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Identifying the Multiple Intelligences of Your Students

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Abstract

One way of addressing individual differences among adult learners is to identify the Multiple Intelligences of the learner. Multiple Intelligences refers to the concept developed by Howard Gardner that challenges the traditional view of intelligence and explains the presence of nine different Multiple Intelligences. The purpose of this study was to develop a valid and reliable instrument for identifying these Multiple Intelligences. Items were developed by field testing with 168 college students, and responses from 874 community college students were factor analyzed to develop a 27-item indicator to identify Multiple Intelligences preferences of adult learners.

Introduction

The distinguishing characteristic of adult education is its focus on the individual learner. This emphasis is reflected in the two foundational theories of adult learning that form the cornerstone of our current understanding of adult learning (Merriam, 2001, p. 3). These twin pillars of adult learning theory are andragogy and self-directed learning.

Malcolm Knowles (1970) conceptualized andragogy as "the art and science of helping adults learn" (p. 38). This approach for "helping human beings learn" (p. 38) was based on a set of "at least four crucial assumptions about the characteristics of adult learners" (p. 39). These basic assumptions hold that as adults mature, (a) they move toward becoming more independent and capable of directing their own learning, (b) they have

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an accumulated reservoir of experience that can be a valuable resource for learning, (c) their readiness to learn is related to their developing social roles, and (d) their orientation to learning is problem centered with a desire for immediate application. Later Knowles added that adults are internally motivated and that adults need to know why they need to learn something before committing to the learning (Knowles, Holton, & Swanson, 1998).The importance of andragogy is that it created a rationale for a learner-centered approach to adult learning.

Knowles (1975) also played a role in conceptualizing self-directed learning. He defined self-directed learning as "a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (p. 18). When this is combined with the work of others such as Houle and Tough, it is clear that self-directed learning is widespread, is an integral part of an adult's everyday life, and is systematic but does not depend on an instructor or classroom (Merriam, 2001, p. 8).

These foundational theories of andragogy and self-directed learning describe adult learning as a learner-centered activity. This focus mandates that individual differences be identified in the classroom in order for teachers to be effective. One way of addressing individual differences is to identify the skills of problem solving that learners use to resolve the genuine problems or difficulties that they encounter in life and that thereby lay the ground work for acquisition of new knowledge (Gardner, 1983, pp. 60-61). Such an approach involves identifying the Multiple Intelligences of learners.

Multiple Intelligences

The traditional mode of teaching, which is termed frontal teaching or chalk and talk, has not been successful for all students as is evidenced by the dropout rate of 50% in high schools in the United States (Snyder, 1999, p. 11). Statistics such as these portray a serious educational problem. The achievement of the American dream of completing an education should not just be for those that can score high on a traditional intelligence test. In 1983, Howard Gardner developed the theory of Multiple Intelligences which explains the presence of nine different Intelligences: these include Bodily/ Kinesthetic, Existential, Interpersonal, Intrapersonal, Logical/

Mathematical, Musical, Naturalist, Verbal/Linguistic, and Visual/Spatial (Gardner, 1997, p. 8). The following are the personal learning styles based upon the nine Multiple Intelligences.

1. Bodily/Kinesthetic Intelligence is the proficiency of using the entire body to express ideas and feelings and the competence of using the body to produce or transform things (Gardner, 1983, pp. 205-236).
2. Existential Intelligence is the appreciation of spirituality and understanding questions about life. This intelligence relates to exploring human existence in the universe (Gardner, 1999, p. 115).
3. Interpersonal Intelligence is the proficiency of an individual in perceiving the moods, aims, motivations, and emotions of others (Gardner, 1983, pp. 237-276).
4. Intrapersonal Intelligence is having a positive self-concept and life direction which is intrinsically grounded. The competency in knowing oneself and acting to modify oneself based on that knowledge (pp. 237-276).
5. Logical-Mathematical Intelligence involves the elevated skill of manipulating and understanding numbers and the ability to reason effectively (pp. 128-169).
6. Musical Intelligence is the ability to appreciate, distinguish, compose, and perform in various musical forms (pp. 99-127).
7. Naturalistic Intelligence is the ability to appreciate, categorize, classify, explain, and connect to things encountered in nature (Gardner, 1999, p. 115).
8. Verbal/Linguistic Intelligence is the ability to understand, use, and manipulate written or spoken words productively (Gardner, 1983, pp. 73-98).
9. Visual/Spatial Intelligence is characterized by being able to see an image or situation and quickly assess areas that could be changed to transform or improve the appearance (pp. 170-204).

