes. No significant interactions were found.

When the external efficacy scores were analyzed pre and post workshop for Forest County, no significant differences were found ($p < .39$, $N = 17$). The effect size was similar to that found for the consecutive-day data set ($d = .34$).

An effect size of this magnitude requires a larger sample to reach statistical significance.

When all three external efficacy scores of the consecutive-day teachers were compared (N = 40), the main effect on External was not significant (p <.08). After a small decrease, the mean score returned to pre-training level.

In the Forest County data no significant differences were found between the mean scores for external efficacy at pre-,post and one-month follow-up (p <26, N = 15)). However, unlike the level of External measured for the teachers in the consecutive-day data, the level of External in the Forest County teachers continued to decrease one month after the training. The effect of the training on External was measured as .32 on the post workshop survey and .58 after a month in the field. The teachers who reported regular use of the 4MAT techniques (N = 3) started at a level of External lower than the average found by Gusky and Passaro and stayed at that level. The occasional users (N = 7) showed a steady decrease in E over the three administrations (effect size between E_1 and E_2= .31, effect between E1 and E_3=.74). In addition, the occasional users initial level of External was higher than the average score in the Gusky and Passaro sample and moved into a low average range after one month in the field.

The levels of external efficacy in the Forest County data were examined in relation to previous knowledge. The change in External was fairly uniform for each level of knowledge. Those with previous knowledge decreased in their level of External from the pre-workshop survey to the one-month follow-up survey almost equally with those with no previous knowledge (effect size previous knowledge =.63, effect size no previous knowledge = .60). Thus,

previous knowledge did not appear to influence the level and stability of changes in External as it did Internal.

Question 2: Do teachers adopt and use learning style terminology and practice during and after a 4MAT training?

This question was answered primarily with field observation data, although the interview data also contributed to the results. In particular, the interview data provided information on teachers' acceptance of the learning style construct as well as some indication of the degree of their use.

Use of Terminology

The first day of Fundamentals Training was devoted to talking about the four types of learners that are described by McCarthy. The teachers warmed to the idea of type as if it were an old friend. After taking the *Learning Type Measure*, they read summaries of type characteristics to verify that the type determined by the *LTM* concurred with their self-perception. During this time, people made comments such as "that's me, all right." One teacher joked that her description said she was fearful under pressure, "yeah, I'm a chicken!" Another mentioned that the *LTM* reminded him of the *MBTI*, "it is uncanny how accurate these are--how one can relate to the types." Overall, then, the teachers seemed quite comfortable with the idea of type.

In addition, the teachers immediately began speculating on the learning type of problem students. After a discussion of different teaching techniques' appeal to the four types, one teacher noted, "I say all the time, 'it's in the book.' I just realized that I say that and it may not have meaning for a lot of my

students." Another, at my table, stated, "I never understood two's (a learning type) who would rather do books than hands on."

As the first day ended, teachers were asked to guess the results of surveys that had gathered information from different learning types about their preferences for foods, drink, cars, etc. The group was able to predict with almost 100% accuracy the survey results. The whole exercise was lighthearted and, again, there was laughter and joking among the teachers. However, the ease with which they entered into this activity indicated that they had readily taken on the 4MAT vocabulary of one's, two's, three's and four's. Later as a dramatic reading of an adapted version of the three little pigs was presented, the room was filled with loud laughter. As the story unfolded , four pigs, each representing one learning style, discussed plans to foil the enemy wolf. Those listening had to determine the type of each pig. The pigs, somewhat extreme caricatures of each type, were readily identified.

In her interview, Sylvia mentioned a social evening with fellow teachers during which the subject of type came up. From her report, it appeared that she and her colleagues not only accepted the concept of type but also felt that a type perspective was valuable.

> We had all read *First Wives Club* last year, so we went to the movies and at dinner we were all discussing what type of learner we were. . . . Everyone had taken it (the workshop) at one time or another. But here we are at the restaurant and 'oh, I am this and I am that.' . . . It was interesting when we did the Myers Briggs. We did that as a staff. I got to know one of my co-workers very well because we ended

up on the same block on the grid and begin to realize that we were both very introverted. . . . So she and I have become very good friends since then.

Thomas appreciated the content of the first day because it provided him with a vocabulary for discussing behaviors he had observed in his students. The first day's curriculum coincided with an informal personal typology he had been developing over his years of teaching.

> It corroborates what I have experienced in the classroom and it explains a lot of the different behaviors of a lot of the kids. . . . You can pick it out. . . you know . . . she can't handle lecture and they can't do group work, because I have seen that over the years and I have always wondered, 'Why is that?' . . . I learned nothing new in terms of content but how to use it in the classroom. How to change my teaching style to accommodate those things that I have always seen in the classroom.

However, he did not endorse the entire 4MAT package uncritically or unthoughtfully. He assumed that a one day presentation of a typology is probably an oversimplificaton of the complexity of type. Even so, he found it appropriate to oversimply the concept in order to make a working model for classroom instruction.

> It makes sense to categorize. But the way I see it . . . I didn't say it (at the workshop). The way I see it, that whole circle is really a continuum. You can't really separate a one from a two from a three or a four, that everybody is a different degree and there is no fixed line. Each of us has part of everything. It makes sense for the sake of

teaching that you would have to say you are a one or a two, but we are all on a continuum.

Moreover, Rob voiced doubts about the accuracy of the workshop's conception of learning styles. Although comfortable with the idea of styles, he found the workshop's discussion of type too superficial for him to accept wholeheartedly. ". . .that little quiz was 20 minutes, and it's like here you are. Who are you now? I'm like a one. . . it was still too quick. I thought we could have spent more time on that, like maybe an hour and a half." The stereotypic pictures of the types bothered him as well as the fact that among his group were people whose teaching styles he judged to be the opposite of his. These contradictions generated questions that kept him from accepting the 4MAT system in its entirety.

Practice

The second day of the workshop focused on using learning style ideas to prepare actual lessons. This day was more serious but still humor persisted. Some teachers began to adapt ideas from 4MAT between the first two sessions; others stated that they felt very "fuzzy" about the 4MAT wheel and procedures still. Between the two sessions, one upper elementary teacher experimented with adding more variety to in-class assignments. He reported obtaining better results from difficult students whom he had previously taught and had little success motivating. Others commented that they felt 4MAT gave them a framework for using cooperative learning techniques, an instructional technique many had studied the summer before.

Between the second and third session, each participant "4MATTED" a lesson to present to the group. Some actually implemented the lessons; others saw the assignment as an exercise. The final session was a circle discussion in which every participant presented his/her lesson plan. Because of a scheduling confusion, the day had a hectic beginning and end. There was no time in the final session for closure or summation. People literally darted from the room because of other obligations. Therefore, I was not able to talk informally to many of the teachers at the end of the training. This last minute confusion also led to many errors in the completion of the post workshop survey. A few teachers did sum up what they perceived to be the value of the workshop for them. Several mentioned that they might not be able to complete the 4MAT wheel on a regular basis, but that they were more aware of the need for variety in their lessons and methodology. Others, mostly elementary teachers, planned to continue with the wheel.

Question 3: Is teachers' discourse consistent with the criteria delineated by Ashton (1984) as being associated with trainings that contribute to a high level of teacher efficacy: a belief in students' potential to learn and develop, awareness of the classroom as a social setting, and use of reflective behavior?

Belief in Student Potential

The interviews were studied for changes in the teachers' perception of their students potential to learn. All participants stated that they revised their judgment of certain students because of the workshop experience. Exposure to

the 4MAT material prompted all the teachers to reevaluate their perception of their students both in terms of how they judged ability and how they defined problem students. Sam, an upper elementary science teacher with extensive teaching experience, commented explicitly on this shift in perspective.

> You know we unconsciously get down on people that don't follow the laws in our head. I was able to take a few students that I had actually been down on . . .and this kid I had had for three years that I thought was lazy and worthless because he didn't do it the way I did it. . . not necessarily to go back and do everything perfectly but, at least, to go back and try a different technique. I actually reached a few of them.

Sam began trying new techniques after the second day of the workshop.

Sylvia, who had the least exposure to learning style ideas prior to the workshop, questioned accepted concepts of intelligence after the first day. It reminded me of sitting in on child study committees when they are talking about bringing in students for the gifted program. . .it made me think about all the different speculations about should this one be in the program or should this one be. . . . it may just be their learning styles are different

In addition, she speculated that the members of a selection committee might be influenced by their own perceptions of creativity and intelligence. She noted that in discussions of gifted children, students who excel but who are seen as hard workers instead of creative performers are sometimes disregarded.

Similarly, Thomas immediately instituted several changes in classroom assignments and assessment procedures for a math section that contained low achievers. During his interview he described in animated detail the success of his efforts, ending his discourse with the following conclusions,

> This is a group that some would identify as slower, but they probably have the most different learning styles and maybe I am seeing it because they have had difficulty before (he taught them the year before as well), so they have come already with an attitude about math and about school. . . . then if you are trying to teach them in a traditional style and they already have an attitude, then it is even more difficult. I am seeing now. . . if they are working in their style, they still may not like school, but they are going to do a lot more and be more productive with it. And I've seen that with these two . . . exercises I have talked about.

