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Multiple Intelligence Domains, Intellectual Styles, and Specific Skills of Freshmen and Seniors at a Metropolitan University: Implications Toward Student Recruitment, Retention, and Success

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Abstract

Using Gardner's (1983, 1993) Theory of Multiple Intelligences, the purpose of this study was to develop, through the exploration of empirical data, an understanding of freshman and senior intelligence at a metropolitan university, and determine if a statistically significant difference existed between freshman intelligence and senior intelligence with regard to the students' multiple intelligence domains, specific skills, and intellectual styles, and within each subject's respective gender, ethnicity, and age group.

Due to the inherent diversity within urban areas, the modern metropolitan university is obviously challenged with educating an immensely diverse student population (Barnett and Phares 1995). Furthermore, the mission and philosophy of the metropolitan university are quite different from the traditional research university (Lynton 1995). The philosophy surrounds a commitment by the university to interact with the metropolitan area and a willingness to adopt a role of leadership in responding to community needs (Johnson and Bell 1995). While student diversity is often linked synonymously with ethnicity (Johnson and Bell 1995), it can also be used to describe other student characteristics, including intellectual ability. However, the traditional view of intelligence is not "fair" to this range of diversity. As a result, many of the current practices within the metropolitan university, based upon the traditional view of intelligence, may be decreasing student success and the rate of student retention (Gardner 1993a; Tinto 1987).

To counter this traditional and very limited view of intelligence, Gardner (1983, 1993a, 1996) argued for the existence of several "relatively autonomous" human intellectual competences, which he referred to as human intelligences. He postulated that the differing intelligences are relatively independent or autonomous from the other, and each can be shaped and joined in a multitude of ways by individuals and cultures. Whereas other attempts have been made to establish independent intelligences, they

have lacked a convincing nature primarily because they rely on only one or two lines of evidence. Gardner's theory, however, was devised through the aid of many diverse sources which include "studies of prodigies, gifted individuals, brain-damaged patients, idiot savants, normal children, normal adults, experts in different lines of work, and individuals from diverse cultures" (Gardner 1993a).

The Different Views and Types of Intelligence

Gardner originally identified seven separate and specific intelligences: linguistic, logical-mathematical, musical, bodily-kinesthetic, spatial, interpersonal, and intrapersonal intelligence (Gardner 1983, 1993a). Gardner has always acknowledged that the original list of seven intelligences is not conclusive, and has since added to this original list the naturalist intelligence. Gardner believed that the first two—linguistic and logical-mathematical—are the intelligences most often valued or "over-valued" in school (Gardner 1996, 1999).

Over the years, Gardner sought to discover the educational implications of his theory. Through his research, Gardner believed his theory on multiple intelligences would assist in the identification of individual's intellectual profile, or proclivities, as a means to heighten one's educational opportunities and options (Gardner 1993a). One such manner by which a student's individual intellectual profile can be identified is through the Multiple Intelligences Developmental Assessment Scales (MIDAS). The MIDAS, which was utilized in this study, assesses and provides a numeric score for the multiple intelligence domains, specific skills, and intellectual styles of students (Shearer 1999c). With such information, educators could devise pedagogical strategies to help students develop their strengths and overcome their weaknesses (Gardner 1993a).

The majority of multiple intelligences theory research in past literature has focused upon the K-12 educational arena (Kerka 2000; Ferro 1999). Recently, however, researchers have begun to consider theory implications within adult and higher education (Visser 1996; Kerka 2000). Gardner's writings have helped to forge a link between his theory and higher education. While admitting that his primary focus has been on the implications of his theory to elementary and secondary education, Gardner has called for the use of his theory to re-think higher education assessment, teaching, and evaluation practices (Gardner 1993a, 1993b).

Specifically, Gardner supported a portfolio approach to college admissions, because in his view, "there is little need and little advantage to be gained by continuing to require the Scholastic Aptitude Test" (Gardner 1993b). Accordingly, Gardner suggested the SAT narrowly addresses only two intelligences—the verbal and logical-mathematical. Furthermore, he made it clear that one does not need to possess the skills necessary to excel on an SAT to be a significant scientist or writer (Gardner 1993b). Similarly, Sternberg (1996) stated, "conventional academic intelligence tests account for less than 10 percent of the individual variation differences in actual performance. Stated another way, more than 90 percent of the variation we see in performance is not accounted for by conventional ability testing."

Instead of relying upon the narrowly focused SAT or its counterparts, Gardner desired colleges to seek evidence of several intelligences. Gardner noted that admission committees will be provided a more authentic picture of applicants through the collection of large-scale project portfolios. By doing so, college admissions procedures would be more sensitive to the range of intelligences and the variety of ways they can be expressed (Gardner 1993b).

However, during a 1997 interview with Checkley, Gardner stated that he does not believe the SAT will drift away "until colleges indicate that they'd rather have students who know how to use their minds well—students who may or may not be good test takers, but who are serious, inquisitive, and know how to probe and problem-solve. That is really what college professors want" (Checkley 1997). Likewise, Smagorinsky wrote, "With historical values institutionalized in standardized assessment practices, it's hard to persuade educators and their constituencies that alternative ways of learning are equally valued. (Smagorinsky 1996)"

Gardner further believed the college experience could benefit from a multiple intelligence perspective. For instance, instructors should reduce their reliance on short-answer tests, and students should be provided credit for strenuous work conducted in a variety of intellectual domains. Advisers should be selected with consideration of students' intellectual profiles and should be sensitive to the range of courses and evaluative styles appropriate for given students. Faculty and students should develop greater awareness of the profiles of abilities and difficulties that students might have and the implications of those profiles toward planning a successful college experience (Gardner, 1993b). Likewise, multiple intelligence teaching approaches can also help enhance faculty collegiality (Hoerr 1996a).

Furthermore, Gardner addressed a desired match between students and methods of instruction (1993a). Given a wide range of cultural goals, and an even greater variety of intellectual profiles, the challenge of obtaining a match between student and method may seem overwhelming. In fact, however, students have managed to learn even when lessons are in no way tailored for them, presumably because most curricula are redundant, and because the students themselves possess an array of intellectual strengths and strategies on which they can draw. A "matching system" should help ensure that a student can rapidly and smoothly master what needs to be mastered, and thus be freed to proceed further along both optional and optimal paths of development.

