Personality Type Demographics and their Relationship to Teaching and Learning

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ABSTRACT

Assessment is the next most important activity that follows teaching-learning in the classroom. Assessment plans must be carefully strategized from a top-down perspective complemented by bottom-up realities. The assessment plan strategy must include elements of robustness which would make the results from implementation of the plan as insensitive as possible and hence more reliable to unavoidable variations. Examples of robustness assessment include assessment at the individual student level and teaching/learning based on the personality type demographics of students. This paper focuses on planning, implementing, and assessing the personality type demographics of undergraduate students in different majors. This must be accomplished in the context of logistics of time, access, and feedback to such studies. The paper also gives specific examples of personality type demographic assessment plan development, implementation, and outcomes from courses in four different programs in three different colleges. Teaching/Learning ideas that can better adapt to the personality type demographics are also addressed.

INTRODUCTION

In quality education, assessment is perhaps the next most important aspect that follows teaching- learning in the classroom. Every major and minor program needs to strategize and plan an assessment methodology. The assessment methodology must be then implemented, data collected, analyzed, and interpreted, eventually leading to improvements in the teaching/learning process. Both a top-down and bottom-up approach is necessary to realize good assessment outcomes. As a top-down approach, programs have their own assessment strategies that constantly evolve to meet the mission and goals of the university, college, and department and the requirements of any formal or informal accrediting agencies. “Robust” assessment is one key strategy that can enhance the assessment outcomes. The author of this proposal presented this novel strategy of robust assessment at the International Conference on Education in Hawaii in January 2008. ^[1] Robust assessment minimizes the adverse effects of variables on the reliability of assessment results by identifying, understanding, and controlling the influence of such variables. The “personality type” demographics of students in a program are one of several variables that must be assessed and effectively utilized to improve teaching-learning. Such an assessment is an example of a bottom-up approach that supports the top-down strategy of robust assessment. Personality types greatly influence team dynamics or interaction. This is particularly important in courses wherein teams or groups of students work on projects. This paper presents the planning/methodology, implementation, anticipated outcomes, and results to achieve the objectives given next.

OBJECTIVES

- identify the personality type demographics of students in project based courses in representative programs in each of the three colleges at UW-Platteville

- identify ways to improve team dynamics and teaching/learning to suit the personality demographics

METHODOLOGY AND RESULTS OF IMPLEMENTATION OF THE METHODOLOGY

Four major tasks were identified as part of the planning/methodology. These tasks are given next. Under each task, the results of implementing that task are also described.

Task1: Identify team project based courses in representative programs from each of the three colleges at UWP

After discussing with several faculty members in the three colleges of EMS (Engineering, Mathematics, and Science), BILSA (Business, Industry, Life Sciences, and Agriculture), and LAE (Liberal Arts and Education) about possible team based courses that can best represent this study in the short-term, the following courses were chosen as shown in Table 1 below. The table also shows additional information about these courses specific to the 2011 Spring semester of study.

Table 1 Courses Chosen for Personality Type Demographics Study

#	College	Course Number	Course Title	Number of Teams
1	EMS	MECHNCHL 4930-01,02,03	Senior Design Project	12
2	EMS	CIVILENG 4930-01	Civil and Environmental Engineering Design Project	14
3	BILSA	AGINDUS 4500-01,02	Agribusiness Management	11
4	LAE	THEATER 1130-01	Introduction to the Theatre	6
5	LAE	THEATER 1130-02	Introduction to the Theatre	7

As can be seen in the above table, all sections of each particular course have been combined in the study except for the two sections of the Introduction to the Theatre class. This was because it was felt that more insight can be gained by treating these two sections separately due to the fact that students from several different majors enroll in this course unlike other courses which are primarily taken by respective majors.

Task 2: Get approval from the Institutional Review Board

A rigorous protocol had to be submitted to the Institutional Review Board (IRB) for Human Subject Research (a UWP University Committee) so that students can participate in a selected personality type test. Approval was received through due process.