Social Interaction and Self-reflection

Ashton (1984) cites self-reflection and awareness of the social nature of the classroom as factors that promote efficacy. In this study the two seemed interconnected because most of the teachers'self-reflection focused on their role in the classroom. Because the interview format employed was semi-structured, the discourse in the interviews adhered to educational and classroom concerns. Although the teachers involved often diverged from the specific questions into other topics, their conversation still centered around educational issues. For the most part, they analyzed their behavior in the context of a student-teacher relationship.

Sylvia, for whom the workshop represented mostly new material, stressed self-reflection more than any other participant. She reported that after the first day of the workshop, she found herself "analyzing everything." When asked to rate the 4MAT workshop after the last day, she placed it second

behind a five day summer workshop on cooperative learning. However, she stressed that her rating was influenced in part by the spaced presentation of the 4MAT workshop. Moreover, there was something about the 4MAT workshop that impressed her differently than a training focused solely on methodology. It appeared important to her to clarify for herself what set the two workshops apart. She discussed this issue at length, even though she was not prompted by an interview question. She concluded that the 4MAT workshop,

> . . . made me learn more about me. Not just about my students, but I am more aware of me and how I learn and how I teach and the fact that I could kind of push that on my kids when I really didn't want to. . . in cooperative learning I didn't do any reflection, well on my teaching I did, but not about me as a person or me as a teacher. And this, the 4MAT, just blew me away the first day when I heard it.

On the other hand, Sam who had familiarity with the *MBTI* and 17 years of teaching experience, also reflected on his teaching sufficiently to decide to add more structure to his lesson plans and to rethink some of his assessment methods. Sam uses a great deal of hands-on and discovery learning in his classroom. As a result of the workshop, he concluded that he held a kind of tacit scorn for students who liked or wanted structure. Subsequently, he decided to add clearer instructions and a printed overall plan to his course for those students that wanted to "know where they were going." Also a community college biology teacher, he reevaluated his reaction to former students who had dropped out of his class. Referring to himself as "left of Joan Baez," a 1960's folk singer, he stated that "before (the workshop) I would

have just thought , 'he quit, tough nuggies' . . . He doesn't like my style or whatever, but I wouldn't have actually related it to the fact that his learning style is different . . . and maybe I need to do a few more hand outs and structured activities."

Similarly, Elvia re-evaluated her use of teaching strategies after completing her 4MAT lesson in-between the second and third day.

> I'll tell you what. This whole thing made you really think through what you do, and why you do it and for whom you do it. I think that I am more used to doing what I think is right and I probably think more about activities than the why of those activities; mostly because they are activities that I know are exciting and they are something I want to do.

Other Observations

Unlike the trainings I observed as exploratory studies, the Forest County workshop did not run smoothly. On the first day, the program met in the high school band room; its long, rectangular design made hearing comments from one end of the room to the other difficult, and provided no clear focal point for the workshop presenter. In addition, no screen for slides and overheads was available. Large sheets of paper were jury-rigged for the job but proved inadequate. On top of these deficiencies was added the malfunctioning of the slide projector. The presenter, an experienced teacher, persevered cheerily despite the set-up, commenting that "you have to work with what you're given." However, the net result of this awkward setting was that the workshop never felt cohesive on the first day. On the second and third days, the training was

held in the library. While a more congenial facility than the band room, it still was not well-suited for running a workshop.

The effectiveness of the workshop was also hampered by scheduling problems that evidently could not be avoided. On the first day, five teachers came late because of a meeting they could not miss. On the second day, many of the teachers left at fifteen minute intervals to have a health screening that was required by the school's health insurance provider. On the last day, several teachers arrived late and others left early because the workshop schedule was listed incorrectly in the teachers' bulletin. The coming and going of teachers often meant that a participant would work on a group project only to miss the actual presentation of that project. It also meant that there was no opportunity for a summation of the workshop material on the last day as several teachers left early and others were anxious to leave because of personal commitments.

For the most part, the response to the workshop was positive; teachers seemed engaged and appeared to be enjoying themselves. There was a great deal of laughter during activities and good-natured banter. As the workshop continued teachers' level of engagement stayed high except for one participant who became increasingly disgruntled. I attempted to interview him informally but again, because of my apparent association with 4MAT, he avoided me. We were in one group activity together, but he left my group to join one that had more of his colleagues. Perhaps 4MAT was not suited to his field, small engine repair and technology. When he presented a lesson plan on the last day, he did not follow the 4MAT wheel accurately, but the trainer made no attempt to correct him as she had the others. She stated later that "you just can't reach some people." Thus, his response was seen as idiosyncratic.

The training also illustrated that gaining solid knowledge about workshops that occur in the field presents several challenges. For example, because I was told the wrong time for the third day, I arrived 15 minutes late, expecting to be 15 minutes early. I had hoped to remind the teachers about the final survey at the beginning of the session, so that they would complete the survey accurately. As a result, the administration of the post workshop survey was hectic and much data was irrevocably lost as teachers failed to fill in ID numbers or complete sections accurately. I had also planned to interview teachers informally as they waited for the workshop to begin. In addition, at one point the workshop breaks were shortened, eliminating another avenue for discussing the workshop informally with teachers.

As in almost any study of this nature, the participants want to appear positive because they are aware that their school's administration supports the program being presented. This tendency to emphasize the positive may also have increased in my presence because of the teachers' sense that I was affiliated with 4MAT. I attempted to correct this impression, but I am not sure how successful I was. Moreover, the director of instruction, a well-liked, known 4MAT supporter was present on the first day of training along with the high school principal. Thus, teachers may have withheld concerns or skepticism during their informal discourse during the workshop.

Although the themes that Ashton has established as linked to efficacy were present in the interview data, there were other aspects of the training that also appeared to influence the teachers' response to the workshop. On the second day, I noticed that some of the faculty from the two different elementary schools were kiddingly discussing doing a teacher exchange for a grading

period. As the training progressed more and more networking occurred. Evidently the faculty at the two elementary schools have little opportunity for collaboration. Similarly, during one group activity, one of the elementary teachers mentioned that she enjoyed hearing what the high school teachers were doing "up there." The high school is ten minutes up the road from the her elementary school. Thus, the workshop also provided an arena for an exchange of information among the county staff.

One theme that occurred repeatedly throughout the interviews was that the workshop gave the teachers a structure around which to organize ideas or methodologies they were already familiar with. Mary, for example, came to the workshop already open to and aware of non-traditional learning strategies; "well there are all these newer techniques that interest me." The workshop provided her with an opportunity to see such activities used systematically. Consequently, she felt that the 4MAT wheel furnished her with a framework for a number of instructional activities that she was already trying to incorporate into her classroom.

Others saw the workshop material as suggesting ways to evaluate remediation strategies. Sylvia, one of the third grade teachers who had done graduate work in reading, felt that the workshop would enable her to be more efficient in employing her knowledge of reading.

> A lot of the time it (working with students) was trial and error as to what to do because there is the set of guidelines to go by. . . . If they need to master fluency, . . . there is a formula. It doesn't deal with individual learning style. It deals with individual reading problems, so I think putting the two together will make a big difference . . . if I

knew their learning style, I might be able to pinpoint one (strategy) in particular instead of going through five different things. Zero in on one and try it first.

The teachers also appeared to value the modeling provided by the workshop leader and by their colleagues in workshop activities. For instance, Mary, a relatively new teacher, gained insight into classroom leadership by watching the workshop leader deal with the inadequacies of the band room on the first day. In a related but slightly different vein, Sylvia remarked that she gained some practical tips from hearing the practice lessons produced during group activities. Those lessons covered subject matter she was about to teach. She garnered new ideas for presenting her curriculum; ideas she felt she would not have thought of independently. Similarly, Thomas, the social studies and math teacher, enjoyed the exchange of lesson plans on the last day, observing that he picked up some good ideas and appreciated hearing what others were doing, especially plans that incorporated Internet research.

For several of the teachers, the workshop content validated aspects of their existing practice. Thomas, Elvia, and Rob all mentioned that the workshop affirmed ideas they held about practice, but Mary was perhaps the most emphatic. When asked if the workshop had an impact on her, she replied.:

Oh definitely, definitely. As I said, when I thought about appreciating the different groups and being sensitive to the needs of those individuals . . . I think I have tried to do that, have a little something

for everyone. It made me feel like I was doing the right thing. That was good for me.

Question: So you found it affirming?

Mary: Absolutely! Absolutely! Absolutely!

On a less theoretical level, it also appeared that the workshop was effective because it was well designed and well delivered. All the teachers found the workshop enjoyable. "Fun" was a word that came up over and over. It was literally fun to participate. In this regard, Fundamentals Training appears to outstrip many other in-service workshops. A number of the teachers compared the 4MAT training to what they considered typical in-service trainings. "Every year you attend a seminar with some fool, who says the same thing automatically, and he is supposed to motivate everybody and you go back with your notes and throw them in the wastebasket. This is one of the few I can honestly say, one of the few that was worth my while."

Chapter 5
Conclusions

The purpose of this study was to investigate the relationship between teacher's participation in 4MAT Fundamentals Training and teachers' perception of teacher efficacy. Three questions were asked:

1) Does participation in 4MAT learning style training influence teachers' level of internal and external control

2) Do teachers adopt and use learning style terminology and practice during and after a 4MAT training?

3) Is teachers' discourse consistent with the criteria delineated by Ashton as being associated with trainings that contribute to a high level of teacher efficacy: a belief in students' potential to learn and develop, awareness of the classroom as a social setting, and use of reflective behavior?