In a study conducted by Sternberg (1996), high school students were taught psychology in a manner that either matched or mismatched their patterns of analytical, creative, and practical intelligence. From this study, Sternberg found students performed significantly and substantially better when there was at least a partial compatibility between the students' patterns of abilities and the form of instruction. Therefore, when teachers teach toward the strengths of students, the performance of students will become better. In reality, educators focus their teaching only toward those students with strong memory and analytical abilities (Sternberg 1996).

Gardner additionally wrote, "the idea of matching individuals with particular subject matters and/or styles of teaching is familiar and has implicitly guided much instruction since Classical times. It is therefore disappointing to note that attempts to document significant improvements as a result of matching students with appropriate teaching techniques have not met with much success" (1993a).

"If universities were in the business of improving the student experience, they would attempt to teach better," according to Smith (1992). And educators need to include all areas of the intelligences within their teaching, thereby assisting the full spectrum of learning strengths (Campbell and Campbell 1994). Smith (1992) further stated that the best teachers should be rewarded and recognized for their work. This would allow others to become aware of the tremendous benefits that are derived from being a superb instructor, including finding ways to create small group learning; rearranging the curriculum in such a way as to make it more accessible to individuals; making self-directed learning a possibility; and using interesting and attention-grabbing lecture methods, multi-media, and computer-assisted education. Instructors who are successful at using innovative teaching techniques should be singled out for praise, advancement, raises, and promotions. According to Smith, the reward system creates the opposite situation. Individuals who actually reach out, arranging continuing education, part-time education, distance education, and creating accessible education for those who are disadvantaged, do so "as a labor of individual love and not because they seek special rewards." Smith continued by stating some educators claim they sacrifice their chance for promotion at the university level because they emphasize those kinds of educational activities. Rewards, according to Smith, are found for publication in the research area and not for innovative teaching techniques.

Additionally, Tinto (1983) concluded,

> If institutions wish to make substantial progress in educating and retaining more, especially those who have been under-represented in the higher educational system, their communities must involve all students. They must actively engage students in the life of the classroom and allow them to gain a valued voice in the educative process. To a very real degree, our failure to make significant improvements in learning and retention over the past several decades reflects the regrettable fact that student experience has not led students to become actively involved in learning. Instead, they have been alienated from education, seeing the task of college completion as a barrier to be overcome, a ritual to endure, rather than an experience to be valued.

Finally, scholars hypothesized that many capable college and university students are caught in an educational system that traditionally places great emphasis on the linguistic and logical-mathematical intelligences (Diaz-Lefebvre, Siefer, and Pollack 1998; Teele 1996). By focusing primarily upon the linguistic and logical-mathematical learning strategies, many professors promote rote-memorization teaching methods that create little connection to the material, decrease student motivation, and foster poorer student performance. These scholars theorize that to uncover the true potential of

students, professors must learn how to use multiple methods of learning stimulation to assist in the effective mastery of the course content (Diaz-Lefebvre, Seifer, and Pollack 1998). According to Jordan (1996), "Recognizing that students learn differently and develop at varying rates makes educational change imperative."

This is particularly true within the metropolitan university. Metropolitan and urban universities attract a diverse population of students due to the location of these universities in the heart of urban centers and metropolitan areas. Consequently, the student population is older and more ethnically diverse. Additionally, many of these students come to the university academically under-prepared for college and academically distanced from advanced learning due to their multiple life roles (Franklin 1999). It is reasonable to hypothesize that this diversity in cultural exposure, chronological maturity, educational preparation, and distance forced by divergent life roles can equate to a diversity in intelligence. One deductive conclusion from this suggested hypothesis is that Gardner's theory of multiple intelligences, along with its implications for teaching practices, may provide a valid foundation for developing new collegiate pedagogical methods to connect diverse intelligences with advanced knowledge.

The Challenge of Metropolitan University Students

Current educational practices in metropolitan universities primarily favor a traditional view of intelligence, which narrowly focuses upon verbal memory, verbal reasoning, numerical reasoning, and appreciation of logical sequences. However, recent intelligence research supports evidence of intellectual plurality. Therefore, a possible mismatch between student intelligence and university focus and practices may exist. This is in contrast to the metropolitan university mission, which promotes teaching that is "adapted to the diverse needs of metropolitan students" (Coalition of Urban and Metropolitan Universities 2000). By concentrating primarily upon the verbal-linguistic and logical-mathematical intelligences, metropolitan universities may not be fully meeting the diverse intellectual needs of students. This study is based on the following hypotheses about the intellectual styles of metropolitan university students.

Hypotheses

- There is no statistically significant difference (a=.01) between the mean multiple intelligence scores of undergraduate freshman and senior students, and within their same demographic variables of gender, ethnicity, and age group.
- There is no statistically significant difference (a=.01) between the mean intellectual style scores of undergraduate freshman and senior students, and within their same demographic variables of gender, ethnicity, and age group.
- There is no statistically significant difference (a=.01) between the mean specific skill scores of undergraduate freshman and senior students, and within their same demographic variables of gender, ethnicity, and age group.

Research Methodology

The purpose of this study was to investigate the multiple intelligence domains, specific skills and intellectual styles of freshmen and seniors enrolled in a metropolitan university located in the southwest, to understand if a statistically significant difference existed between the two groups during the fall semester of 2001. Additionally, this study determined if a statistically significant difference was found among the multiple intelligence domains, specific skills, and intellectual styles of these students within their respective variables of gender, ethnicity, and age. This research is significant since it provides data that may serve to increase the student success rate and retention rate in metropolitan universities.

Using a quantitative research design, a cluster sample of approximately 1,155 freshmen and seniors was drawn from a total population of 3,030 freshmen and 1,850 seniors. The total enrollment for the university of study during fall 2001 consisted of 11,318 students.