Task 3: Select and Administer the Personality Test

Well-known personality test instruments with varying combinations exist including Keirsey's four-combination temperament scale ^[2] and Myers-Briggs ^[3] sixteen-combination scale. Keirsey Temperament Sorter (KTS-II) was chosen for students to understand their preference personality type in the four-

combination Keirsey scale of Artisans, Idealists, Rationals, and Guardians. Their website keirsey.com^[4] gives some idea of the popularity of this particular survey instrument.

As for better inference from the personality type test, a survey questionnaire consisting of ten questions was carefully planned on the basis of the underlying principles of not only the four-combination Keirsey scale but the sixteen-level Myers-Briggs model as well. The ten-question survey questionnaire requires that response to only Question I be entered from the on-line test result of the personality type (as Artisan or Idealist or Rational or Guardian) at keirsey.com. The responses to all the remaining nine questions II through X are the opinions of the students about themselves. The survey questionnaire that the students complete is given below.

QUESTIONNAIRE

QUESTION I

What is your Temperament (or personality type) **as per the result of the test** you took at keirsey.com?

(Check one)

ARTISAN: _____ IDEALIST: _____ RATIONAL: _____ GUARDIAN: _____

To each of the following questions II through X, select an answer that best describes you in **your opinion**:

QUESTION II: In communicating, are you _____ (Abstract or concrete?)

QUESTION III: In achieving goals, are you _____ (Cooperative or Utilitarian)?

QUESTION IV: What are you most proud of about yourself? (Select ONE from the following):

- a. Of the degree to which you are graceful in action
- b. Of the degree to which you are empathic in action
- c. Of the degree to which you are competent in action
- d. Of the degree to which you are reliable in action

QUESTION V: What do you respect the most about yourself? (Select ONE from the following):

- a. Of the degree to which you do good deeds
- b. Of the degree to which you are daring
- c. Of the degree to which you are benevolent
- d. Of the degree to which you are autonomous

QUESTION VI: What are you most confident of about yourself? (Select ONE from the following):

- a. Of the degree to which you are strong willed
- b. Of the degree to which you are respectable
- c. Of the degree to which you are adaptable
- d. Of the degree to which you are authentic

QUESTION VII: Are you more of an extrovert (E) or an introvert (I)? _____ (E or I?)

QUESTION VIII: Do you notice information more by Sensing (S) or by intuition (N)? _____ (S or N?)

QUESTION IX: Do you make decisions more by thinking (T) or by feeling (F)? _____ (T or F?)

QUESTION X: Would you like to live in a world run more by judging (J) or by perceiving (P)? _____ (J or P?)

It is appropriate at this point to discuss the underlying principles/theory/literature that served as drivers to generate these specific questions to effectively administer, gather & analyze data, and interpret results of the survey.

One school of thought about the 4-level Keirsey model is that the four personality types stem from the four combinations of two possible responses to each of two questions as follows:

In communicating, are you abstract or concrete?

In achieving goals, are you cooperative or utilitarian?

The personality type preference (“preference” because all of us have all four personality type behavior in us but prefer one of these more to varying degrees over the rest) is based on the particular combination of responses to the above two questions as shown in Table 2a below:

Table 2a

Communicating	Achieving Goals	Personality Type Preference
Abstract	Utilitarian	Artisan
Abstract	Cooperative	Idealist
Concrete	Utilitarian	Rational
Concrete	Cooperative	Guardian

Obviously, many specific traits have been lumped into the simple model shown in the above table of four possible response combinations to two questions. The actual test at Keirsey.com uses responses to about seventy (70) questions to determine the personality type much more rigorously. But the two-question simple model gives broad categorizations of communicating and goal achieving preferences of each personality type which in and of itself can be valuable to a person as an individual or as a team member. These two questions are therefore included as Questions II and III in the survey.

Several different perspectives understandably exist about the fascinating and complex field of study of personality types. Deeper or finer characteristics of different personality types are proposed by different authors. Obviously, meaningful statistical correlations between such deeper/finer characteristics and personality types are less likely than broader characteristics. Large sample sizes would be required even if such correlations could be extracted for such deeper/finer characteristics. A short-term study such as the one done here with small sample sizes cannot obviously yield meaningful statistical inferences on deeper or finer characteristics. Yet, the author decided to include Questions IV, V, and VI seeking the students’ choices to questions on deeper or finer characteristics that are proposed as possible correlations to the 4-level personality types. The author hopes to continue collecting responses to these questions over time to have enough sample size to make meaningful inferences.