Question 1: Does participation in 4MAT learning style training influence teachers' level of internal and external control.

Effect on Internal Efficacy

The workshop on 4MAT significantly influenced teachers' sense of internal efficacy. Teachers' level of internal control increased by over one standard deviation on the post workshop survey (effect = 1.21, N = 40). When teachers returned to their classrooms, their level of internal efficacy decreased significantly but still remained significantly higher than pre-workshop levels (effect = .58). The decrease in internal efficacy at the one-month follow-up was not anticipated; it was assumed that the impact of training would be tied to

practice with efficacy increasing as teachers witnessed improvements in student achievement or behavior as a consequence of using the practice taught in the workshop. However, the level of personal efficacy was at its highest immediately after the training and decreased after one month of practice. This finding suggests that the training experience itself had a powerful impact on many of the teachers, but that the effect was ameliorated during subsequent experiences..

Why the level of internal efficacy dropped at the one-month follow-up survey administration was not readily apparent. Perhaps the teachers needed greater on-going support to maintain the level of optimism they reported at the end of the workshop. Several of the teachers who were interviewed mentioned their desire for continued training and support in the 4MAT model. Moreover, Ashton (1984) points out that teacher isolation and inadequate collegial support work against the development and maintenance of a strong sense of efficacy among teachers. Once the teachers in this study returned to the classroom, they may have lost the boost they received from sharing with their colleagues during the workshop. Field observation indicated that many of the teachers used the workshop as an opportunity to exchange information. In addition, they may have found using the 4MAT methodology more difficult in practice than in the workshop, and required more focused and site specific help. Miller (1989) reported in a study on 4MAT implementation that teachers who had follow-up training and support groups integrated 4MAT techniques into their teaching with greater frequency and felt more positive overall about their ability to employ new instructional strategies.

Not all groups of teachers experienced an equal loss of efficacy after one month. When interactions in the data were examined, some teachers were found to have maintained important gains in personal efficacy. In the consecutive-day data, those teachers who had 0 to 5 years of teaching experience maintained a large gain in personal efficacy after one month in the field (effect = 1.84). Similarly, the Forest County data showed that teachers without previous knowledge of learning style theory appeared to make dramatic gains in efficacy that remained high after one-month (effect size of gain from pre-workshop to one-month follow-up = 1.66).

A relationship appeared throughout the data between teachers' response to the training and their initial knowledge about learning style theory. Those participants without previous knowledge of learning style methodology consistently reported greater gains in personal efficacy than teachers with previous knowledge. For instance, although investigation of the consecutive-day data indicated an interaction of internal efficacy with years of experience, a one way ANOVA suggested that the levels of previous knowledge held by the teachers in different experience categories might contribute to the interaction between years of experience and internal efficacy. The greatest gains in internal efficacy were reported by those teachers with the least previous knowledge.

In the consecutive-day data, those teachers without previous knowledge appeared to be affected by the training (pre- workshop to post workshop) to a greater degree, even though both reported considerable gain in efficacy (effect size no previous knowledge = 1.31; effect size previous knowledge = 1.10). When the data from all three survey administrations in the consecutive-day

trainings were analyzed, a similar pattern emerged. Again, those teachers without previous knowledge reported increases in personal efficacy to a greater extent than those with previous knowledge (effect size no previous knowledge after one-month = .89, effect size previous knowledge = .19). The Forest County teachers with previous knowledge reported almost no gain in internal efficacy, while teachers without previous knowledge reported a dramatic increase in personal efficacy (2.74 post workshop and 1.66 at the one-month follow-up). This finding indicates that teachers without previous knowledge may have found the learning style workshops more influential than those with previous experience in learning style concepts. It also suggests that learning style theory and methodology might be particularly suited to preservice programs.

Effect on External Efficacy

The workshop appeared to have only a minor impact on the teachers' external efficacy, producing a significant but small decrease in the weight teachers attributed to external factors as determinants of learning outcomes. The effect of the workshop on external efficacy was almost equal for both the consecutive-day (effect =.34) and the Forest County teachers (effect = .33). Though the change in level of external efficacy was significant pre- and post workshop for the consecutive-day data, the one month follow-up data indicated that the decrease did not endure. In contrast, the Forest County teachers' reported level of External continued to decrease over the course of the survey administrations until the difference in the level of external efficacy approached significance (p <.051, effect =.61). The Forest County teachers'

with and without previous knowledge reported the same pre-workshop level of External. Moreover, the decrease in external efficacy pre- and post workshop by each knowledge group was essentially equal. This finding suggests that external efficacy was affected by teacher characteristics different from those that interacted with internal efficacy.

Although based on a very small cell size, one trend toward an interaction in the Forest county data is intriguing. Ability tended to interact with external efficacy ($p < .07$) ; teachers of low ability students experienced a large drop in External (effect = 2.7, $N = 2$). While this is an extremely small cell size, the identical response was seen in the consecutive-day data ($N = 76$, $p < .17$). Again the teachers of low ability students ($N = 2$) had the largest decrease in external efficacy. This may indicate an important area for further investigation, because Cohen (1995) and others (Ashton, 1984; Bar-Tal, 1982; Graham, 1990) have found that many teachers think disadvantaged and remedial students have limited academic capacity. Because of this perspective, they accept lower standards of performance. Participation in learning style workshops may decrease the weight teachers of low ability students give to external events. Brightwood's principal reported that his staff began to tie student performance more to instruction than to socio-economic factors (Andrews, 1990).

The difference in response between internal and external teacher efficacy is consistent with the findings of other studies (Ashton, l984; Gibson & Dembo, 1984; Gusky & Passaro 1994; Woolfolk & Hoy, 1990). Researchers have noted that internal and external teacher efficacy consistently test as two distinct factors. Currently, the relationship between external and internal

teacher efficacy is not well defined. Research has shown, for instance, that teachers can fall in all four possible combinations of internal and external efficacy: high I, low E; high I, high E; low I. low E; and low I and high E. Although it appears logical to assume that an increase in internal efficacy would bring about a decrease in external efficacy, research, including this study, has not supported this supposition. In this case, the large increase that many of the teachers reported in internal efficacy was not matched by an equal decrease in external efficacy. In addition, factors that seemed to influence internal teacher efficacy did not appear to be relevant for external efficacy. Skinner (1995) has shown that the independence of internal and external efficacy appears in other domains as well. In fact, except in lab-like settings "internal and external perceptions of efficacy are usually complementary" (p. 134) rather than bi-polar. Moreover, Skinner points out that understanding how the success of an endeavor is contingent on external and well as internal factors can be seen as a characteristic of psychological health.

The only notable difference between the Forest County and the consecutive-day trainings was the spaced presentation format. Perhaps the opportunity to practice learning style theory in the field in-between sessions contributed to a decrease the teachers' external efficacy in some way. Because this study contained only two relatively small groups, a comparison of the data has limited relevance. Nonetheless, it does indicate that the pacing of a teacher training may be important in terms of ultimate effectiveness. In Forest County, teachers had the opportunity to experiment with the workshop material in their classrooms and then return to compare results and ask questions.

Those who had the consecutive-day training had no opportunity for questions or support based on their own experiences in their classrooms.

It is not surprising that the workshop had a smaller impact on external efficacy than internal; discussion of external factors that affect school success was not an integral part of the training. Instead, the workshop content focused almost exclusively on theories of how individual learning styles interact with instructional techniques. Group characteristics, other than those of learning styles, were not considered. Moreover, implicit in the workshop material was the assumption that styles were relevant and similar for all groups of people.

Learning style theorists' failure to focus on social and political factors that influence education is one of the reasons that the construct is sometimes criticized by educators. Dunn (Dunn & Griggs, 1988) is often thought to exaggerate the power of learning style theory and methodology. For example, she states in one of her works (Dunn & Griggs, 1988) that reform analysts have not "reported what is truly wrong with it (the system)" (p.1). She goes on to claim that "our system is ineffective because it does not respond to the many different ways in which . . .normal. . .students absorb, process, and retain difficult information and skills" (p.2). Several teachers in the exploratory studies reported in Appendix B, mentioned their concern that learning style methodology would be judged as sufficient to deal with educational issues such as resource management and appropriateness of course offerings when other measures were needed. However, not all learning style theorists make claims as bold as Dunn's. Some do acknowledge the limits of the theory and the problems connected with allowing it to be seen as a panacea (Brandt, 1990; Leflar, 1983). This study supported their circumspection.

Question 2: Do teachers adopt and use learning style terminology and practice during and after the 4MAT training?

Use of Terminology

Data from field observation at the Forest County training and at the exploratory study sites indicated that many teachers accepted the idea of style because it seemed to capture differences they perceived in themselves and in their students. In a sense, they recognized the profiles of learning differences that were presented to them because of their experience as teachers. As a result, they quickly adopted the terminology into their discussions of teaching and learning. Most of the Forest County teachers, as a well as those in the exploratory studies, sought techniques for accommodating individuality. Throne (1994) echoes this concern when she discusses the impact on teachers when educational theory alternates between opposite methodological positions. "Classroom teachers may try to resolve these ideological differences by adopting an eclectic approach -- a little bit of one method and a little bit of another. . .The paradox is that no one approach works for all children--which is why the pendulum never stops swinging" (p.196). The appeal of learning style theory may result in part from the fact that the construct coincides with an important concern of many teachers.