Sample

The cluster sample included 98 classes located within the six colleges of the university: College of Education, College of Business, etc. The researcher identified the cluster sample using the fall 2002 Course Bulletin as the sampling frame. Each cluster was chosen based on the following sampling criteria: *(a)* 1000-level history, algebra, political science, English and speech for freshmen, and *(b)* 4000-level courses for seniors. After drawing the sample, the researcher contacted the instructor for each course for voluntary participation. The researcher met with each participating class, and distributed the survey instrument to volunteering freshmen and seniors.

Instrumentation

To assess and obtain a score for each of the multiple intelligences, specific skills and intellectual styles of students, the Multiple Intelligence Developmental Assessment Scales (MIDAS) questionnaire was selected. The MIDAS questionnaire was developed by C. Branton Shearer, and is supported by Howard Gardner (Shearer 1999c). Four versions of the MIDAS exist: MIDAS-Adults, Teen-MIDAS (ages 14–18), MIDAS-KIDS (ages 10–14) and MIDAS-My Child (ages 6–9) (Shearer 1999a). The MIDAS-Adults was the version utilized for this study.

The MIDAS were created to provide an objective and effective means by which one may obtain a descriptive assessment of a student's multiple intelligence profile. MIDAS is a measure of intellectual disposition that can be reported by an individual (self-report) or by a knowledgeable informant, such as a parent or teacher. The MIDAS provides data concerning intellectual development, activities, and propensities that are not typically provided through standardized intelligence or aptitude tests. The MIDAS also provides information directly from the person's (and/or informant's) experience that is useful for educators, personalized learning, curriculum design, and the counseling process (Shearer 1999a).

The MIDAS was developed using a rational-empirical approach based on Gardner's Theory of Multiple Intelligences. From a detailed investigation of Gardner's theory, one hundred twenty one initial questions were created for the MIDAS. Each question was written in one of three forms. The first form asks the test taker to consider the frequency or duration of time he or she participates in a particular activity. The second form of question asks the test taker to consider or assess his or her performance on a specific activity. Finally, the third type of question asks the test taker to address the enthusiasm he or she has for a particular activity (Shearer 1999c).

Following the creation of the initial set of questions, the questions and the scale content were examined and reviewed by experts, including Multiple Intelligences theorist Howard Gardner. The questions were further evaluated during in-depth interviews with volunteers, and a series of empirical investigations provided descriptive item statistics. Based upon the evaluations, the questions and scale content were evaluated, revised, and some portions were added and others removed. Additionally, the series reviews provided reliability and validity information for the questionnaire (Shearer 1999c).

Reliability

The mean Alpha reliabilities for the seven scales in four studies ranged from .76 to .87. It can therefore be determined that the questions for each scale were answered in a consistent manner by the respondents around a common theme. Further, the test-retest reliability studies of temporal stability provided evidence that there is some variability in response patterns, but the overall results are sufficient with strong correlations above .80 (Shearer 1999c).

A categorical agreement rate of around 80 percent, plus or minus one category, existed when the self-report responses were compared with the responses made by a knowledgeable informant. An exact categorical agreement rate of 40 percent also existed (Shearer 1999c).

Investigation into cultural bias was also undertaken. Through a study of 119 college students (58 African-American and 50 Caucasian) in a Pan-African Studies program, the mean score for six of the seven scales was determined not to be statistically different for the two groups. The only statistical difference existed within the Spatial scale, where Caucasian students scored 6 percentage points higher (Shearer 1999c).

Validity

The validity of the MIDAS scales has been examined concerning the following: content validity, construct validity, concurrent validity, predictive validity, and contrasted criterion groups validity. To determine if the MIDAS could successfully distinguish the seven distinct constructs, an initial research question was created. This initial exploratory factor analysis involved 349 participants and successfully distinguished, in addition to the seven hypothesized constructs, an eighth. The eighth factor was later termed "Leadership." Those items which were created to assess specific intellectual abilities correlated with those factors for which they were intended

to correlate, or co-loaded appropriately on two factors. A multi-trait/multi-method study was conducted to examine discriminant and convergent validity. Findings showed validity coefficients that were moderately strong when the identical trait was assessed by differing methods (ranging from .54 to .80). In general, the validity coefficients were greater than the correlations among those traits measured by the same and different methods (Shearer 1999c).

Additionally, the MIDAS scores of participants were compared to a battery of brief tests of the same or a related ability to investigate concurrent validity. As an example, when the Linguistic and Logical-Mathematical scores were combined, a brief measure of IQ correlated at .59. Similarly, when the measures of Vocabulary and Expressive Sensitivity Fluency were combined, the Linguistic scale correlated at .60. The tests of Abstraction and Calculations (Intra) likewise correlated at .58 with the Logical-Mathematical scale. Overall, Shearer (1999) determined "the patterns of correlations to be moderate and in the expected directions with appropriate tests" (Shearer 1999c).

In a study of 224 college students, *(see Table 1)*, the self-reported scores agreed with the ability scores provided by their professors 86 percent of the time, plus or minus one category. Additionally, this study compared MIDAS scores from fourteen specific groups that were expected to be strong in a particular intelligence. For instance, dancers were expected to score high in the kinesthetic intelligence, and creative writers were expected to score high in the linguistic intelligence (Shearer 1999c).

Table 1
Group Mean Scores—Shearer Study (MIDAS Validity)

Scale	College Group	*M*	HS Group	*M*	All HS Students*	M
Kinesthetic	Dancers	65	Sports	57		48
Spatial	Interior Design	66	Art Class	58		49
Musical	Music Theory	72	Band	62		49
Logical-Mathematical	Number Theory	65	Academic Team	66		48
Linguistic	Creative Writing	62	Newspaper	58		51
Interpersonal	Student Leaders	65	Drama Club	64		55
Intrapersonal	mixed	55	Debate	59		50
Innovation	Design & Sculpture	60	Art Club	54		47
Leadership	Student Leaders	65	Student Government	64		51
General Logic	mixed	55	Academic Team	63		52

*N=2,294 (Shearer 1999c)

More than four hundred adults in eighteen various occupational groups were similarly surveyed with the MIDAS. Although the size of each group was small, the patterns of high and low mean scores for the different groups were expected for the professions they represented. *Table 2* provides the findings.