Questions VII, VIII, IX, and X, well known in the literature, have been chosen to seek the students’ responses to identify their particular individual personality type in the sixteen-level Myers-Briggs model. As can be seen in the questionnaire, these four questions each have two choices. Picking one choice for

each of these questions therefore results in one particular personality type from $2 \times 2 \times 2 \times 2 = 16$ possible combinations or types. It should be noted that in the IRB protocol no on-line Myers-Briggs testing was proposed because the focus in the proposal was more on the Keirsey model for better understanding of group demographics. The Myers-Briggs model is more useful for inferences at the individual level. But the author intends to add an on-line Myers-Briggs testing in future studies for which a new IRB protocol will be submitted. This will provide additional inferences regarding the students' own assessment and an actual test assessment of the individual personality type in the 16-level Myers-Briggs model. Additionally, any correlation done using the students' self-assessment can be repeated for the actual test assessment.

Before presenting results of the personality type surveys in the five courses identified in Table 1, historical major developments in personality type studies are discussed next to provide a contextual framework for the results in this task phase and for the analysis of the results to follow in the next task phase.

The earliest rigorous work on personality types dates back to the work of Carl Gustav Jung (1875-1961)⁵. Isabel Briggs Myers (1897-1980), together with her mother Katherine Cooks Briggs, extended Jung's theory of personality types, adding two important aspects. These were the recognition of the existence and roles of the auxiliary processes and the addition of the Judging (J) and Perceiving (P) preference^{6, 7, 8}. Thus Jung's eight types ($2 \times 2 \times 2$) were extended to the Myers-Briggs' sixteen types ($2 \times 2 \times 2 \times 2$). Sixteen "Myers-Briggs Type Indicators" (MBTI) arise from every possible combination of one selection from each pair of dichotomies as shown in the table below. (ISTP and ENTJ are two example types of the possible 16). The abbreviations E, I, S, N, T, F, J, and P as shown will be used throughout this report.

Table 2b

Extroversion	E	Introversion	I
Sensing	S	Intuition	N
Thinking	T	Feeling	F
Judging	J	Perceiving	P

The MBTI has been and continues to be used worldwide and is an instrument developed specifically as a tool for the general population, and is therefore inherently benign. As a founding principle, no one type is any better or worse than any other and the test candidate has the final say as to his or her type designation⁶. In its basic form, MBTI is a 93-item instrument used worldwide for psychological type classification and is available in many different languages. The MBTI has been around for over 60 years

and has been used in a number of occupational settings. MBTI instrument intends to find an individual's preference to the four dichotomies mentioned above as follows⁹:

Putting attention and getting energy by spending more time

- in the outer world of people and things (E) or
- in the inner world of ideas and images (I)

Paying more attention to

- information that comes in through the five senses (S) or
- the patterns and possibilities seen in the received information (N)

Making decisions by putting more weight on

- objective principles and impersonal facts (T) or
- personal concerns and the people involved (F)

Liking to live in a world of a more

- structured and decided lifestyle (J) or
- flexible and adaptable lifestyle (P)

The choice between E or I is about orientation, S or N is about cognitive perceiving function, T or F is about cognitive judging function, and J or P is about attitude of the functions. Myers stated that the interaction of these orientations, functions and attitudes are what makes up the personality types.