Use of Practice

Field observation data indicated that some teachers did report using 4MAT techniques immediately after the first day of the workshop; others

reported finding translating the theory into practice to be more daunting and waited until later in the training to implement learning style strategies. The teachers' use of learning style methodology was fairly idiosyncratic with teachers adapting 4MAT techniques into units or subject areas they judged appropriate or manageable. Thomas, for example, began implementing 4MAT ideas in math before he used them in social studies because he could see more easily how to modify math curriculum. All the teachers interviewed were incorporating some of the workshop ideas into their classroom practice but at different levels and in different ways. Thus, teachers were influenced by 4MAT theory; but, they did not employ the methodology in a strict or consistent fashion.

That this partial adoption of 4MAT techniques should occur is not particularly remarkable. The 4MAT methodology is complex and the training is guided more by the realities of available time and money for in-service training than by the requirements of the curriculum (Excel, Inc., personal communication, October, 1996) The challenge that the Forest County system faced in finding even three days for a training is testimony to the difficulty of providing adequate in-service training. However, the use of 4MAT, even if modified, indicated that participation in the workshop altered practice for at least some of the participants.

Unfortunately, the level of integration of 4MAT materials was hard to determine from this study because of how poorly rate of use was reported on the one-month follow-up survey. The limited information on use that was reported showed that a reasonable number of the teachers incorporated 4MAT methodology, with approximately 10% of the original 120 teachers reporting

frequent use and roughly 30% using the techniques now and then. Anecdotal reports suggest that even partial or idiosyncratic use of learning style methodology can be beneficial (Anderson, 1990). How much of the learning style methodology needs to be implemented before achievement or student behavior will be affected is not defined by current research on learning style. From the Brightwood study, it seemed that minor changes in practice were made gradually with excellent results. Many questions still need to be answered concerning the effect of using learning style methodology. For example, is adherence to learning style methodology the main factor that contributes to improved achievement or is it the increased efficacy of the teaching staff? Can the two actually be separated? Do teachers feel more efficacious because they know learning style instructional techniques, even if they use them idiosyncratically? Does this tendency to adapt methods have the unintended effect of limiting change in practice so that noticeable results in achievement are not generated? Are the methods taught in these workshop insufficiently powerful so that even when adopted and even when teachers have strong belief in them, no significant change in student achievement can be expected?

Question 3: Is teachers' discourse consistent with the criteria delineated by Ashton(1984) as being associated with trainings that contribute to a high level of personal efficacy: a belief in students' potential to learn and develop, awareness of the classroom as a social setting, and use of self-reflection?

What is perhaps most evident from the interview data is that teachers' reactions to learning style training are multi-faceted; they are in response to

many elements of the training, not just the explicit content of how to use learning style theory to shape teaching units. The interviews indicated that the teachers' discourse reflected all the elements Ashton outlined as the basis teacher efficacy: a belief in students' potential to learn and develop, awareness of the classroom as a social setting, and use of reflective behavior. Moreover, the data suggested that other aspects of the workshop supported the maintenance of a high level of efficacy: the support of colleagues, modeling of instructional techniques, and validation of teachers' practice.

When studying the interviews, it became apparent that the process and the content of the workshop were intimately connected in the teachers' minds. For these teachers, the workshop was an integration of theory and method, such that the theory was instilled in the process. When asked about the impact of the workshop, these teachers' discourse shifted freely from feelings about the theory to impressions of the value of workshop activities to reactions to the presenter's performance. In a sense, the total workshop experience shaped their conception of learning styles because they were exposed to learning style theory in the context of the workshop.

Furthermore, the interview data offered insight into dimensions of efficacy not captured by the Gusky and Passaro (1994) scale which is primarily a measure of control. In this regard, the interview data suggest that the relationship between previous knowledge and efficacy may be more complex than it appears from the survey results on change in internal and external teacher efficacy. The Use results, although incomplete, indicated that those who reported frequent use in Forest County (N =3) all had previous knowledge. Similarly, the frequent users in the consecutive-day data also had

slightly more knowledge of learning style concepts than the teachers in the other use categories. Thus, although the teachers with previous knowledge may not have shown as large a gain in internal efficacy on the Gusky and Passaro scale, they were more likely to implement significant changes in practice. The interview data also indicate that those teachers with prior knowledge altered their classroom practice in response to the workshop.

Sam, Mary, and Thomas all reported previous knowledge of learning styles. Sam, had attended a workshop on the *MBTI* and yet because of the 4MAT workshop, he revised his teaching and assessment procedures. All those interviewed, exhibited discourse patterns consistent with the criteria outlined by Ashton (1984) as contributing to an increase in efficacy. Thus, the interview data indicated that all the interview teachers' practice was altered in response to their participation in the workshop whether they had previous knowledge or not. Those who had previous knowledge on average had higher internal control scores on the pre-workshop survey. Therefore, those teachers with previous knowledge may have responded more on a behavioral than an attitudinal level. The workshop may have moved those who already knew about learning styles and who felt a fairly high sense of internal efficacy to institute more systematic practice, and prompted those with less experience to think differently about their practice, to "analyze everything" as Sylvia did.

However, the nature of the relationship between previous knowledge and efficacy may be masked in part by the limits of the Gusky scale itself. The scale may not be sensitive to small but meaningful changes at the extremes. In general, those teachers in the consecutive-day group who made the least gain in personal efficacy had the highest initial internal efficacy score. Similarly, in

the Forest County data (N = 15) the teachers with previous knowledge had a higher in level of personal efficacy than the teachers without previous knowledge, although the difference was not significant at the .05 level. The scale may not have reflected effectively gains in efficacy by those teachers who initially reported a perception of internal efficacy that was above average.

Another possible explanation for the discrepancy between the interview and the survey data may lie in the definition of efficacy itself. Currently, teacher efficacy is seen as a multidimensional construct. Control, as measured on the Gusky and Passaro scale, is only one of several dimensions that Ashton et al. (1983) identifies as constituting teacher efficacy. Ashton's criteria for efficacy were drawn from a multi-method study that employed both qualitative and quantitative measures: interviews, observations, surveys, teacher journals, and analyses of patterns in student achievement. Therefore, elements identified and described in this study's interviews and field observations may reflect gains in dimensions of efficacy that are not captured by a scale that is focused on control.

The overall impact of learning style training on teachers' sense of efficacy as defined by Ashton (1984) indicated that intensive, well-designed workshops can alter teachers' perception of efficacy and theoretically, their practice. This is an important finding because the success of educational reforms is seen by a number of researchers to hinge on teachers making changes in their attitudes and behaviors (Ashton, 1984, 1996; Cohen, 1995). Cohen (1995) argues that if reform efforts are to be effective, steps must be taken to provide teachers with experiences that enable them to witness and participate in ways of learning that are in line with reform goals Many teachers

have not had the opportunity to see or experience non-traditional classroom practice. As a result, their teaching is informed by their own schooling which may or may not have been adequate. If teachers cannot envision alternative forms of instruction, they are unlikely to alter their practice. Ashton (1996) also notes the importance of examining teacher preparation programs to find those that influence efficacy and help teachers to develop "understandings of self and students." Training in learning style theory and practice appears to have the potential to contribute positive changes in teachers' attitudes and to foster behaviors that promote improved instruction.

Of course, conclusions based on these interview data must be tempered by the knowledge that the data came from a small group of teachers who appeared to be highly motivated. All those interviewed seemed to care about achieving excellence in their teaching. Because only teachers who volunteered could be interviewed, the data may have been somewhat skewed; those teachers who are willing to give time to educational research may tend to care more about education in general.

However, as one of the teachers I informally interviewed during the Level II exploratory study noted, "You can workshop a sorry teacher to death and she'll still be a sorry teacher." Perhaps there are few trainings that can take teachers with no talent or interest in education and make them more able. Nonetheless, the 4MAT training effected significantly those teachers who had no previous knowledge and those with low initial internal efficacy scores. This finding indicates that the training has potential value in settings where teachers are interested in gaining new skills, even if those teachers are not as highly motivated as those who volunteered to be interviewed. Interestingly, the

comment quoted above came from a teacher who attended Level II involuntarily and was skeptical about the program. By the fourth day of Level II training she was enthusiastically presenting a 4MAT lesson plan she had written.

Future Research

This study contributed information that may inform the continuing debate about the usefulness of the learning style construct. Much of the discussion of learning style has centered around analyzing results from quasi-experimental studies that argue for or against matching instruction to style as well as around reevaluating ATI results. This study was designed on the premise that the discussion surrounding the merit of learning style ideas was incomplete without an understanding of what teachers mean when they claim to use learning style methods or to subscribe to learning style theory. The findings indicate that teachers trained on the introductory level of learning style theory were influenced by that theory but did not employ learning style methodology in a strict or consistent fashion. Some of the teachers experienced high gains in internal efficacy, a factor that has been linked to improved student achievement. Doyle and Rutherford (1984) posited ten years ago that the most productive way to capitalize on knowledge about learning and teaching styles was to study how learner and teacher styles were acted out in classrooms. This study supported their supposition and suggested that more research on how learning style ideas affect classroom interactions might

contribute to a better understanding of the construct and a more appropriate use of information on individuality in learning.