In his 1983 landmark book *Frames of Mind*, Dr. Howard Gardner of Harvard University introduced his theory of Multiple Intelligences. Gardner is the author of many books and articles. His theory of Multiple Intelligences has challenged long-held assumptions about intelligence.

Gardner's (1983) theory conceptualized intelligence as consisting of

several distinct intelligences rather than a singular cognitive capacity. Multiple Intelligences celebrates the uniqueness and diversity of all students. Gardner suggests the need for a broader view of the human mind and of human learning than what currently exists. Multiple Intelligences holds that every student is smart not just in one or two ways but in many. Gardner believes instructors must attempt to reach all students and develop their diverse intelligences. Moreover, instructors need to teach in a variety of ways which provide varied learning experiences for students.

Intelligence traditionally has been defined in terms of Intelligence Quotient (IQ), which measures a narrow range of Verbal/Linguistic and Logical/Mathematical abilities (Gardner & Hatch, 1989). Gardner argues that humans possess a number of distinct intelligences beyond verbal and logical abilities that appear in different skills and abilities. All human beings apply these intelligences to solve problems, invent processes, and demonstrate their creativity (Gardner & Hatch, 1989).

Throughout most of this century, the popular definition of intelligence is what is measured in an IQ Test. That has basically been how intelligence is viewed (Fellenz & Conti, 1989). To be considered intelligent, a person has to do well on an intelligence test. In fact, one cannot gain access to higher education without doing well on such test (Fellenz & Conti, 1989).

In the 1970's, a group of cognitive psychologists began to feel that the definition of intelligence was also wrong. They felt as though the definition was missing the understanding of what intelligence really is (Sternberg, 1990). The conclusion of Earl Hunt, Jack Carrol, Jim Pelegrino, Bob Glaser, and Robert Sternberg was that what is missing is an understanding of the mental processes that underlie intelligence (Sternberg, 1990). In other words, the tests can give you a score, but what they do not give you is an understanding of the mental processes that underlie the score (Sternberg, 1990).

Howard Gardner (1993) argues that humans possess a number of distinct intelligences beyond verbal and logical skills that are measured on traditional instruments. These intelligences appear in different skills and abilities. All human beings apply these intelligences to solve problems. His concept that celebrates individual differences is the theory of Multiple Intelligences.

Traditionally, intelligence is defined operationally as the ability to answer items on tests of intelligence. The inference from the test scores to some underlying ability is supported by statistical techniques that compare responses of subjects at different ages. The correlation of the test scores

across ages and across different tests corroborates the notion that the general faculty of intelligence does not change much with age or with training or experience (Gardner, 1993, p. 15).

However, Gardner believes intelligence is an inborn attribute or faculty of an individual. Human cognitive competence is better described in term of a set of abilities, talents, or mental skills which is referred to as intelligence (Gardner, 1993, p. 15). All normal individuals possess each of the skills to some extent; however, individuals differ in the degree of skill and their combinations (p. 15). This theory of intelligence may be more humane and more controversial than alternative views of intelligence. Moreover, it more adequately reflects the data of human intelligent behavior (p. 15). Such a theory has important educational implications, including opportunities for curriculum development (p. 15).

Multiple intelligence theory pluralizes the traditional concept of intelligence. Multiple Intelligences is the ability to solve problems or devise products that are of significance in a particular cultural setting (Gardner, 1993, p. 15). The problem solving skill allows one to approach a situation that requires a goal to be met and locate the appropriate route to that goal (p. 16). Multiple Intelligences theory is framed in light of the biological origins of each problem solving skill. Only those skills that are universal to the human species are treated. Therefore, the biological tendency to participate in a particular form of problem solving must also be coupled with the cultural nurturing of that domain (p. 16). For example, the use of language, which is a universal skill, may expose itself particularly as writing in one culture, as oratory in another culture, and as the secret language of anagrams in a third (p. 16).