Table 2

High/Low Occupational Group Mean Scores—Shearer Study (MIDAS Validity)

Scale	High	*M*	Low	*M*
Musical	Musicians	73	Firemen	34
Kinesthetic	Dancers	67	Writers	33
Logical-Mathematical	Engineers	68	Elem. Teachers	44
Spatial	Artists	68	Writers	41
Linguistic	Writers	72	Skilled Trade	43
Interpersonal	Psychologists	68	Engineers	45
Intrapersonal	Pilots	68	Writers	49
Leadership	Supervisors	66	Skilled Trade	43
General Logic	Pilots	66	Musicians	52
Innovation	Dancers	57	Police	44

(Shearer 1999c)

Data Collection

Data collection for this study consisted of demographic survey questions and the Multiple Intelligence Developmental Assessment Scales (MIDAS) questionnaire. The demographic survey provided data concerning each subject's undergraduate classification, gender, ethnicity, and age. The MIDAS questionnaire consisted of 119 questions and was used to assess and obtain multiple intelligence, specific skill, and intellectual style scores, ranging from 0 to 100, for each subject.

Data collection took place during the third week of September and first full week of November 2001. The researcher scheduled and met with each of the participating classes once during the data collection process. During the visit, the researcher provided a cover letter, MIDAS questionnaire with student instructions, scantron sheet, and #2 pencil to each volunteering student. The cover letter guaranteed to each student the confidentiality of the data provided by the student. The letter further noted that the research had been approved, as required by the Institutional Review Board for Research Involving Subjects. The subjects were instructed by the researcher to provide demographic information on the scantron form. Each student provided the following information on the appropriate spaces provided on the scantron form: Gender (male/female); Grade Level (13=Freshman, 16=Senior); Age; and Ethnicity (01=African-American; 02=Asian American; 03=Hispanic-American; 04=Native American; 05=Non-Resident/Alien; 06=White; 07=Other). The above information was explained verbally, with occasional written assistance cues on the chalkboard/white board.

After completing the demographics section, students were informed they had one week to review the brief introduction and instruction section, and complete the MIDAS. The 119 questions were provided in eight multiple intelligence categorical sections (musical, kinesthetic, etc.) of approximately 9 to 20 questions each. Finally, students were instructed to return the completed MIDAS scantron to the exact class from which it was distributed. The researcher provided each course professor with a self-addressed, stamped envelope in order that the completed scantrons could be collected, mailed and

returned to the researcher. Prior to leaving the classroom, all students and professors were thanked for their participation.

During the data collection process, a total of 98 classrooms from the six university colleges were visited by the researcher, and 882 MIDAS questionnaires were distributed to volunteering freshmen and seniors at the University of Arkansas at Little Rock. A total of 363 completed questionnaires were returned to the researcher from 142 freshmen and 221 seniors.

Data Analysis

The completed scantron sheets were sent to Dr. C. Branton Shearer, the MIDAS developer, at Multiple Intelligence Research and Consulting, Inc. in Kent, Ohio. The sheets were scanned, scored and returned in electronic MIDAS profile and database formats. The data were entered into a software scoring program that generated an individualized MIDAS student profiles for each of the subjects.

The profiles provided data in four primary areas. First, the profiles provided a graph that represented the general strengths and limitations for each of the eight intelligence domains. Second, the profiles represented the general strength and limitations for each intellectual style. Third, they provided a rank-ordered list, from highest to lowest dominance, of each of the specific skills. Each skill was also paired with its particular categorical intelligence. For example, the skill of "written-academic" was categorically placed within the linguistic intelligence, and the skill of "interpersonal work" was placed within the interpersonal intelligence. Lastly, the profiles supplied a percentage, based on the total number of completed items, for each of the multiple intelligence domain main scales, specific skills subscales, and intellectual styles.

The quantitative data were also returned to the researcher in an SPSS database. The researcher analyzed the data with the assistance of NCSS and SPSS software to determine the dominant multiple intelligences, specific skills, and intellectual styles of the entire sample. Additionally, the mean scores for the multiple intelligences, specific skills, and intellectual styles of the freshmen and seniors were obtained and analyzed. Quantitative data analysis methods, including the Repeated Measures Analysis of Variance, were utilized to determine if a statistically significant difference existed between the multiple intelligence domain scores of freshmen and seniors. The Repeated Measures ANOVA was also conducted for each of the intellectual styles and specific skills. Post hoc comparisons using Scheffe's procedure were also utilized to determine if and where any statistically significant difference existed between the multiple intelligence domain scores, intellectual style scores, or specific skill scores of freshmen and seniors within the same demographic variables of gender, ethnicity, and age group. While statistically controversial to consider post hoc comparisons without a statistically significant F value, these post hoc procedures were utilized to identify areas of significance between the freshman and senior scores, even in those instances when no significant ANOVA F value was identified. This action is explained by Hinton (1999) as follows: "we are saying that, prior to knowing whether the ANOVA F value was significant or not, we were interested in this comparison in particular."

Within this study, the researcher is particularly interested in those specific comparisons between freshmen and seniors within the same demographic variables of gender, ethnicity, and age group. Therefore, while controversial, the researcher decided to take the school of thought that allowed for the consideration of post hoc comparisons between freshmen and seniors, specifically within the same demographic variables, even if a significant *F* value was not identified.

The response variable for each procedure was the MIDAS scores received for a particular multiple intelligence domain. The factor variables were (1) gender, (2) grade level, (3) ethnicity, and (4) age group.

To verify the appropriateness of using the Repeated Measures ANOVA procedure, the following assumptions about the data were tested: continuity, normality, homoscedasticity, independence, and random sampling. The assumptions were tested and met. Through a data screening procedure, the response variable scores were tested and confirmed as continuous. The assumptions of normality and homoscedasticity were tested by running the multiple regression procedure. Probability values and probability plots confirmed normality. A residuals vs. predicted plot confirmed homoscedasticity. Finally, the assumption of random sampling was confirmed as functions of the design of the study.