This study also demonstrated the complexity of analyzing teachers' conceptualizations of learning style theory and practice. As noted in the interview results, the teachers responded to many elements of the training. It was difficult to sort out learning style methodology from other positive aspects of the workshop, such as the opportunity for collegial support. This contamination does not invalidate learning style conceptions, but it illustrates the difficulties involved in trying to understand the effects of learning style training on teachers' practice and assessing the dimensions of that practice. Is the effect of classroom teaching different when it is done from a learning style perspective rather than a constructivist perspective? Are instructional strategies more powerful in one context than another? Many teachers mentioned that 4MAT material provided a framework for organizing other instructional techniques. Does having a framework influence teachers to use those techniques more effectively? These are the questions that seem relevant for future study of the learning style construct.

Summation

Twenty years ago Messick (1976) edited a collection of essays on individuality in learning. Several of the essays addressed the importance of preventing ATI research from lapsing into trivial studies. The authors urged that a systematic search for basic factors that undergird observable traits be made. Messick himself cautioned that the use of knowledge about individual differences in cognition must perforce interact with factors such as the

developmental level of the learner, the subject matter being mastered, and institutional and personal educational goals. In line with this, proponents of learning style attempted to determine the implications of individual differences for instruction. Unfortunately, research to date on the learning styles paradigm has not resulted in a cogent theory. Many of the factors that Messick identified still have not been systematically explored. Yet, in the classroom, learning style conceptions are taught and practiced by a reasonable number of teachers who judge learning style theory to be consistent with their perceptions of students and useful for organizing their practice. This study indicated that knowledge of learning style theory and practice can be valuable to teachers. It also suggested that examining the impact of learning style training on teachers' attitudes and behaviors may provide meaningful insights into why interest in learning style concepts continues despite inadequate research.

In 1994, Messick wrote an updated report on cognitive styles, contending that progress in understanding the basis of cognitive styles was hampered by both critics and supporters of the construct. He noted that "deconstructive critiques" appear to have an underlying ideology that prevents an unbiased judgment of the paradigm. Similarly, the overprotective justifications of proponents also provided "blinders that hinder scientific evaluation of contrary evidence" (p. 12). The learning style construct appears to be stuck in a similar quagmire--caught between overly enthusiastic proponents and overly critical opponents. The results of this study suggest that focusing on teachers who actually use learning style concepts and methods in their classrooms might open up research that would break the current stalemate over the validity of the learning style construct. At this point, more

dispassionate and objective evaluation is needed to determine how best to capitalize on current knowledge of individuality in learning.

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Appendix **A**
Outline of 4MAT Training Procedures

The training consists of six sessions, each of which is put on a 4MAT wheel.

Session One : Teachers take the *LTM* and become familiar with the concept of learning style and the types of learners as they are defined by McCarthy.

Session Two: The session is a continuation of session one and involves further discussion of how different teaching strategies are perceived by different learners.

Session Three: The concept of brain hemisphericity is introduced. Research on brain hemisphericity is discussed and teachers use a measure to determine where they stand on the continuum of left and right brain information processing. Activities are performed that help teachers to understand the characteristics of left and right brain thinking.

Session Four: Teachers experience and design activities that are thought to capitalize on left and right brain strengths and thus accommodate left and right brain student preference.

Session Five: This session introduces teachers to the concept of using a model as an organizational tool and familiarizes them with the details of the 4MAT wheel.

Session Six: Teachers practice planning units using the 4MAT wheel. First they complete a group lesson and then an individual lesson. A celebration

of some sort is held during the last session. This is in line with the principles of 4MAT. The final step in the wheel is seen as involving some kind of recognition of skills learned and/or a display of student products.

Appendix B

Exploratory Study 1

4MAT Fundamentals Training Seminar (FTS)

Date and Location

The training was held July 22-24, 1995 in suburban New Jersey at the administrative offices of a New Jersey school system that has trained a number of teachers in 4MAT methodology. The administration provided Excel with space in one of their administrative buildings.

Participants

The school system staff who were to attend the workshop were told the wrong dates and came on the last day, thinking it was the first day of training. As a result, the training was composed completely of a diverse group of professionals from other school systems and states.

Besides myself the following attended: two teachers from a private middle school outside of Boston; a Chapter I reading program director from a South Carolina school district and the only person of color in the training; a professor of education from a college in Pennsylvania; a professor of education from a college in Wyoming; a reading specialist from an elementary school in Pennsylvania; two high school science teachers from southern New Jersey; and two counselors from a community agency that teaches life skills to at-risk young adults.

The Instructor

The workshop was led by an English teacher from a small city system in New Jersey. His school system has trained 1600 teachers in 4MAT Fundamentals and 650 in 4MAT Level II training. Forty-five teachers have been trained to teach 4MAT methodology to other teachers within the system. The instructor's English classes, which are currently for remedial and at risk students, had the highest achievement level among comparable classes in his high school. He attributed this level of achievement to his use of 4MAT.

The Training Procedure

The training followed the course as outlined in the course syllabus (detailed in Appendix A). The trainer had an air of competency. The room was well-designed for the workshop, and the course was delivered very professionally. Stressing that doing the complete 4MAT cycle was important, the trainer gave the impression that the theory was researched based.

Participant Response:

The teachers identified readily with the ideas of a learning style and with the type that the *Learning Type Measure* showed them to be; they joined in the workshop activities with enthusiasm and humor. A sense of camaraderie and fellowship began to develop as the workshop went on with teachers sharing teaching and personal stories as well as having lunch together in the nearby town. People made good-natured jokes about the characteristics of their type. There was very little criticism.

The participant from South Carolina had heard many good things about 4MAT. She hoped that the workshop would give her new ideas for working with disadvantaged students. She was also working on a Ed. D. and hoped to do research on the effects of introducing 4MAT techniques into her system's reading program.

One of the teachers from Boston had heard about 4MAT from a statistics professor while she was enrolled at Harvard College of Education. Her professor had done a statistical analysis of achievement levels in high school classes where 4MAT was introduced. The professor was so impressed by the results that he became an advocate for 4MAT. The Cambridge teacher in turn was impressed by her professor's opinion. She stated that he said "this stuff (4MAT) is real."

She was more skeptical about other learning style models and quoted research that showed that a meta-analysis of learning styles did not confirm that it made a significant difference in achievement. While she seemed very interested in and approving of the initial activities of the workshop, she was extremely critical to the point of being upset when the instructor showed a video that claimed a connection between education in the fine arts and the growth of cognitive structures that are important in other disciplines. The video led one to believe that it was based on conclusive research. She was skeptical and felt the video overstated what was really known. She actually left the workshop rather angrily. I asked her in the elevator as we were leaving what had upset her. In general, she felt the workshop had been positive, but felt that the video had gone "too far," and such exaggeration of truth bothered her about all these kinds of workshops.

The professor of education from Pennsylvania took the training because his students had consistently reported the usefulness of 4MAT. He appeared to enjoy the workshop and voiced little skepticism, although he was not very open in his reactions, so he may have had more doubts than his demeanor indicated. He joined in good humored jokes about his particular type and took extensive notes.

Aside from the one concern that was voiced, the general response to the workshop was quite positive. People exchanged addresses while leaving and appeared to be quite stimulated by the material in the workshop.

Exploratory Study 2

The Southeast Learning Styles Conference, Honoring Diversity VIII

Date and Location

The conference was held November 10-11, 1995 at Fairfax High School, Fairfax, VA., and was sponsored by the Southeast Learning Styles Center, a collaborative program between Fairfax County Public Schools and George Mason University. The center is affiliated with the National Learning Styles Network, the National Association of Secondary School Principals (NASSP), St. John's University, and seven other learning style centers. The mission of the center, as stated on the conference program, is to encourage the study of learning styles and the application of brain research to improve education.

Participants

Teachers from Northern Virginia and Southeastern Maryland attended the workshop.

Sequence of Events

The program began on Friday afternoon with Robert Sylwester as keynote speaker; Sylwester, from the University of Oregon, has written several books for educators explaining current theories on how the brain processes information. While a bandwagon effect may surround left brain/right brain conceptions, Sylwester's presentation was balanced. Throughout his lecture,

he issued caveats concerning the inconclusiveness of much research on the brain. Enthusiasts may not be hearing qualifying statements made by experts such as Sylwester, but at this particular conference, the truth was not overstated.

Sylwester's speech was followed by 2 1/4 hour workshops that were presented by independent consultants. Most of the presenters shared teaching techniques they had developed or that were developed and researched by a center they were affiliated with. Many of the workshops included information on physiological factors that are thought to promote or retard brain function. The presenters discussed what they judged to be the implications of this research for classroom instruction.

For example, one workshop showed classroom exercises and pacing techniques adapted from brain research done on stroke victim rehabilitation. These exercises have been documented to be effective through medical testing. That same workshop discussed how minor dehydration has been shown to slow the brain's ability to function, and claimed that many children suffer from the first stages of dehydration because of the drying effect of school heating systems and the limited access they have to drinking water. While much of the information in the workshop was based on solid medical research, a good portion of it relied on the presenter's personal research in schools where she had implemented her learning techniques. When asked to document research on her program, the presenter said that there was research but she did not have references handy or a summary of the research. Clearly, presenting a research summary was not seen as a priority.

The second day featured Thomas G. West. author of *In the Mind's Eye*, who has done historical/cultural studies of the contribution of visual and spatial thinking to the acquisition of knowledge. Interwoven in his discussion were examples of how computer technology, particularly graphic capabilities, was transforming information systems. In addition, he hypothesized that dyslexia is an extreme example of working with the right instead of the left side of the brain. He points out that such right brain talent is very valuable to society and should be recognized as such. He highlighted examples of dyslexics such as Harvy Cushing whose three-dimensional drawings of the brain revolutionized brain surgery, but who could never spell or read well. In his conclusion, he urged teachers to broaden their conceptions of how students perceive and learn in order to respect and cultivate all talents and ways of knowing.