Gardner (1993) identified intelligences that are rooted in biology and that are valued in one or more cultural settings. Evidence was obtained from several different sources: knowledge about normal development and development in gifted individuals; information about the breakdown of cognitive skills under conditions of brain damage; studies of exceptional populations, including prodigies and autistic children; data about the evolution of cognition over the millennia; cross-cultural accounts of cognition; psychometric studies, including examinations of correlations among tests; and psychological training studies, particularly measures of transfer and generalization across tasks (p. 16). Only those intelligences that satisfied all or a majority of the criteria were selected as bona-fide intelligences.

Gardner based the Multiple Intelligences theory on three foundational

principles: (a) individuals are not the same--individuals differences exists; (b) people do not all have the same kinds of minds; and (c) education becomes most effective if these individual differences are considered (Gardner, 1999). It is the existence of the individual differences that started Gardner on his path of developing the theoretical bases of Multiple Intelligences. In addition, he believed his task was to envision forms of education and modes of assessment that would have a firm root in current scientific understanding and that contributes to enlightened educational goals (Gardner, 1993, p. 163). In adult leaning, individuals should be able to understand and articulate their learning preferences, which are specified by their intelligences.

Many educators have begun to recognize that students have unique differences and would like to modify teaching methods to include Multiple Intelligences. However, for educators to apply various teaching methods for the various Multiple Intelligences, they must have a valid and reliable way to identify their Multiple Intelligences. While the concept of Multiple Intelligences has been around for almost 30 years, there is currently no valid or reliable tool that is easily accessible.

Purpose

There is no question that the traditional method of measuring and assessing students' intelligence works well for some students (Gardner, 1993). However, understanding and meeting the needs of all students should be the goal. An improved approach is needed for assessing intelligence. In Gardner's view, the purpose of school should be to develop intelligences and to help people reach vocational and avocational goals that are appropriate to their particular spectrum of intelligences (p. 9). It is of the utmost importance for society to recognize and nurture all of the possible human intelligences. If recognized early, the chance of dealing with educational problems could be addressed appropriately and effectively (p. 9).

In order for teachers to understand how to implement various teaching methods which incorporate Multiple Intelligences, they must be able to easily and accurately identify a students' intelligence ranking. In addition, for individuals to understand and articulate their own learning preferences specified by their intelligences, they too must be able to easily identify individual strengths.

Although practitioners have embraced the concept of Multiple

Intelligences, they do not have an easily accessible, affordable, valid, and reliable tool for identifying Multiple Intelligences. Many surveys, checklists, and inventories have been devised for classroom use. However, most lack validity and reliability information, and several are cumbersome to score. Most of these instruments have been developed as curricular tools rather than as valid and reliable instruments. In addition, it is not known how accurate they are. In order for teachers to competently use the concept of Multiple Intelligences in their classes, they need a valid and reliable tool which is suitable for classroom use and which can be easily used with students.

In 2001 Gardner spoke to an overflow crowd of educators about his theory of Multiple Intelligences at an educational conference in Tulsa, Oklahoma. During personal conversations after the presentation, Gardner shared that his interest was in developing the theory related to Multiple Intelligences and that he felt that the development of measurement instruments related to the theory was the task of others. When we expressed our interest in developing such an instrument, Gardner offered his support through Project Zero where he serves as Co-Director. With this encouragement, this study was initiated with the purpose of developing a valid and reliable preference indicator that practitioners could use to identify the Multiple Intelligences of adult learners.

Methodology

The Multiple Intelligence Survey (MIS) was developed to identify Multiple Intelligences as conceptualized by Gardner. This tool was designed for use in instrumented-learning situations rather than for psychological testing in clinical settings; that is, it was designed to provide self-report information (Blake & Mouton, 1972) to help students in the metacognitive process of reflecting upon how they learn.

This study utilized the traditional steps in instrument development to create a valid and reliable process for identifying a person's Multiple Intelligences. Construct validity for items was based on Howard Gardner's conceptualization of Multiple Intelligences. Using this concept, items were identified and tested for accuracy in measuring each of the separate intellingences in the concept. Once a pool of useable items was created, content validity was established by field testing these items with adult learners in classes in a community college. Finally, reliability was established by using the test-retest method.