Findings

Descriptive statistics were utilized to determine the highest mean scores within the multiple intelligence domains, specific skills, and intellectual styles of the entire sample, and each of the undergraduate sub-samples. The mean intelligence domain scores for the entire sample are as follows: interpersonal, 55.91; intrapersonal, 55.46; linguistic, 54.70; logical-mathematical, 51.30; spatial, 49.33; musical, 46.33; naturalist, 44.84; and kinesthetic, 42.80. The mean intellectual style scores for the entire sample were as follows: leadership, 55.05; general logic, 54.80; and innovation, 45.63. The five highest mean specific skill scores were: written-academic, 64.52; personal knowledge/efficacy, 61.97; social persuasion, 59.13; musical appreciation, 57.30; and social sensitivity, 56.49.

The mean intelligence domain scores for the freshman sub-sample were: interpersonal, 56.81; intrapersonal, 55.05; linguistic, 54.37; logical-mathematical, 52.04; musical, 50.14; spatial, 47.93; naturalist, 43.82; and kinesthetic, 43.37. The mean intellectual style scores for the freshmen were as follows: leadership, 55.35; general logic, 54.45; and innovation, 46.96. The five highest mean specific skill scores for the freshmen were: written-academic, 62.70; musical appreciation, 61.27; personal knowledge/efficacy; 60.44; school math, 59.42; and social persuasion, 58.16.

The mean intelligence domain scores for the senior sub-sample were as follows: intrapersonal, 55.73; interpersonal, 55.34; linguistic, 54.92; logical-mathematical, 50.82; spatial, 50.24; naturalist, 45.50; musical, 43.88; and kinesthetic, 42.43. The mean intellectual style scores for the seniors were: general logic, 55.02; leadership,

54.85; and innovation, 44.78. The five highest mean specific skill scores for the seniors were: written-academic, 65.70; personal knowledge/efficacy; 62.96; social persuasion, 59.75; space awareness, 56.58; and effectiveness, 56.44.

Findings for Hypothesis One

Hypothesis one: There is no statistically significant difference, at the .01 level, between the mean multiple intelligence domain scores of undergraduate freshman and senior students, and within their same demographic variables of gender, ethnicity, and age group.

The Repeated Measures Analysis of Variance was utilized to determine if a statistically significant difference existed between the multiple intelligence domain scores of freshmen and seniors. The Repeated Measures ANOVA was conducted for each of the intelligence domains. Post hoc comparisons using Scheffe's procedure were also utilized to determine where statistically significant differences existed between the multiple intelligence domain scores of freshmen and seniors within the same demographic variables of gender, ethnicity, and age group. The response variable for each procedure was the MIDAS scores received for a particular multiple intelligence domain. The factor variables were (1) gender, (2) grade level, (3) ethnicity, and (4) age group. Within each ANOVA Table, the Partial Eta Squared was a measure of effect. Furthermore, the post hoc coefficients were not included within the tables, but rather the differences were discussed within the text.

The first response variable utilized was the musical intelligence scores. Repeated Measures Analysis of Variance for the musical multiple intelligence domain scores of freshmen and seniors showed no statistically significant difference between the musical domain scores of freshmen and senior students.

Post hoc comparisons using Scheffe's procedures were utilized to determine if statistically significant differences existed between the musical domain scores of the freshman and senior students within their demographic variables of gender, ethnicity, and age group. No statistically significant differences were found between the musical intelligence scores of the freshmen and senior students within the demographic variables of gender, ethnicity, or age group.

Results from the Repeated Measures Analysis of Variance for the remaining multiple intelligence domain scores of freshmen and seniors, again, showed no statistically significant difference between the musical domain scores of freshmen and senior students. However, post hoc comparisons using Scheffe's procedures yielded statistically significant difference in the mean intrapersonal multiple intelligence domain scores of the female freshmen and female seniors.

Table 3

Analysis of Variance for Multiple Intelligence Domains by Grade Level

Source	Type III Sum of Squares	*df*	Mean Squares	*F*	*p*	Partial Eta Squared	Observed Power
Musical							
Grade	32.814	1	32.814	.083	.773	.000	.013
Grade X Gender	38.288	1	38.288	.097	.755	.000	.014
Grade X Ethnicity	1.395	1	1.395	.004	.953	.000	.010
Grade X Age Group	1174.667	2	587.333	1.494	.226	.009	.137
Kinesthetic							
Grade	12.410	1	12.410	.040	.842	.000	.011
Grade X Gender	72.072	1	72.072	.231	.631	.001	.019
Grade X Ethnicity	12.368	1	12.368	.040	.842	.000	.011
Grade X Age Group	100.075	2	50.038	.160	.852	.001	.018
Logical-Mathematical							
Grade	82.958	1	82.958	.314	.576	.001	.023
Grade X Gender	510.166	1	510.166	1.931	.166	.006	.116
Grade X Ethnicity	4.818	1	4.818	.018	.893	.000	.011
Grade X Age Group	234.863	2	117.431	.445	.642	.003	.036
Spatial							
Grade	149.654	1	149.654	.467	.495	.001	.030
Grade X Gender	560.820	1	560.820	1.749	.187	.005	.104
Grade X Ethnicity	149.629	1	149.629	.467	.495	.001	.030
Grade X Age Group	482.496	2	241.248	.753	.472	.004	.060
Linguistic							
Grade	99.916	1	99.916	.373	.542	.001	.025
Grade X Gender	57.127	1	57.127	.213	.645	.001	.018
Grade X Ethnicity	13.835	1	13.835	.052	.820	.000	.012
Grade X Age Group	176.044	2	88.022	.328	.720	.002	.028
Interpersonal							
Grade	1.704	1	1.704	.008	.928	.000	.010
Grade X Gender	89.137	1	89.137	.430	.513	.001	.028
Grade X Ethnicity	57.937	1	57.937	.279	.598	.001	.021
Grade X Age Group	157.853	2	78.926	.380	.684	.002	.031
Intrapersonal							
Grade	43.364	1	43.364	.277	.599	.001	.021
Grade X Gender	398.756	1	398.756	2.544	.112	.007	.161
Grade X Ethnicity	15.754	1	15.754	.100	.751	.000	.014
Grade X Age Group	522.028	2	261.014	1.665	.191	.010	.157
Naturalist							
Grade	92.651	1	92.651	.232	.630	.001	.019
Grade X Gender	508.659	1	508.659	1.276	.259	.004	.073
Grade X Ethnicity	445.845	1	445.845	1.118	.291	.003	.064
Grade X Age Group	1814.110	2	907.055	2.275	.104	.013	.237

In summary of the findings for hypothesis one, there is not sufficient evidence to reject the null hypothesis based upon the findings from the Repeated Measures Analysis of Variance. However, differences became evident as a result of the Scheffe post hoc testing. Due to the statistically significant difference in the mean intrapersonal multiple intelligence domain scores of the female freshmen and female seniors, the null hypothesis can be rejected. Hence, there is a statistically significant difference, (a=.01), between the mean multiple intelligence scores of freshman and senior students.