His speech was followed by two more workshop sessions that repeated topics from Friday night, and also added workshops by several practitioner groups from the Fairfax schools. These practitioner/presenters shared how they worked with cultural and learning diversity in their classrooms by using learning style methodology. They also demonstrated their use of learning style methodology for ESL instruction. Thus, the workshops provided both "expert" and practitioner knowledge. However, the practitioner workshops had a consistently lower attendance than did the workshops run by presenters with reputations among educational circles and who presented on "hot" topics such as multiple intelligence, accelerated learning, and left/right brain information.

I attended a practitioner workshop on accommodating diversity. The session was run by a dynamic panel of teachers who presented many examples of curricula they had used in a local elementary school. They also discussed

the issues they had faced in adding new curriculum and teaching techniques. What was perhaps the most interesting aspect of the workshop was the manner in which the workshop leaders freely combined learning style ideas, whole language theory, multiculturalism, constructivist ideas, and fairly traditional methodology. This interweaving of techniques and theories appeared to reflect their sense that these methodologies were linked by a common philosophical thread.

Rita Dunn was present and her work on learning style was praised, always with the statement that her *LSI* was reliable and valid; however, she was not a major speaker. She ran one workshop that was well attended but neither she nor her theory seemed to dominate the conference. If anything, theories connected to brain research appeared to eclipse Dunn's theories. Nevertheless, at one point in the program, Dunn was honored by one of the conference coordinators for her work in helping to start learning style centers.
Dunn was given a watch with the inscription, "a woman ahead of her time." Thus, Dunn's work is still viewed respectfully by teachers who subscribe to learning style ideas; it is seen as one of the seminal bodies of practical research on learning differences.

<u>Practitioner Response to the Conference</u>:

Teachers were observed at workshops and informally interviewed at the intervals between presentations. Several recurring themes
were evident from their discourse and behaviors.

First, most of the teachers who attended did not subscribe wholly to any one theory. In a sense, they were shopping for techniques and methods with

specific students in mind. For example, one special education teacher from a nearby system attended the workshop on brain behavior and the unconscious because it promised to offer understanding of student behaviors she had witnessed in her classroom. She reported that she gained valuable insight into why her students might be losing their attentional focus and garnered as well some activities and techniques to use when their attention wandered. Similarly, another teacher came literally rushing over to a colleague after attending one of the workshops, announcing that she had found some techniques that she felt certain would help with a problem student they both taught.

In addition, the workshop provided an opportunity for teachers to network and share successful techniques. The need for teachers to have more time to consult with their colleagues has been well documented, and this need was certainly evident at this conference. There was an almost frenetic sharing of experience and ideas at every break and over lunch.

Few of the teachers seemed to be actively interested in examining the research base behind what was presented. This lack of concern about the research behind what was presented appeared to stem from the practitioner's focus on gaining practical tips. From their perspective, techniques that made their classroom run more smoothly were valuable. After all, as some of them commented, research takes time and they have to produce every day. Thus, in a sense, they saw themselves as practical researchers, willing to give a technique a try that seemed reasonable.

However, this willingness to suspend judgment did not mean that no one questioned the statements that were made by presenters. Several were dubious when workshop leaders made broad or sweeping statements. As one teacher

stated after a presenter implied that L.D. students had problems because their brain dominance pattern differed from the style that was needed to succeed in a traditional classroom, "there has to be more to it than that. I have worked with L.D. kids and it seems like a very complex thing."

However, overall, teachers at the conference seemed to feel that the idea of differences was sensible and that finding learning techniques to serve diversity was important. The people attending wanted to discuss differences seriously and to find activities that would assist them in serving more children. The closing speech summed up the overriding spirit of the conference by stating that "learning is personally constructed and styles drive that construction."

Aside from the keynote addresses which were presented as lectures, the sessions of the workshop modeled many of the presenters' methodologies; the sessions were highly interactive. The presenters had polished presentations that appeared to be engaging for most of the teachers who attended.

Exploratory Study 3

4MAT Level II Training Seminar

Date and Location The training was held on January 22, 23, 29, and 30, 1996 at a small community college in the western part of North Carolina with an enrollment of under 500. The college offers primarily technical and allied health assistant programs along with a small liberal arts transfer program.

Participants

Approximately 30 of the faculty of the college attended. This group constituted a second wave of training that was mandatory because the college had decided to adopt the 4MAT method in all of its instruction. A first wave had gone through "voluntarily" about 6 months earlier. The faculty attending had taken Fundamentals Training voluntarily either 5 or 6 months earlier.

The participants taught a wide range of subjects: electronics, automobile body work, nursing, occupational therapy, child care, history, science, computer science, math, and business.

Instructor

The instructor was a top level trainer from Excel who works with business as well as educational organizations in North Carolina. The college requested that she return as they felt that her previous work had been excellent. She gave a very expert presentation.

Setting

The workshop was held in a conference room at the college. The room was well arranged with excellent audio-visual equipment and lighting. Snacks and refreshments were served at a table in the rear and the college treated the faculty to lunch on the last day of the workshop.

The Training Procedure

The training followed the format of the Level II course curriculum. The workshop material was essentially the same material that was covered in Fundamentals Training except that more emphasis was placed on developing lesson plans and on understanding the fine points of style and left/right brain differences.

Observations

On the first day, the workshop began with a pep talk by the Dean of the Faculty who endorsed 4MAT and encouraged the staff to engage fully in the training, thanking them for the time they were giving. The teachers were a reluctant group at first because they did not voluntarily select this session for training. In order to participate they were required to make substitute arrangements for their classes. As a result, they were concerned about their students, probably more so than usual because the college had already missed several days of class work during a recent ice storm.

The trainer entered into this situation rather innocently, having thought that the teachers were coming to the training voluntarily and that they would not have to worry about their classes during the training. All previous trainings had been voluntary and had taken place during breaks between quarters.

Additional tension was created by a recent state mandate requiring the upgrading of community college faculty. Originally, instructors were hired who were successful in their field whether they had academic credentials or not. Thus, a number of the current faculty had not earned a B.A. The State of North Carolina had recently mandated that all community college faculty hired in the future have master's level training. This mandate produced animosity between old and new faculty and put older, less educated faculty on the defensive at the training.

However, in spite of these negative undercurrents, the teachers gradually became quite involved in the workshop and many grew increasingly more enthusiastic about the workshop content. On the first day, people straggled in, an apparent form of passive resistance, but as the workshop progressed, teachers entered more enthusiastically into the workshop activities; however, the pressure to maintain their classes and concentrate on the workshop concurrently definitely took a toll on the teachers who often seem tired or disgruntled at the beginning of the sessions.

Moreover, the first day of training had to end early in order for the faculty to attend an important all-college meeting. At the meeting, the president announced his resignation, ostensibly for health problems, but rumor had it that campus politics also played a significant role. This resignation deflected

attention and focus from the workshop, although the current vice-president, who would be temporarily in charge, was felt to be a major supporter of 4MAT.

Participant Response

As I participated in the workshop, I questioned the faculty that shared group activities with me, and I informally interviewed teachers at breaks and at lunch. I also observed how well-received the ideas were and how actively the teachers engaged in the workshop activities.

Many of the faculty felt that the first training had influenced their teaching, but they had not adopted the 4MAT system in a consistent way. Most did not feel adequately prepared to implement 4MAT methodology in its entirety. For example, one instructor, who taught in the allied health program, had introduced more group and cooperative activities into her teaching even though she herself was not drawn to those kinds of instructional techniques. She made the change because she felt the workshop showed her the importance of such activities for certain types of students. At the workshop, she had seen that a number of her colleagues enjoyed and benefited from such activities and had been convinced that she needed to include more group activities in her teaching repertoire. In addition, she and her co-worker, who had a different learning style, began to collaborate on lessons plans, with the assumption that the combining of their different learning and teaching styles would produce lesson plans superior to those they would develop individually.

Several of the instructors complained that they felt overly pressured by the college to implement 4MAT, that the college had chosen "Pepsi over Coke"

and had not allowed the staff to evaluate different learning style systems and incorporate them as they saw fit. However, it must be noted that several of the faculty who were the most adamant about this later volunteered to share their 4MAT lesson plans in front of the group and, at least on the surface, were very enthusiastic participants in the workshop. Whether this show of enthusiasm was politically motivated or was a genuine response to the content of the workshop is hard to know. No doubt it was some combination of the two.

Several faculty voiced concern that the training would be used as evidence by the administration of its efforts to grips with larger instructional problems. They feared that the college would rest on its efforts to train teachers in 4MAT and fail to confront broader issues that involved resource management and the setting of program priorities. For example, one of the math faculty brought up the pressures in the "leaner, meaner" times of the 90's to cut costs and to move students through their programs rapidly. She worked with older adults who were coming back to college to be retrained through limited federal job displacement funds. She questioned whether these students could realistically meet their goals in the time frame that the funding allowed and that the college had designed. She worried that the administration would think that a change in methodology was adequate to solve the larger instructional problems that the college faced. She recognized that 4MAT was a valuable instructional system, but felt there were limits to what it could accomplish. Another faculty member took me aside to make sure that I heard a less enthusiastic workshop member. He wanted more research information on 4MAT. Skeptical of the administration's enthusiastic endorsement of 4MAT,

he judged it to be an effort to find an easy solution to broader problems that the college needed to solve.