Construct Validity

The most important type of validity is construct validity (Gay & Airasian, 2000, p. 167). It is the degree to which the test reflects the constructs it is intended to measure (p. 167). Construct validity deals with what an instrument actually measures (p. 167). It is broad and is concerned with characteristics or behaviors that impart performance on an assessment or instrument (p. 167). Construct validity evaluates the fundamental theory of the instrument. "A construct is a non-observable characteristic like intelligence" (Gay, 1996, p. 14).

For this study, it was important to establish construct validity to match the theoretical factors proposed by Gardner. In the initial process of establishing construct validity for the new instrument, Howard Gardner's Non-Profit organization Project Zero was contacted. In addition, electronic searches were conducted, and materials related to Multiple Intelligences were also identified using personal sources. Several Multiple Intelligences instruments were identified in these sources. These Multiple Intelligences materials were compiled and reviewed to determine which instruments were congruent with Howard Gardner's theoretical foundation. There were a total of 17 different Multiple Intelligences instruments identified. Each Multiple Intelligences instrument referred to itself as either an instrument, survey, inventory, assessment, or checklist.

After reviewing each of the Multiple Intelligences instruments, it was decided to incorporate material from several instruments. Ten questions were selected to represent each of the nine Multiple Intelligences. The first draft for the new Multiple Intelligences instrument contained a pool of 90 items. These 90 items were derived from instruments currently being used in the field that encompasses Howard Gardner's theoretical foundation. The items were screened for compatibility with Gardner's writings. Some minor editing was conducted on the items for grammar, so that each item measured only a single construct, and for parallel wordings.

Thus, construct validity deals with what the instrument actually measures. The construct validity for the new instrument was established by creating a pool of items that were directly related to the writings of Howard Gardner. Instead of arbitrarily developing some items, various existing Multiple Intelligences instruments were used. These instruments are being used in the field to informally identify Multiple Intelligences areas but have not had their validity and reliability systematically established. These items were then edited in order to be combined into a single Multiple

Intelligences preference indicator.

Content Validity

Content validity represents the degree to which a measure embodies the range of meanings within the concept (Babbie, 1989, p.125). Content validity is the degree to which an instrument measures the precise content areas (Gay, 1996, p. 139). It is the extent to which an instrument represents the total body of theory from which the items could have been taken (Gall, Gall, & Borg, 1999, pp. 133-134). The content of an instrument is valid to the degree the participant's responses on that instrument are a representative sample of the items (p. 134).

To establish content validity for an instrument, the instrument must include items that represent the range of content that the test is designed to measure (Gall, Gall, & Borg, 1999, p. 526). To accomplish this, the 90 items in the pool of items were used in field tests with college students at Oklahoma State University and Northeastern State University–Broken Arrow. These students assisted in the process of determining which items correctly discriminated respondents on the concepts. In the first field tests, eight graduate students in Adult Education at Oklahoma State University provided feedback on the language, readability, and format of the preference indicator. They pointed out words and phrases that they found confusing. Their responses indicated that the instrument could not use a rating scale because students rated almost every item high. Finally, although the preference indicator could be completed in approximately 10 minutes, the students expressed a desire for a shorter preference indicator.

Based upon the feedback from the students, revisions were made in the wording of several items. Also, the 5-point Likert scale that was used in the first version was replaced with a ranking system. For this format, the 90 items in the pool of items were arranged in 10 blocks of 9 items with 1 item in the block representing each Multiple Intelligences category. For each block, the respondents were asked to rank the items according to how the item applied to them. The item most like them was ranked 1, and the item least like them was ranked 9. The rankings for each Multiple Intelligences area were summed, and the Multiple Intelligences area with the lowest score was judged to be the preference Multiple Intelligences area for the respondent.

The modified preference indicator with the ranking system was once again field tested with 11 Adult Education graduate students at Oklahoma

State University. In order to determine if each item was making a positive contribution to the total score, each of the items in the Multiple Intelligences category was correlated with the total score for each Multiple Intelligences category. The correlations for this process indicated that several of the items positively correlated with the total score and each had potential for being included in the final preference indicator. Since the previous testing had indicated a need to shorten the preference indicator, the number of items was reduced to 45. The five items with the highest correlations were selected for each of the nine Multiple Intellingences areas. For the new 45-item preference indicator, the item from each group that had the highest correlation was placed in the first grouping of Multiple Intelligence items, and this process was repeated for each of the five areas. Thus, for each ranking group, the items for each Multiple Intelligence area competed with items of similar standing from the other Multiple Intelligence areas. Field testing with 19 students in graduate classes in Adult Education confirmed the retention of these 45 items.