The Keirsey Temperament Sorter II (KTSII) is an instrument developed by David Keirsey¹⁰, a contemporary of Isabel Myers. The test is available online as a 70-item instrument that has only two possible responses for each item¹¹. Keirsey follows the MBTI tradition of using 16 types but condenses through a tree-like structure into four temperament groupings called Artisans, Idealists, Rationals, and Guardians. Fundamentally, the Keirsey model theory looks at the four possible combinations between abstract or concrete in communicating and cooperative or utilitarian in achieving goals. Artisans prefer concrete communication and utilitarian goal achievement traits, idealists prefer abstract and cooperative traits, rationals prefer abstract and utilitarian traits, and guardians prefer concrete and cooperative traits. Linkage of the four KTSII types to the sixteen MBTI types is another classification. Artisans prefer S and/or P, idealists prefer N and/or F, rationals prefer N and/or T, and guardians prefer S and/or J. Just like MBTI, KTSII is widely used in industry and education. In general, the KTSII Temperament Sorter can provide a better insight into group demographics due to the broad but relatively not so deep 4-level categorization whereas any study based on the Myers-Briggs model provides a better insight into individuals' personal assessment due to the specific or relatively deep 16-level categorization. It should be noted though that KTSII does offer insights into individuals' personal assessment and the Myers-Briggs based model does offer insights into group demographic information.

Having discussed the brief historical context of the KTSII and Myers-Briggs models, results from the surveys conducted in the five courses identified earlier are tallied below. Tables 3, 4, 5, 6 and 7 show the

- Artisans, Idealists, Rationals, and Guardians
- SPs, NFs, NTs, and SJs
- ESTPs, ISTPs, ESFPs, ISFPs, ENFPs, INFPs, ENFJs, INFJs, ENTPs, INTPs, ENTJs, INTJs, ESTJs, ISTJs, ESFJs, and ISFJs
- Extroverts (E) and Introverts (I); Sensing (S) and Intuitive (N); Thinking (T) and Feeling (F); Judging (J) and Perceiving (P)

TABLE 3

Category	Percentage (%)
Others	21.0
Students	5.0
Employees	4.0
Customers	68.0

CIVILENG 4930-01		TABLE 4																	
	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	Total	%		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N					
Artisan	0	0	0	0	0	0	0	2	0	1	1	0	1	1	6	14.0			
Idealist	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2.3			
Rational	0	1	0	0	0	0	1	0	1	0	1	0	0	0	4	9.3			
Guardian	2	3	1	3	3	4	3	0	4	1	4	1	2	1	32	74.4			
Total																			
Rspncs	43																		
SP		NF		NT			SJ												
ESTP	5	ENFP	1	ENTP	4	ESTJ	2												
ISTP	11	INFP	0	INTP	5	ISTJ	6												
ESFP	4	ENFJ	0	ENTJ	0	ESFJ	2												
ISFP	1	INFJ	0	INTJ	2	ISFJ	0												
	21		1		11		10												
	49	percent	2	percent	26	percent	23	percent											
Extroverts	18	42	percent		35	81	percent												
Introverts	25	58	percent		8	19	percent												
Sensing	31	72	percent		Judging	12	28	percent											
Intuitive	12	28	percent		Perceiving	31	72	percent

Category	Count
Thinking	18
Feeling	25
Judging	31
Perceiving	81

TABLE 5

AGINDUS	TABLE 5																		
4500-01,02	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	Total	%		
	A	B	C	D	E	F	G	H	I	J	K								
Artisan	1	0	0	0	0	0	0	0	1	1	1					4	12.5		
Idealist	0	0	0	0	0	0	0	0	0	0	0					0	0.0		
Rational	0	0	1	0	0	0	0	1	0	1	0					3	9.4		
Guardian	2	4	1	5	1	4	2	3	1	1	1					25	78.1		
Total																			
Rspncs	32																		
SP		NF		NT		SJ													
ESTP	2	ENFP	1	ENTP	4	ESTJ	1												
ISTP	7	INFP	0	INTP	3	ISTJ	3												
ESFP	0	ENFJ	0	ENTJ	4	ESFJ	2												
ISFP	1	INFJ	0	INTJ	3	ISFJ	1												
	10		1		14		7												
	31	percent	3	percent	44	percent	22	percent											
Extroverts	14	44	percent		Thinking	27	84	percent											
Introverts	18	56	percent		Feeling	5	16	percent											
Sensing	17	53	percent		Judging	14	44	percent											
Intuitive	15	47	percent		Perceiving	18	56	percent