Even those teachers who were actively participating in the 4MAT program at the college were evaluating its performance as they used it and were adapting it to their own needs. For instance, one of the teachers in the earlier training was enthusiastic about the program and was, in fact, having some of her lessons published by 4MAT. Still she had questions. She found that her older students discounted group and hands-on learning unless the activities had a high face validity that connected the activity to the course curriculum. This particular instructor planned to use the same tests she had employed for the last two years in order to keep a detailed record of how her current students performed. She wanted to document for herself that this methodology was truly producing improved student performance. On an anecdotal level, she felt that her younger students had benefited greatly from her new techniques. They had been very passive when she taught traditionally and now were activity involved in their own learning. However, she also planned to assess their actual performance carefully. Similarly, some of the teachers who taught in the allied health fields felt the demands of licensing pressed them for time. Although they felt 4MAT had potential for conceptual learning, they wondered if they could make 4MAT work with the volume of material their students had to master.

Almost all the teachers I interviewed felt that the initial workshop had affected their teaching either in terms of added teaching strategies or in terms of how they perceived their students. None were actually using the 4MAT wheel for regular planning at this point, although several felt they would after

the second training. Several commented that the student response to the new activities that they had incorporated was "tremendous."

I also asked as many teachers as possible why they had not volunteered for a second session. The answers varied considerably and demonstrated that participation in training is influenced by many variables. A number of the teachers had enjoyed the first training, but had not signed up for the second training because of family illness or personal commitments. Thus, their decision to participate in the training was not based on an evaluation of the training itself but determined by personal factors that demanded their time. One older faculty member, for example, mentioned that she relied heavily on the interim session between quarters to rejuvenate because her health was poor.

Moreover, even though the first group to complete Level II did have the reputation of being very "gung ho" 4MAT, it is likely that their decision to volunteer was influenced by knowledge of the administration's favorable attitude towards those who enrolled in the trainings. Therefore, no clear meaning can be drawn from whether a faculty member did or did not volunteer for the Level II workshop when it was first offered.

Other Observations

At the end of the training the presenter mentioned a number of ways that 4MAT was now being used in areas other than the classroom. In fact, as often happens with "hot" educational ideas that are promoted by medium sized consulting firms, Excel is beginning to do almost more consulting with business than with education. The trainer also mentioned that the Association for Supervision and Curriculum Development (ASCD) has deemed 4MAT the

best model for integrating technology into curriculum. In addition a student teacher preparation textbook soon to be published will carry a chapter on 4MAT. The Smithsonian has asked Excel, Inc. to use 4MAT methodology to set up an exhibition. Thus, 4MAT methodology is continuing to grow in popularity and, consequently, Excel is flourishing.

Appendix C

Questions on the Gusky and Passaro Scale (1994)

1. When a student does better than usually, many times it is because the teacher exerts a little extra effort.

2. The hours in my class have little influence on students compared to the influence of their home environment.

3. The amount a student can learn is primarily related to family background.

4. If students aren't disciplined at home, they aren't likely to accept any discipline.

5. I have not been trained to deal with many of the learning problems my students have.

6. When a student is having difficulty with an assignment, I often have trouble adjusting it to his/her level.

7. When the grades of students improve, it is usually because their teachers found more effective teaching approaches.

12. If a student masters a new concept quickly this might be because the teacher knew the necessary steps in teaching that concept.

13. If parents would do more for their children, teachers could do more.

14. If a student did not remember information I gave in a previous lesson, I would know how to increase his/her retention in the next lesson.

15. The influences of a student's home experiences can be over come by good teaching.

16. If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect him/her quickly.
17. Even a teacher with good teaching abilities may not reach many students.
18. If a student couldn't do a class assignment, most teachers would be able to accurately assess whether the assignment was at the correct level of difficulty.
19. If I try hard, I can get through to even the most difficult or unmotivated students.
20. When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his/her home environment.
21. My teacher training program and/or experience did not give me the necessary skills to be an effective teacher.

Factor Item Loadings for the Gusky and Passaro Scale (1994)

Item No.	Item	Loading
	Items loading on Factor 1--External	
9	I am very limited in what I can achieve because a student's home environment is a large influence on his/her achievement.	.778
20	When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his/her home environment.	.682
10	Teachers are not a very powerful influence on student achievement when all factors are considered.	.664
4	If students aren't disciplined at home, they aren't likely to accept any discipline.	.610
3	The amount a student can learn is primarily related to family background.	.572
2	The hours in my class have little influence on students compared to the influence of their home environment.	.563
5	I have not been trained to deal with many of the learning problems my students have.	.448
6	When a student is having difficulty with an assignment, I often have trouble adjusting it to his/her level.	.421
13	If parents would do more for their children, teachers could do more.	.411
17	Even a teacher with good teaching abilities may not reach many students.	.344
21	My teacher training program and/or experience did not give me the necessary skills to be an effective teacher.	.289
	Items loading on Factor 2--Internal	
11	When the grades of students improve, it is usually because their teachers found more effective teaching approaches.	.700
12	If a student masters a new concept quickly, this might be because the teacher knew the necessary steps in teaching that concept.	.619
7	When a student gets a better grade than he/she usually gets, it is usually because I found better ways of teaching that student.	.601
14.	If a student did not remember information I gave in a previous lesson, I would know how to increase his/her retention in the next lesson.	.592

1	When a student does better than usually, many times it is because the teacher exerts a little extra effort.	.546
8	When I really try, I can get through to most difficult students	.534
19	If I really try hard, I can get through to even the most difficult or unmotivated students.	.503
16	If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect him/her quickly.	.441
15	The influences of a student's home experiences can be overcome by good teaching.	.423
18	If a student couldn't do a class assignment, most teachers would be able to accurately assess whether the assignment was at correct level of difficulty.	.343

Appendix D
Surveys

Pre-Workshop

The Impact of Learning Style Training

Identifying Number: _____ *(Please use the numbers in your mother's most recent street or rural route address, followed by the number of children your mother had -- This will be the ID number you will use on all follow-up surveys.)*

How many years have you taught? _____

What grade level do you primarily teach? (*please circle one)*

1) K-2
2) 3-5
3) 6-8
4) 9-12

Have you attended other workshops that involved learning style theory?

1) YES
2) NO

If yes, please describe.

Do you primarily teach classes that are? ... *(please circle one)*

1) HIGH ABILITY
2) AVERAGE ABILITY
3) LOW ABILITY
4) MIXED ABILITY

To what degree do you agree with each of the statements below? *(Please indicate your level of agreement by circling one number. 1= strongly disagree.....6 = strongly agree)*

1) When a student does better than usual, many times it is because the teacher exerts a little extra effort	1	2	3	4	5	6
2) The hours in my class have little influence on students compared to the influence of their home environment	1	2	3	4	5	6
3) The amount a student can learn is primarily related to family background	1	2	3	4	5	6
4) If students aren't disciplined at home, they aren't likely to accept any discipline	1	2	3	4	5	6
5) I have not been trained to deal with many of the learning problems my students have	1	2	3	4	5	6
6) When a student is having difficulty with an assignment, I often have trouble adjusting it to his/her level	1	2	3	4	5	6
7) When a student gets a better grades than he/she usually gets it is usually because I found better ways of teaching that student	1	2	3	4	5	6
8) When I really try, I can get through to most difficult students	1	2	3	4	5	6
9) I am very limited in what I can achieve because a student's home environment is a large influence on his/her achievement	1	2	3	4	5	6
10) Teachers are not a very powerful influence on student achievement when all factors are considered	1	2	3	4	5	6
11) When the grades of students improve, it is usually because their teachers found more effective teaching approaches	1	2	3	4	5	6
12) If a student masters a new concept quickly this might be because the teacher knew the necessary steps in teaching that concept	1	2	3	4	5	6
13) If parents would do more for their children, teachers could do more	1	2	3	4	5	6
14) If a student did not remember information I gave in a previous lesson, I would know how to increase his/her retention in the next lesson	1	2	3	4	5	6

15) The influences of a student's home experiences can be overcome by good teaching	1	2	3	4	5	6
16) If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect him/her quickly	1	2	3	4	5	6
17) Even a teacher with good teaching abilities may not reach many students	1	2	3	4	5	6
18) If a student couldn't do a class assignment, most teachers would be able to accurately assess whether the assignment was at the correct level of difficulty	1	2	3	4	5	6
19) If I really try hard, I can get through to even the most difficult or unmotivated students	1	2	3	4	5	6
20) When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his/her home environment	1	2	3	4	5	6
21) My teacher training program and/or experience did not give me the necessary skills to be an effective teacher	1	2	3	4	5	6

Post Workshop Survey

The Impact of Learning Style Training

Identifying Number: _____ *(Again, please use the numbers in your mother's most recent street or rural route address, followed by the number of children your mother had -- This is the ID number you used on preceding surveys.)*

To what degree do you agree with each of the statements below? *(Please indicate your level of agreement by circling one number. 1= strongly disagree.....6 = strongly agree)*