This 45-item version of the preference indicator was field tested with a larger group of students from Northeastern State University in Broken Arrow, Oklahoma. These 149 students were enrolled in the Special Education Program. After the preference indicators were scored, correlations were computed for the relationship of each item in a Multiple Intelligences area to the total scores for the area. The correlation scores for all of the items except two were at .3 or above; 57.7% of the items were at .5 or above, and 26.7% of the items were at .6 or above.

This entire process was designed to get the preference indicator ready for field testing with a large group. Since the correlations for the 45-item version of the instrument indicated that each of these items had potential for correctly identifying its Multiple Intelligence area, the preference indicator was prepared for a larger field testing with adult students at Tulsa Community College.

Data were collected from community college students to establish the content validity of items for the new preference indicator. A community college was chosen because it is a good representation of the general population of an area. Students were selected from the General Education classes at Tulsa Community College (TCC)in Tulsa, Oklahoma. The General Education classes were used because they represent the basic classes most students take their first year at a community college. With the assistance of the Registrar's Office, 11 General Education courses taught at all 4 TCC campuses were selected. From this list of General Education

courses, there was a need to further reduce the list of classes because of the multiple sections. Therefore, every third class on the list was selected for data collection. This brought the total to 24 classes for data collection. The day of the week for collecting data on each of the four campuses was randomly selected. The instructors for the classes were contacted, and their permission was secured for data gathering in their classes. In all of the classes, the Multiple Intelligences preference indicator was completed in about 5 to 7 minutes. The number of participants surveyed in these classes was 403. Of these, 355 were complete and useable. When the data were examined, it was discovered that the representation in some of the Multiple Intelligences area was very low. Therefore, 2 weeks later, this entire process was repeated in order to secure a larger sample. Data were collected from 432 participants in 27 classes during this second round. With 355 from the first round and 432 from the second round, a total of 787 students from Tulsa Community College participated in the study. These participants were similar in age and gender to the general population of Tulsa.

Factor Analysis

Once the data were collected, the first statistical analysis sought to check to see if the items in the Multiple Intelligences Survey (MIS) were congruent with Howard Gardner's underlying theory of Multiple Intelligences. Therefore, a factor analysis was conducted with a data set that consisted of the 787 TCC students and an additional 87 students for whom data were collected to check criterion-related validity. Factor analysis is a statistical method for researching the intercorrelations among a set of test scores to determine the number of factors or constructs needed to explain the intercorrelations (Ary, Jacobs, & Razavieh, 1996, p. 271). "It is a family of procedures for removing the redundancy from a set of correlated variables and representing the variables with a small set of 'derived' variables, or factors" (Kachigan, 1991, p. 237). Thus, factor analysis provides a method to reduce the data to form a set of related variables (Ary, Jacobs, & Razavieh, 1996, p. 271), and "in each case the subset of variables can be thought of as manifestations of an abstract underlying dimension--a factor" (Kachigan, 1991, p. 237). Factor analysis finds the groups of variables that are highly correlated with each other and that are not directly observable (Ary, Jacobs, & Razavieh, 1996, p. 271).

MIS is based on the nine Multiple Intelligences categories

conceptualized by Howard Gardner. These Multiple Intelligences categories represented the abstract underlying dimensions of the preference indicator. Therefore, a factor analysis was conducted with the 874 MIS responses to confirm these factors. Since the sample size should preferably be 10 or more times as large as the number of variables in multivariate research (Roscoe, 1975, p. 184), this sample was large enough to eliminate the concern of sampling error.

This analysis used a principal components factor analysis. A "principal-components analysis is a relatively straightforward method of transforming a given set of variables into a new set of composite variables or principal components that are orthogonal (uncorrelated) to each other" (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975, p. 470). This is perhaps the most common variation of factor analysis with the first factor accounting for the most variance in the analysis and with each succeeding factor accounting for less and less of the total variance (Kachigan, 1991, p. 245). Because of this feature, "principal components analysis is often used as a preliminary step to help decide the difficult question of how many factors...represent abstractions of the input variables" (p. 246).