TABLE 6

THEATER	TABLE 6																		
1130-01	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	Total	%		
	A	B	C	D	E	F													
Artisan	1	2	1	0	1	2										7	21.9		
Idealist	1	1	0	1	2	2										7	21.9		
Rational	0	0	0	0	1	0										1	3.1		
Guardian	2	3	4	4	2	2										17	53.1		
Total																			
Rspncs	32																		
SP		NF		NT		SJ													
ESTP	3	ENFP	4	ENTP	6	ESTJ	1												
ISTP	2	INFP	2	INTP	6	ISTJ	1												
ESFP	1	ENFJ	1	ENTJ	1	ESFJ	2												
ISFP	1	INFJ	0	INTJ	1	ISFJ	0												
	7		7		14		4												
	22	percent	22	percent	44	percent	13	percent											
Extroverts	19	59	percent		Thinking	21	66	percent											
Introverts	13	41	percent		Feeling	11	34	percent											
Sensing	11	34	percent		Judging	7	22	percent											
Intuitive	21	66	percent		Perceiving	25	78	percent

TABLE 7

THEATER 1130-02	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	Total	%				
	A	B	C	D	E	F	G														
Artisan	2	2	1	0	1	1	0									7	20.0				
Idealist	0	1	1	1	0	0	0									3	8.6				
Rational	0	0	0	0	0	1	0									1	2.9				
Guardian	4	3	6	3	4	3	1									24	68.6				
Total Rspncs	35																				
SP		NF		NT		SJ															
ESTP	1	ENFP	3	ENTP	5	ESTJ	2														
ISTP	4	INFP	3	INTP	4	ISTJ	0														
ESFP	5	ENFJ	1	ENTJ	0	ESFJ	1														
ISFP	4	INFJ	0	INTJ	2	ISFJ	0														
	14		7		11		3														
	40 percent		20 percent		31 percent		9 percent														
Extroverts	18		51 percent		Thinking	18	51 percent														
Introverts	17		49 percent		Feeling	17	49 percent														
Sensing	17		49 percent		Judging	6	17 percent														
Intuitive	18		51 percent		Perceiving	29	83 percent

Task 4: Analyze and Interpret the Data

Results extracted from students' response to Question I of the Questionnaire regarding the on-line KTS-II test result of personality type of each student in the five courses listed in Table 1 are summarized below in Table 8a through 8e (extracted from Tables 3 to 7). The tallies in the last four rows are for Artisans, Idealists, Rationals, and Guardians respectively for each course.

Table 8a: Mechnchl 4930-01,02,03, College of EMS

TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	Total	%
A	B	C	D	E	F	G	H	I	J	K	L			
1	1	2	2	2	0	1	1	1	2	0	1	14	21.5	
0	0	0	0	1	0	0	0	0	1	1	1	4	6.2	
1	1	0	0	0	0	0	0	0	1	0	0	3	4.6	
4	4	3	3	2	5	4	5	4	2	5	3	44	67.7	

Table 8b: CivilEng 4930-01, College of EMS

Team	Team	Team	Team	Team	Team	Team	Team	Team	Team	Team	Team	Team	Team	Total	%
A	B	C	D	E	F	G	H	I	J	K	L	M	N		
0	0	0	0	0	0	0	2	0	1	1	0	1	1	6	14.0
0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2.3
0	0	0	0	0	0	1	1	0	1	0	0	0	1	4	9.3

2	3	1	3	3	4	3	0	4	1	4	1	2	1	32	74.4
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Table 8c: Agindus 4500-01,02 College of BILSA

TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	Total	%
A	B	C	D	E	F	G	H	I	J	K		
1	0	0	0	0	0	0	0	1	1	1	4	12.5
0	0	0	0	0	0	0	0	0	0	0	0	0.0
0	0	1	0	0	0	0	1	0	1	0	3	9.4
2	4	1	5	1	4	2	3	1	1	1	25	78.1

Table 8d: Theater 1130-01, College of LAE

TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	Total	%
A	B	C	D	E	F		
1	2	1	0	1	2	7	21.9
1	1	0	1	2	2	7	21.9
0	0	0	0	1	0	1	3.1
2	3	4	4	2	2	17	53.1

Table 8e: Theater 1130-02, College of LAE

TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	TEAM	Total	%
A	B	C	D	E	F	G		
2	2	1	0	1	1	0	7	20.0
0	1	1	1	0	0	0	3	8.6
0	0	0	0	0	1	0	1	2.9
4	3	6	3	4	3	1	24	68.6

The composite percentage demographics of Artisans, Idealists, Rationals, and Guardians shown in the extreme right column of Tables 8a through 8e are shown next in Figures 1a through 1e respectively.