1) When a student does better than usual, many times it is because the teacher exerts a little extra effort	1	2	3	4	5	6
2) The hours in my class have little influence on students compared to the influence of their home environment	1	2	3	4	5	6
3) The amount a student can learn is primarily related to family background	1	2	3	4	5	6
4) If students aren't disciplined at home, they aren't likely to accept any discipline	1	2	3	4	5	6
5) I have not been trained to deal with many of the learning problems my students have	1	2	3	4	5	6
6) When a student is having difficulty with an assignment, I often have trouble adjusting it to his/her level	1	2	3	4	5	6
7) When a student gets a better grades than he/she usually gets it is usually because I found better ways of teaching that student	1	2	3	4	5	6
8) When I really try, I can get through to most difficult students	1	2	3	4	5	6
9) I am very limited in what I can achieve because a student's home environment is a large influence on his/her achievement	1	2	3	4	5	6

10) Teachers are not a very powerful influence on student achievement when all factors are considered	1	2	3	4	5	6
11) When the grades of students improve, it is usually because their teachers found more effective teaching approaches	1	2	3	4	5	6
12) If a student masters a new concept quickly this might be because the teacher knew the necessary steps in teaching that concept	1	2	3	4	5	6
13) If parents would do more for their children, teachers could do more	1	2	3	4	5	6
14) If a student did not remember information I gave in a previous lesson, I would know how to increase his/her retention in the next lesson	1	2	3	4	5	6
15) The influences of a student's home experiences can be overcome by good teaching	1	2	3	4	5	6
16) If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect him/her quickly	1	2	3	4	5	6
17) Even a teacher with good teaching abilities may not reach many students	1	2	3	4	5	6
18) If a student couldn't do a class assignment, most teachers would be able to accurately assess whether the assignment was at the correct level of difficulty	1	2	3	4	5	6
19) If I really try hard, I can get through to even the most difficult or unmotivated students	1	2	3	4	5	6
20) When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his/her home environment	1	2	3	4	5	6
21) My teacher training program and/or experience did not give me the necessary skills to be an effective teacher	1	2	3	4	5	6

One Month Follow-Up Survey

The Impact of Learning Style Training

Identifying Number: _____ *(Again, please use the numbers in your mother's most recent street or rural route address, followed by the number of children your mother had -- This is the ID number you used on preceding surveys.)*

To what degree are you currently using 4mat techniques?
(Please indicate your frequency of use by circling one number)

1)Regularly
2)Now and Then
3)Almost Never

To what degree do you agree with each of the statements below? *(Please indicate your level of agreement by circling one number. 1= strongly disagree.....6 = strongly agree)*

1) When a student does better than usual, many times it is because the teacher exerts a little extra effort	1	2	3	4	5	6
2) The hours in my class have little influence on students compared to the influence of their home environment	1	2	3	4	5	6
3) The amount a student can learn is primarily related to family background	1	2	3	4	5	6
4) If students aren't disciplined at home, they aren't likely to accept any discipline	1	2	3	4	5	6
5) I have not been trained to deal with many of the learning problems my students have	1	2	3	4	5	6
6) When a student is having difficulty with an assignment, I often have trouble adjusting it to his/her level	1	2	3	4	5	6
7) When a student gets a better grades than he/she usually gets it is usually because I found better ways of teaching that student	1	2	3	4	5	6
8) When I really try, I can get through to most difficult students	1	2	3	4	5	6
9) I am very limited in what I can achieve because a student's home environment is a large influence on his/her achievement	1	2	3	4	5	6
10) Teachers are not a very powerful influence on student achievement when all factors are considered	1	2	3	4	5	6
11) When the grades of students improve, it is usually because their teachers found more effective teaching approaches	1	2	3	4	5	6
12) If a student masters a new concept quickly this might be because the teacher knew the necessary steps in teaching that concept	1	2	3	4	5	6

13) If parents would do more for their children, teachers could do more	1	2	3	4	5	6
14) If a student did not remember information I gave in a previous lesson, I would know how to increase his/her retention in the next lesson	1	2	3	4	5	6
15) The influences of a student's home experiences can be overcome by good teaching	1	2	3	4	5	6
16) If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect him/her quickly	1	2	3	4	5	6
17) Even a teacher with good teaching abilities may not reach many students	1	2	3	4	5	6
18) If a student couldn't do a class assignment, most teachers would be able to accurately assess whether the assignment was at the correct level of difficulty	1	2	3	4	5	6
19) If I really try hard, I can get through to even the most difficult or unmotivated students	1	2	3	4	5	6
20) When it comes right down to it, a teacher really can't do much because most of a student's motivation and performance depends on his/her home environment	1	2	3	4	5	6
21) My teacher training program and/or experience did not give me the necessary skills to be an effective teacher	1	2	3	4	5	6

VITA

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Education

1993-1997: College of Education, Virginia Tech, Blacksburg, Virginia. Ph.D. in Curriculum and Instruction with a specialization in Educational Psychology.

1971-1973: College of Education, Northeastern University, Boston, Massachusetts, M.Ed. in Reading.

1966-1970: Harvard University (Radcliffe College), Cambridge, Mass., B.A. cum laude in English History and Literature. Honors thesis on Joseph Conrad as a political critic.

Training

1996: Completed Level II training in 4MAT, an instructional model based on learning style theory.

1995: Completed Fundamentals training in 4MAT.

1994: Completed beginning level training in consensus decision-making and mediation

1993: Attended a workshop on using the *Myers Briggs Type Indicator* (*MBTI*) to understand learning individuality.

1992: Completed a three-credit graduate seminar on the use of manipulatives in elementary and middle school mathematics instruction.

1991: Received on-the-job training in using Jungian type theory as defined by the *MBTI* to plan curriculum for college students with learning difficulties

1975-76: Received on-the-job training in crisis intervention and active listening.

1975: Received training as a counseling center volunteer on how to counsel women on health issues surrounding pregnancy and birth

Work Experience

1984 to present: Private educational consultant. Test elementary, middle present and secondary students to determine achievement levels and diagnose learning problems. Provide tutoring and design educational programs for students experiencing learning problems.

9/92-6/97: Dabney S. Lancaster Community College, Clifton Forge , Virginia. Talent Search Program Tutor; instructed minority and low-income high school students. (Part-time)

9/88-6/92: Southern Virginia College for Women (Southern Seminary), Buena Vista, Virginia. Adjunct Instructor of Developmental English. Designed and taught a developmental language arts program for students with learning problems.

9/86-9/88: AFS International/Intercultural Programs, Southwest Virginia. Development Specialist; facilitated the start-up of new AFS chapters, recruited host families and high school students for international exchange program. (Part-time)

3/87-6/88: Rockbridge County Schools, Rockbridge County, Virginia. SAT Instructor; taught test-taking strategies for verbal section of the SAT.

1/77-3/85: Dabney S. Lancaster Community College: Employment Skills Program. GED instructor for Aid to Dependent Children recipients; tested all program participants and supervised literacy tutoring. (Part-time)

Youth Employment Training Program. Instructor/Assistant Coordinator; helped establish a youth program that involved work experience and GED preparation, taught GED courses and did diagnostic testing of participants.

Upward Bound. Designed and taught in a remedial English and reading program for minority and low-income high school students.

Evening Program, Clifton Forge campus, GED instructor.

Summer Youth Employment Program. Director of instruction and language arts instructor for high school summer program; designed language arts projects for students at all levels.

9/83-6/84: Rockbridge County Schools Adolescent Day Treatment Program. Taught high school courses to emotionally disturbed adolescents in a special program at the local mental health center. (Part-time)

6/76-9/76: Origins, Inc., Salem Mass. Designed and directed special summer job training/growth program for adolescent female CETA pregnancy.

11/74-6/76: RASTA House, Middleton, Mass., a temporary shelter for runaway adolescents. Counselor. Duties included referral work, individual and group counseling, volunteer training and house management.

6/74-9/74: Salem Youth Commission, Salem, Mass. Coordinator of student group involved in designing an alternative high school program.

9/73-6/74: Salem High School, Salem, Mass. English and Remedial Reading teacher.

Achievements

From 1975 to the present I have been actively involved in the founding and administration of several service and educational organizations.

1989-97: On founding board and currently president of Snakefoot Educational Association an alternative school program in Rockbridge County. Snakefoot was cited in the April, 1994 Sunday *Washington Post* as an innovative educational experiment. Designed the mathematics curriculum for all grades after doing extensive research on mathematics instruction. Applied for and received grant money to expand Snakefoot's programs.

1988-90: Secretary of Rockbridge Area Recycling, a volunteer organization that initiated the start-up of a county-wide recycling program that was later taken over by the local government. Co-authored a newspaper column on recycling issues.

1986-88: Implemented after-school film series as a volunteer with the Rockbridge Regional Library. Also assisted in Literacy Volunteer workshops.

1979: Board member of Rockbridge food cooperative during time of expansion.

1976-77: Volunteer counselor at Reach Out, a local crisis hotline

1975-76: On founding board of a counseling and referral center for women in Salem, Mass. Applied for and received grant monies for initial start-up costs and for program expansion.

As a board member in the above organizations I have done the following:

Completed the necessary paperwork for 501(c)3 tax exempt status and negotiated with the IRS to obtain that status for three organizations.

Helped design the governing structure for three organizations. Translated that structure into a corporate form, and filed the necessary state incorporation papers.

Chaired board and membership meetings and supervised the creation of new programs.

Written numerous newsletters and news releases.