45-Item Form of MIS

It was anticipated that the principal components analysis would reveal nine factors with eigenvalues of greater than 1.0. Eigenvalues refer to the variance existing in the variables (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975, p. 442), and an eigenvalue "corresponds to the equivalent number of variables which a factor represent....One frequently used rule of thumb is to retain factors to the point where an additional factor would account for less variance than a typical variable; that is, less than one eigenvalue" (Kachigan, 1991, p. 246). Nine factors were expected to have eigenvalues greater than 1 because there are nine Multiple Intelligences categories. However, 16 possible factors had eigenvalues greater than 1. The first and strongest factor accounted for only 7.61% of the variance in the analysis, and the sixteenth factor only accounted for 2.22% of the variance. To test other possibilities for the relationship of the Multiple Intelligences categories, eight additional factor analyses were run. Each one held the number of factors fixed at between two and nine.

The 8-factor solution was determined to be the best explanation of the community college data. The factors accounted for 40.74% of the variance. However, these factors did not independently represent Gardner's Multiple

Intelligences categories. All of the factors were made up of a combination of items from different Multiple Intelligences categories. The failure of the original principal components analysis and the eight follow-up analyses to identify Gardner's nine categories suggested either that there is an interaction among the Multiple Intelligences categories conceptualized by Howard Gardner or that the items in the Multiple Intelligences Survey were not correctly identifying a single Multiple Intelligences category as conceptualized by Howard Gardner.

Since the possible interaction of Multiple Intelligences categories could not be investigated if the items in the MIS were not accurately measuring the concepts for which they were written, the question of the validity of the items was addressed. Since each of the five items for each of the Multiple Intelligences categories was designed to measure a single concept, a separate principal components factor analysis was conducted for each Multiple Intelligences category using the responses of the 874 community college students to the five items in the category. Eight of the nine analyses revealed that the items were measuring more than one concept. Seven of these eight were measuring two concepts while one was measuring three concepts. For example, the Logical-Mathematical Intelligences area had items related both to the construct of logic as indicated by organization and structure and to the construct of mathematics as indicated by calculations.

Although it is possible for each conceptual Multiple Intelligences area to be made up of several constructs, it was the goal of this preference indicator development process to confine the items in each area of MIS to a single factor so that additional analyses could be conducted. Therefore, the factor analyses of the nine separate Multiple Intelligences areas were used to reduce the MIS to three items for each Multiple Intelligences category. This was possible because all of the areas except for Naturalistic had at least three items in Factor 1, and the three items with the highest loadings were selected for inclusion in the final form of MIS because the first factor explains the greatest amount of variance in the analysis (Kachigan, 1991, p. 245). For Naturalistic, the items in Factor 2 were selected for inclusion in the final form of MIS because it contained three items.

The process of selecting the three items with the highest loadings from a factor with at least three items in it produced strong factors for all Multiple Intelligences categories except for Verbal Intelligence. Therefore, a series of additional factor analyses were conducted for Verbal Intelligence to find the best combination of items. Once all of the

intelligences areas were reduced to three items, a final factor analysis was conducted for each Multiple Intelligences area. These analyses confirmed that each of the three items for the area formed only one factor.

Final Form of MIS

Thus, the process of factor analysis was used to confirm the construct validity of MIS. This data reduction procedure resulted in MIS being decreased from its 45-item, field-testing version to a 27-item preference indicator. Each of the nine Multiple Intelligences categories contains three items that form a single abstract dimension, and these items are highly correlated with that dimension or factor as indicated by their factor loadings.

In addition, the factor analysis process contributed to establishing the content validity of the items in MIS. "Item validity is concerned with whether the test items are relevant to measurement of the intended content area" (Gay & Airasian, 2000, p. 163). The high factor loadings for the 27 items in the final version of MIS confirm that each item contributes to explaining the factor. Moreover, each of the items are highly correlated with the total score for the three items in the Multiple Intelligences category. For the 27 items, the correlations are as follows: .800 and over--1, .700 to .799--12, .600 to .699--9, and .500 to .599--5.