Findings for Hypothesis Two

Hypothesis two: There is no statistically significant difference, at the .01 level, between the mean intellectual style scores of undergraduate freshman and senior students, and within their same demographic variables of gender, ethnicity, and age group.

The Repeated Measures Analysis of Variance was the procedure used on the three intellectual styles to determine if a statistically significant difference existed between the mean intellectual style scores of freshmen and seniors. Post hoc comparisons using the Scheffe procedures were also utilized to determine where statistically significant differences existed between the intellectual style scores of freshmen and seniors within the same demographic variables of gender, ethnicity, and age group. The response variable for each procedure was the MIDAS scores received for a particular intellectual style. The factor variables for the analysis were (1) gender, (2) grade level, (3) ethnicity, and (4) age group. Again, the post hoc coefficients were not included within the tables, but rather the differences were discussed within the text.

The results from the Repeated Measures Analysis of Variance for the leadership, general logic, and innovative intellectual style scores of the freshmen and seniors are provided in *Table 4*. The results showed no statistically significant differences between the intellectual style scores of the freshmen and senior students. Furthermore, the post hoc procedures (Scheffe) identified a statistically significant difference between the mean general logic intellectual style scores of female freshmen and female seniors.

Table 4
Analysis of Variance for Intellectual Styles by Grade Level

Source	Type III Sum of Squares	*df*	Mean Square	*F*	*p*	Partial Eta Squared	Observed Power
Leadership							
Grade	8.611	1	8.611	.041	.840	.000	.012
Grade X Gender	296.054	1	296.054	1.397	.238	.004	.081
Grade X Ethnicity	132.725	1	132.725	.627	.429	.002	.037
Grade X Age Group	56.877	2	28.438	.134	.874	.001	.017
General Logic							
Grade	41.998	1	41.998	.220	.640	.001	.019
Grade X Gender	1058.209	1	1058.209	5.537	.019	.016	.407
Grade X Ethnicity	91.905	1	91.905	.481	.488	.001	.030
Grade X Age Group	306.517	2	153.259	.802	.449	.005	.065
Innovative							
Grade	7.440	1	7.440	.026	.872	.000	.011
Grade X Gender	202.910	1	202.910	.710	.400	.002	.041
Grade X Ethnicity	62.586	1	62.586	.219	.640	.001	.019
Grade X Age Group	990.317	2	495.158	1.733	.178	.010	.166

In summary, there was not sufficient evidence to reject the null hypothesis based on the results from the repeated measures analysis of variance. However, a difference was identified between the mean general logic intellectual style scores of female freshmen and female seniors. As a result, the null hypothesis can be rejected. Therefore, there is a statistically significant difference, at the .01 level, between the mean intellectual style scores of freshman and senior students.

Findings for Hypothesis Three
Hypothesis three: There is no statistically significant difference, at the .01 level, between the mean specific skill scores of undergraduate freshman and senior students, and within their same demographic variables of gender, ethnicity, and age group.

Again, the Repeated Measures Analysis of Variance was utilized on each of the twenty-six specific skills. Likewise, post hoc comparison procedures were used to determine where statistically significant difference existed between the specific skill scores of freshmen and seniors within the same demographic variables of gender, ethnicity, and age group.

The results from the Repeated Measures Analysis of Variance for the specific skill scores of the freshmen and seniors are provided in *Table 5*. The results showed no statistically significant differences between the specific skill scores of the freshmen and senior students. Furthermore, the post hoc procedures (Scheffe) yielded no statistically significant differences between the specific skill scores of the freshmen and seniors, within the same demographic variables of gender, ethnicity, and age group.

Table 5

Analysis of Variance for Specific Skills by Grade Level

Source	Type III Sum of Squares	*df*	Mean Square	*F*	*p*	Partial Eta Squared	Observed Power
Composer							
Grade	1712.128	1	1712.128	2.491	.115	.007	.157
Grade X Gender	539.642	1	539.642	.785	.376	.002	.045
Grade X Ethnicity	141.215	1	141.215	.205	.651	.001	.018
Grade X Age Group	7122.133	2	3561.066	5.180	.006*	.030	.628
Working with Objects							
Grade	488.303	1	488.303	1.183	.278	.003	.068
Grade X Gender	780.863	1	780.863	1.892	.170	.006	.114
Grade X Ethnicity	47.391	1	47.391	.115	.735	.000	.014
Grade X Age Group	362.596	2	181.298	.439	.645	.003	.036
Written-Academic							
Grade	214.208	1	214.208	.561	.454	.002	.034
Grade X Gender	1773.493	1	1773.493	4.645	.032	.014	.333
Grade X Ethnicity	675.337	1	675.337	1.769	.184	.005	.105
Grade X Age Group	333.063	2	166.531	.436	.647	.003	.035
Spatial Problem-Solving							
Grade	311.041	1	311.041	.836	.361	.002	.048
Grade X Gender	711.512	1	711.512	1.912	.168	.006	.115
Grade X Ethnicity	19.970	1	19.970	.054	.817	.000	.012
Grade X Age Group	1132.328	2	566.164	1.521	.220	.009	.140
Animal Care							
Grade	46.614	1	46.614	.084	.773	.000	.013
Grade X Gender	30.029	1	30.029	.054	.817	.000	.012
Grade X Ethnicity	13.056	1	13.056	.023	.879	.000	.011
Grade X Age Group	5531.864	2	2765.932	4.957	.008*	.028	.602