Fig. 1a Bar-Chart of Personality Type Demographics of MechEnl 4930-01, 02, 03

Fig. 1b Bar-Chart of Personality Type Demographics of CivilEng 4930-01

Fig. 1c Bar-Chart of Personality Type Demographics of Agindus 4500-01, 02

Fig. 1d Bar-Chart of Personality Type Demographics of Theater 1130-01

Fig. 1e Bar-Chart of Personality Type Demographics of Theater 1130-02

Some preliminarily strong but inconclusive inferences can be made from the cross-tabulation statistics of Tables 8a through 8e about the proportion of students that fall into each of the four personality types of the KTS-II model in the surveyed courses as follows:

- Irrespective of major specific classes or not, majority of the students are guardians. The proportion of guardians is around 65% or more in engineering and business majors. The author is very confident of the position that 60% or more of mechanical engineering majors will be guardians at any time based on unpublished statistics collected over several years. Guardians are good team players, organized, concrete in communicating, and cooperative in achieving goals.
- Idealists are only about 8 to 10% of the general population. It is noteworthy that the Introduction to Theater classes represent that distribution (more so in 1130-01) whereas idealists are significantly underrepresented in Engineering and Business classes. Idealists

bring harmony within teams, have broad and futuristic visions, are abstract in communicating, and cooperative in achieving goals.

- c. Rationals form the lowest percentage in the general population (about 5 to 8%) which is reflected across all courses. Rationals are pragmatic, creative, problem solvers who are abstract in communicating and utilitarian in achieving goals.
- d. Artisans are the second largest segment of the general population (about 30 to 35%) after guardians. This ratio is much better reflected in the theater classes than the engineering/business classes where the lower percentage of artisans than the national average goes to somewhat make up the higher percentage of guardians than the national average. Artisans are concrete in communicating, utilitarian in achieving goals, and can bring creative ideas for teams.

In order to check the degree of association between personality types and program majors, a Chi-square test as previously planned was conducted using different re-binned combinations of the contingency tables 8a through 8e. For example, a 4 X 2 contingency table relating artisans, idealists, rationals, and guardians to enrollments in non-LAE and LAE courses was set up as shown in Table 9 below (drawn from Tables 8a through 8e) and analyzed as follows:

Table 9

	Artisans	Idealists	Rationals	Guardians
Enrolled in Non-LAE course	24	5	10	99*
Enrolled in LAE course	14	10	2	41

*A value of 99 has been used instead of the actual count of 101 due to a 2-digit restriction in the software

The results of the chi-square test ¹² for the data in Table 9 are as follows:

Data:

	A	B	C	D	
1	24	5	10	99	138
2	14	10	2	41	67
	38	15	12	140	205

Expected values:

	A	B	C	D
1	25.6	10.1	8.08	94.2
2	12.4	4.90	3.92	45.8

Chi-square = 10.3; Degrees of freedom = 3; Probability = 0.016

Although the low probability value of 0.016 negates the null hypothesis of non-influence of personality types on enrollment in LAE or non-LAE courses, the inference is strictly not acceptable because two of the expected values as seen in the above results are below the rule-of-thumb limit of 5 for the Chi-square test to be valid. It can be seen that the low number of idealists and/or rationals compared to artisans and guardians as data is the root cause of the problem. Such data is reflective of small and unbalanced data. For such small, sparse, unbalanced data, the Fisher test is much better suited.^{13,14}

The results of the Fisher exact test¹⁵ for the data in Table 9 are as follows:

Data:

	A	B	C	D	
1	24	5	10	99	138
2	14	10	2	41	67
	38	15	12	140	205

Expected values:

	A	B	C	D
1	25.6	10.1	8.08	94.2
2	12.4	4.90	3.92	45.8

The given table has probability of 7.7E-05

The sum of the probabilities of "unusual" tables $p = 0.021$

The low value of $p=0.021$ negates the null hypothesis and thereby provides a strong inference that personality types of individuals affects their choice between non-LAE and LAE majors. It should be noted that this inference is likely to have been even stronger if the LAE courses 1130-01 and 1130-02 were to be taken only by students majoring programs in the College of LAE alone and not in other colleges as well. This conclusion is drawn from the additional data that was collected that 19 of the 67 students in the combined 1130 Theater course were interested in majoring in a program within the College of LAE. In other words, if just 19 of 67 students interested in LAE majors the 1130 course could significantly affect the association between personality type and choice of non-LAE and LAE majors, the effect would have been much more pronounced if all students in the 1130 course were majoring in LAE programs.

As for association between personality types and choice of majors within the college of EMS or in majors in EMS and BILSA, the Fisher tests revealed no strong association, thereby confirming the null hypothesis. For example, in checking the association between personality types and majors in Mechanical Engineering and Civil & Environmental Engineering, the data is shown in Table 10 (extracted from Tables 8a and 8b). The results of the Fisher test follow the table.

Table 10

	Artisans	Idealists	Rationals	Guardians
Mechnchl 4930	14	4	3	44
CivilEng 4930	6	1	4	32

The results of the Fisher exact test ¹⁵ for the data in Table 10 are as follows:

Data:

	A	B	C	D	
1	14	4	3	44	65
2	6	1	4	32	43
	20	5	7	76	108

Expected Values:

	A	B	C	D
1	12.0	3.01	4.21	45.7
2	7.96	1.99	2.79	30.3

The given table has probability 6.9E-03. The sum of the probabilities of "unusual" tables $p = 0.484$

With a p value of 0.484 from the results as seen above, the null hypothesis of non-association between personality types and choice of Mechanical or Civil Engineering cannot be negated. Inferences from Fisher Exact test inferences can improve with more sampling. As for the 16-level Myers-Briggs demographics of students in the five courses based on their own assessment in this model, the following results are summarized in Table 11a through 11e (extracted from Tables 3 through 7).

Table 11a: Mechnchl 4930-01,02,03, College of EMS

SPs	NFs	NTs	SJs
ESTP: 5	ENFP: 1	ENTP: 5	ESTJ: 4
ISTP: 13	INFP: 3	INTP: 15	ISTJ: 3
ESFP: 1	ENFJ: 1	ENTJ: 4	ESFJ: 1
ISFP: 1	INFJ: 0	INTJ: 8	ISFJ: 0
31%	8%	49%	12%

Table 11b: CivilEng 4930-01, College of EMS

ESTP: 5	ENFP: 1	ENTP: 4	ESTJ: 2
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ISTP: 11	INFP: 0	INTP: 5	ISTJ: 6
ESFP: 4	ENFJ: 0	ENTJ: 0	ESFJ: 2
ISFP: 1	INFJ: 0	INTJ: 2	ISFJ: 0

Table 11c: AgIndus4500-01, College of BILSA

ESTP: 2	ENFP: 1	ENTP: 4	ESTJ: 1
ISTP: 7	INFP: 0	INTP: 3	ISTJ: 3
ESFP: 0	ENFJ: 0	ENTJ: 4	ESFJ: 2
ISFP: 1	INFJ: 0	INTJ: 3	ISFJ: 1

Table 11d: THEA 1130-01, College of LAE

ESTP: 3	ENFP: 4	ENTP: 6	ESTJ: 1
ISTP: 2	INFP: 2	INTP: 6	ISTJ: 1
ESFP: 1	ENFJ: 1	ENTJ: 1	ESFJ: 2
ISFP: 1	INFJ: 0	INTJ: 1	ISFJ: 0

Table 11e: THEA 1130-02, College of LAE

ESTP: 1	ENFP: 3	ENTP: 5	ESTJ: 2
ISTP: 4	INFP: 3	INTP: 4	ISTJ: 0
ESFP: 5	ENFJ: 1	ENTJ: 0	ESFJ: 1
ISFP: 4	INFJ: 0	INTJ: 2	ISFJ: 0