Summary

Factor analysis was used to confirm the construct validity of the items of the Multiple Intelligences Survey and to establish construct validity for the items. Principal components factor analysis was used with the responses from 874 community college students. The first factor analysis failed to confirm the validity of the 45 items in the MIS. It not only had eight factors instead of the nine Multiple Intelligences areas conceptualized by Howard Gardner, but also each of the factors contained items from more than one Multiple Intelligences category. Therefore additional analyses were conducted to eliminate poorly performing items. Separate factor analyses were conducted with the five items in each of the nine Multiple Intelligences areas. This process resulted in the number of items in each Multiple Intelligences area being reduced to three items that had high factor loadings and that correlated highly with the total score for all of the items in the Multiple Intelligences category. Thus, the final form of the Multiple

Intelligences Survey consists of 27 items with construct and content validity (see Insert).

Reliability

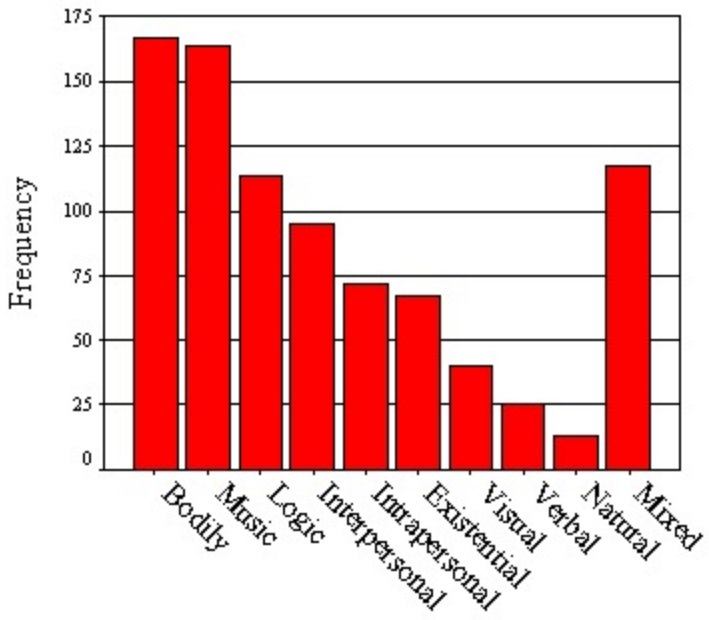
The reliability of the Multiple Intelligences Survey was established by the test-retest process. The test-retest process was employed with 70 General Education students at Tulsa Community College. The new Multiple Intelligences preference indicator was administered to these students and then re-administered 2 weeks later. For an acceptable finding of reliability, a correlation of at least .7 should be obtained. Four of the nine Multiple Intelligences areas exceeded the .7 level, four were slightly below it, and one was at .5: Bodily/Kinesthetic--0.83; Verbal--0.75; Existential--0.73; Interpersonal--0.72; Intrapersonal--0.66; Naturalistic--0.64; Logical--0.59; Musical--0.59; and Visual--0.50. All were statistically significant. Thus, almost half of the items are at or above the generally accepted level for reliability and about half are slightly below this level.

Multiple Intelligences Survey Scores

The final form of the Multiple Intelligences Survey after the factor analyses was used for constructing a Multiple Intelligences profile of the 874 Tulsa Community College students. The possible scores ranged from 3 to 27 with a midpoint of 15. This is because the participants ranked all of the items starting with 1 for the items that were the most like them through 9 for the item least like them. Scores were computed for each participant in each Multiple Intelligences area by summing the ranking for each of the three items in each area. Low scores indicate support of a Multiple Intelligences area while high scores indicate the Multiple Intelligences area does not apply to the participant. The area with the lowest score was identified as the person's preferred Multiple Intelligences area. The Multiple Intelligences preferred area for the 874 TCC students that participated in the study were distributed over the nine Multiple Intelligences categories (see Figure 1). The Multiple Intelligences preferences categories were distributed as follows: Bodily/Kinesthetics Intelligence--19%, Musical Intelligence–18%, Logical Mathematical Intelligence--13%, Interpersonal Intelligence–10%, Interpersonal--10.9%, Intrapersonal--8.2%, Existential--7.7%, Visual--4.6%, Verbal--2.9%, and

Naturalistic--2.9%. Some (13.4%) of the participants had an equal high score in more than one Multiple Intelligences area; these preferences were labeled as “mixed”.