*p<.01

Discussion

It is interesting to note that four areas of statistical significance were identified between the scores of female freshmen and female seniors: *(a)* intrapersonal multiple intelligence domain, *(b)* general logic intellectual style, *(c)* working with objects specific skill, and *(d)* spatial problem-solving specific skill. In each instance, the female seniors scored statistically significantly higher than the female freshmen. Do these findings suggest that female students become increasingly intrapersonal and logical, as well as favoring working with objects and spatial problem-solving as they progress through college? To the contrary, these statistics only represent the differences found between these two particular groups of females during a specific point in time. Furthermore, the data are of a self-report nature. Therefore, the honesty and confidence levels of the females must be taken into consideration. The senior females scored themselves significantly higher when compared with the freshmen females in these four areas. It would be of benefit to compare these findings with the findings from

confidence or emotional intelligence instruments. Such comparisons could help in determining if the differences in scores are primarily attributable to the confidence levels of the subjects.

It is reasonable to suggest, however, that the female senior subjects, when compared with the female freshmen, would tend to favor educational methods that include the involvement of the intrapersonal intelligence domain and general logic intellectual style: improvisations, reflective assignments, know-wonder-learn charts, decision-making techniques, self-evaluations, and journal writing. Likewise, the female seniors would most likely enjoy and be aided by experiential learning and spatial problem-solving when learning new information: manipulation of objects, observational activities, posters, semantic mapping, analysis of visuals, and hands-on learning (Weber 1996).

Furthermore, while this study is not of a longitudinal nature, it seems reasonable to suggest the possibility that the college process "weeds out" those females who are not as strong in the intrapersonal multiple intelligence domain, the general logic intellectual style, the working with objects specific skill, and the spatial problem-solving specific skill. Therefore, those females with a higher degree of strength in any or all of these four areas may have an increased chance at completing their college education, as compared with those females who are weaker in these areas. This is perhaps an area worthy of future research.

Analysis of the data also revealed that freshmen students between the ages of 21 and 25 rated themselves significantly higher within the specific skill of composer, when compared with seniors of the same age. Again, the statistical significance could point toward a favoritism of musical and/or poetry-related pedagogical methods by freshmen ages 21–25, at least within this study sample. Specifically, these activities could include musical compositions, tape recordings, portfolios, performance videotapes, choreography, listening assignments, audiovisuals, song analysis, and creative poetry and song writing (Weber 1996). Future research could identify a correlation between those entering or re-entering at a nontraditional age with the composer specific skill.

A strikingly significant finding relates to the written-academic scores of male freshmen and male seniors. The male freshman students scored themselves statistically significantly higher when compared with the senior males. This finding is unique, since it would seem more logical for those who have nearly completed their college education to score higher in the written-academic skill than those beginning as college freshmen. Again, one must consider the confidence level of students when considering these self-report data. Additionally, it would be interesting to compare linguistically-related achievement scores of the two groups to determine which showed a stronger writing ability. Nonetheless, it is still reasonable to suggest that the male freshmen identify themselves more as writers and as skilled in academic writing, as compared with the senior males in this study. Therefore, it would most likely be beneficial for the freshman males in this study if their professors took their writing skill into consideration in the classroom by including activities such as writing to learn, note-

taking, creative writing, and written exams, including short answers and essays. It would be of further value to follow up on this finding by determining if subsequent male seniors rate themselves lower than male freshmen.

Furthermore, the findings from this study coincide with the earlier findings of Gardner (1999) concerning the diversity of students. Gardner concluded, "People have a wide range of capabilities." He further stated, "strengths are distributed in a skewed fashion" in most cases. Likewise, the findings from this study suggest that these students hold a range of "intellectual" strengths. Furthermore, the students in this study tended to favor some intelligences over others. Therefore, students tended to have various strengths, in varying degrees, as related to the multiple intelligence theory.

The highest mean scores for the entire sample and the freshman and senior subgroups were for the interpersonal and intrapersonal intelligence domains. The interpersonal domain concerns an individual's ability to think about and understand other people. The intrapersonal intelligence domain is concerned with a person's ability to think about and understand one's self. Therefore, it seems reasonable to suggest that these "interpersonal" students from this study would enjoy social activities, being around people, and would tend to learn best by relating and participating in cooperative/collaborative group environments. Due to the high "intrapersonal" mean scores for the students in this study, it further seems reasonable to suggest these students would also be cognizant of their own weaknesses, strengths, and inner feelings. These students would likely favor independent projects and might also respond with strong opinions when controversial topics are discussed (Teele 1996).

The linguistic and logical-mathematical intelligence domains were found to be within the four strongest intelligence domains for the entire sample, as well as the freshman and senior subgroups. Similarly, the strongest specific skill mean score for the entire sample and the freshman and senior subgroups was within the written-academic specific skill. These findings could be reasonably expected of this study sample, since part of the admission criteria for the university includes the screening of students based upon their verbal and mathematical abilities (UALR 2001).

Of additional importance are the frequency of dominant specific skills. When considering the strongest single skill of each student, it is important to note that more of the students were dominant in the musical skills (musical appreciation, instrumental skill, vocal ability, and composer skill), than the mathematical and linguistic skills, with the exception of school math and written-academic. Amazingly, only eight students showed greatest favoritism for everyday problem-solving, five students were identified as most dominant in everyday math skill, and only one student was identified as most dominant in the specific skill of logical/strategy games. Similarly, only four students were most dominant in the rhetorical skill and one student was most dominant in the expressive sensitivity specific skill. Therefore, while students need to continue to learn with regard to the verbal-linguistic and logical mathematical intelligences, educators may want to consider an increase in the inclusion of the musical intelligence. Students may learn and achieve at a greater rate, if their teachers

included music-related activities such as song analysis, song creation, performances, tape recordings, and listening assignments (Weber 1996).