Figure 1: Distribution of Multiple Intelligences Categories for Community College Participants



Conclusion

A valid and reliable preference indicator, which is named Multiple Intelligences Survey (MIS), exists for identifying Multiple Intelligence preferences of adult learners (McClellan, 2006). Howard Gardner first introduced Multiple Intelligences over 20 years ago. Gardner’s theory provides a theoretical foundation for recognizing different abilities and talents. This theory acknowledges that while all students may not be verbally or mathematically gifted, students may have an expertise in other areas.

Although the nine Multiple Intelligences are anatomically separated

from each other, Gardner advises that they rarely operate independently. Rather, the intelligences are used concurrently and typically compliment each other as individuals develop skills and solve problems. Gardner believes that everyone has Multiple Intelligences, and there are opportunities to strengthen those intelligences. He ascertains Multiple Intelligences is meant to empower and not to label.

Educators have realized that students have unique learning differences, and they have widely embraced Multiple Intelligences. They have reconsidered the "factory" approach to education (Reynolds & Miller, 2003, p. 35). Instead, they are encouraging their students to develop their own intelligence profiles. This individualized evaluation permits educators to make more informed decisions on what and how to teach various subjects.

Gardner encourages teachers to think of all the Multiple Intelligences as equally significant. This is in great contrast to traditional educational systems. Typically, a significant emphasis has been placed on the development and use of Verbal and Mathematical Intelligences (Gardner, 1983). Thus, the theory of Multiple Intelligences implies that educators should recognize and teach to a broader range of talents and skills.

Moreover, because diversity exists in the Multiple Intelligences of the adult population, educators need to be equipped with the tools to understand and address all nine Multiple Intelligences. Arming educators with this new knowledge could enable them to use Multiple Intelligences in planning for and teaching with all nine of the intelligences. In addition, students could be empowered and encouraged to become creative with their assignments.

With the recognition of Multiple Intelligences by the teachers, student projects and assignments could become customized so that presentations correspond to one or more of their Multiple Intelligences preferences. For example, instead of writing a paper, students could present the results of their projects in the form of a video that incorporates linguistic (narrative), musical (background and rhythm), and spatial (pictures and charts) elements. These educational enhancements would seem to be more accessible to educators and students as the availability of the MIS instrument increases.

Multiple Intelligences has encouraged the reconsideration of standardized tests to determine intelligence. Educators have also began to use Multiple Intelligences checklists, inventories, and surveys to identify their students Multiple Intelligences preferences. There are many different

kinds of Multiple Intelligences checklists and inventories currently being used in the field. These Multiple Intelligences instruments typically represents themselves as a legitimate instrument. However, almost none of the checklists or inventories currently in the field report validity or reliability statistics. So far, there is only one other Multiple Intelligences instrument, the Midas, that has been developed that reports validity and reliability statistics. However, that instrument is not readily available to practitioners.

Therefore, for educators to become successful in teaching with Multiple Intelligences in mind, they must have an accessible, valid, and reliable assessment tool. Assessing a student's learning preferences allows a wider range of students to successfully participate in classroom learning (Lazear, 1991). In addition, it can create a learning environment conducive to adult learning.

The Multiple Intelligences Survey (MIS) is now available for practitioner use (see Insert). It is designed for easy and convenient use in the classroom. This 27-item preference indicator can be completed and scored in 5 to 7 minutes.

In addition to making an instrument available to practitioners, this study provided the first insights on the distribution of nine categories of Multiple Intelligences. Although Gardner does not provide any information on the relative size of each category of Multiple Intelligences, this study shows that they are not equally distributed. Moreover, while the traditional schooling system depends on the intelligences of Visual and Verbal, these are among the least preferred by the adult learners. The most preferred Multiple Intelligences are ones that allow the learner to be actively and emotionally involved in the learning; these are Bodily-Kinesthetic and Musical.

Thus, the MIS provides practitioners with another tool to help them address the individual differences in their students. In addition, the results from this study provide an initial guide for how frequently teachers can expect to encounter each of the Multiple Intelligences among their students. Equipped with this information, teachers can create a classroom that is supportive of Knowles' concepts of andragogy and self-directed learning and which fosters an environment for learner-centered education.

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