Likewise, it is of great interest to note the dominant intelligence domains of each undergraduate classification. The greatest number of freshman students in this study had the most dominant intelligence scores within the interpersonal and musical domains. Similarly, the senior students in this study held the most dominant scores in the interpersonal and linguistic domains. The interpersonal nature of many students, whether freshman or senior, is evident from these findings. Specific interpersonal activities which could be helpful toward student learning include collaborative learning, partner work, reciprocal teaching, community involvement, brainstorming, think-pair-share, and peer teaching (Weber 1996).

It is further relevant to note that the Repeated Measures Analysis of Variance did not yield any statistically significant differences, at the .01 level, between the mean multiple intelligence domain scores of the freshmen and seniors. One could suggest that a positive implication of this lack of difference between those entering the university and exiting from it is that most students tend to adapt to the university setting and progress toward graduation, no matter their "intellectual" strengths and weaknesses or the teaching methods of their professors. However, this suggestion would seem to be overly far-reaching. Furthermore, because the freshmen and seniors within this study are not identical, such a recommendation should not be made. Rather, it seems more reasonable to suggest that the intellectual makeup of the two groups appears to be statistically similar. Again, this diversity within both the freshman and senior classes would reasonably suggest that educational practices should be diverse for students—whether entering or exiting from the university.

Finally, the mean "innovation" intellectual style score is noticeably lower than the mean scores of the "leadership" and "general logic" intellectual styles. The "leadership" intellectual style concerns a student's ability "to use language effectively to organize and solve interpersonal problems and goals," and the "general logic" intellectual style concerns dealing with "practical problems in an intuitive, rapid and perhaps unexpectedly accurate manner" (Shearer 1999c). However, the "innovation" intellectual style, the intellectual style that was noticeably lower for the students, concerns a student's ability "to work in artistic, divergent and imaginative ways," and "to improvise and create unique answers, arguments, or solutions." The students' lack of interest or ability in creating imaginative and unique solutions may be of importance and value to those assisting them in the improvement of their intellectual abilities.

Recommendations for Practice

The findings from this study also align with concerns pertaining to educational practice. The findings suggest that a variety of "intellectual" strengths existed within the student samples. Gardner (2000) has similarly concluded that students learn in a variety of ways. Furthermore, Gardner claimed that while it would seem equitable to

teach all students in the same manner, doing so is in fact "unfair," because such an approach favors some intelligences over others. Due to the diverse intellectual abilities of students, professors should make an effort to teach toward this diverse range of strengths. Sternberg (1996) concluded students perform significantly and substantially better when there is at least a partial compatibility between the students' pattern of abilities and the method of instruction.

Similarly, Teele (1996) stated, "If schools are to provide opportunities for all students, instruction should address the students' dominant intelligences. This enables them to process information through their strengths and then translate from their strengths into the less dominant intelligences." Within this study, the entire sample as well as each undergraduate classification subgroup held the highest multiple intelligence domain mean scores within the "interpersonal" and "intrapersonal" domains. While it is important for professors to take into account the intelligences of all students, these mean scores showed a favoritism on the part of students toward a teaching approach that includes focus upon the "interpersonal" and "intrapersonal" domains. Weber (1996) suggested collaborative learning, partner work, reciprocal teaching, community involvement, brainstorming, think-pair-share techniques, and peer teaching to incorporate the interpersonal intelligence within teaching. Likewise, Weber suggested experience charts, improvisations, know-wonder-learn techniques, and decision making methods for incorporation of the intrapersonal intelligence within teaching. Therefore, in light of the intelligence domain findings, concerning the interpersonal and intrapersonal domains, it would likely be advantageous for professors to use these recommended techniques.

As was previously mentioned, the linguistic and logical-mathematical intelligence domains were found to be within the four strongest domains for the entire sample, as well as the freshman and senior subgroups. Again, these findings may be in part due to the university admissions procedures. Therefore, these findings may have implications toward educational practice, particularly within educational admissions criteria. For instance, Gardner (1993b) suggested admissions criteria, such as the Scholastic Aptitude Test (SAT), narrowly addresses only two intelligences—the linguistic and logical-mathematical. The "high" mean scores in the linguistic and logical-mathematical intelligence for the entire sample and each of the subgroups may serve as evidence the university is "overlooking" and not admitting students who are "intelligent" or talented in other areas. It may be to the university's advantage to heed Gardner's words: "there is little need and little advantage to be gained by continuing to require the Scholastic Aptitude Test (1993b)." Therefore, the university may consider an admissions approach that seeks evidence of several intelligences, rather than a select few.

Finally, the "innovation" intellectual style score was notably lower when compared with the mean scores within the "leadership" and "general logic" intellectual styles. This finding may also have implications toward educational practice. According to Weber (1996), "By making room for students' interests and abilities in class, MI theory generates even more room for understanding content by opening the doors of

imagination, emotion, intellect, and spirit through which deeper learning can emerge" (Weber 1996). Therefore, the incorporation of the MI theory in the university classroom may serve as a means to increase the subject's "innovation" intellectual style abilities. As a result, students could become better prepared to work in imaginative ways as they create unique solutions for problems.

Conclusion

In the most basic sense, each student is different and has a talent to be shared. However, some are overlooked or ignored and seem to fall through the cracks. The abundance of talent is evident, yet it is not always recognized or put to the best use. While students tend to process information most efficiently and effectively, through their areas of strength (Teele 1996), our educational system does not always promote an efficient means toward student success. In the words of Jordan (1996), "Recognizing that students learn differently and develop at varying rates makes educational change imperative."

The results of this study agree with this suggestion. The students within this study are intellectually diverse. Many are especially strong within the "interpersonal" and "intrapersonal" intelligence domains and would therefore favor teaching methods linked to these strengths. However, professors should still attempt to teach toward all intelligences, rather than a few. Educators can increase the equity and ease in education for students by teaching to all intelligences.

While it may be obvious to some that such changes within the educational system could benefit all involved, obstacles still exist. For instance, "With historical values institutionalized in standardized assessment practices, it's hard to persuade educators and their constituencies that alternative ways of learning are equally valued" (Smagorinsky 1996). Likewise, "the difficulty in creating this new educational system," according to Gauld (1996), "is in breaking old learning roles, approaches, and habits. Old habits die hard—and change is difficult."

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