As can be seen in Tables 11a through 11e, the sixteen level Myers-Briggs model often has too many levels to expect significant percentage of students falling into a few of these levels. But noteworthy numbers still tally for ISTP, ENTP, and INTP types across the board. Also, there are more ISTJs in engineering/business major courses than in courses with enrollment from different majors. Again, these are probable inferences that must be validated over larger samples over time. Even though dominant personality type presence cannot be discerned in the 16-level model, it is helpful to recognize the implications of the significant presence of ISTP, ENTP, and INTP types in team-based courses such as the ones being studied. For example, ISTPs are loyal to their peers and to their internal value system. Detached and analytical, they excel at finding solutions to practical problems. ENTPs are creative, resourceful, and intellectually quick. They are good at a broad range of things. They get very excited about new ideas and projects. They have excellent ability to understand concepts and apply logic to find solutions. But during team discussions they may tend to dominate. INTPs are logical, original, creative thinkers. They can become very excited about theories and ideas. Exceptionally capable and driven to turn theories into clear understandings. They highly value competence and logic. They tend to be individualistic. ISTJs are extremely thorough, responsible, and dependable. They are well-organized, hard working, and progress steadily towards identified goals. They can usually accomplish any task once they set their mind to it.

Literature regarding engineering teams suggests that ISTJs (Inspectors) and ESTJs (Supervisors) can be very good team leaders (Tier 0). Working under them could be a suitable development team combination

of ISTPs (Operators), ESTPs (Promoters), INTJs (Mastermind), INTPs (Architects), ENTPs (Inventors), and ENTJs (Field marshals who can also be team leaders) (Tier 1). At the next level of Tier 2, choices could be a suitable combination of ISFJs (Protectors), ESFJs (Providers), INFPs (Healers), and ENFPs (Champions). At the next less important level of Tier 3 in engineering work, INFJs (Counselors) and ENFJs (Teachers) could be considered. At the fourth and final level, ISFPs (Composers) and ESFPs (Performers) can be placed. It should be recognized that such a model is not likely to suit a team working on putting together a theatrical performance. In such artistic environments, ISFPs (Composers) and ESFPs (Performers/Actors/Costume Designers) are far more important in the team hierarchy than they are in engineering work environments. The author has no professional qualification in the fine arts area to make any specific recommendations for courses in LAE. Instead, a detailed demographic feedback from the survey has been given to the faculty who teach the theater classes so that they can utilize the information to form teams and/or assign tasks that suit their needs based on the personality types. Similar comments about the author apply to courses in BILSA. In summary, having the right mix of personality types in team membership and assigning tasks to each of them that best suits their individual personality types will significantly improve team dynamics and performance. If teams cannot be formed based on personality types due to different reasons such as confidentiality or logistics, students must be cognizant about the subject of personality types, their effects on team dynamics, and possible conflicts that could arise due to too many members being of the same personality type – guardians in engineering majors such as mechanical engineering for example.

Personality type demographics can also be used to improve teaching-learning methods. For example, guardians (who are often the majority personality type in most, if not all, courses) like material to be presented in an organized manner. This may require teachers to be more methodical in their lectures and to supplement their lectures with more handouts. Care should be taken to also motivate guardians to put extra effort to be creative when situations warrant as in design problems. Care should also be taken to avoid over-saturating the teaching-learning strategies that adapt only to guardian type at the exclusion of other types. Surveys taken by students, feedback given to them similar to the key findings in this report, and encouragement given to them to further understand the topic and influence of personality types are different means of enhancing their learning of the subject. For example, students are asked to see a web site that provides a high-level description of the sixteen personality types¹⁶ in the Myers-Briggs model and compare themselves to the particular description as per their particular individual personality type.

This paper is the result of furthering the knowledge about personality types, sharing with students and continued publishing and presentation¹⁷. The author intends to extend the study to students in other majors not only at UWP but also in other institutions in countries such as India and China about which not much information is available. Such information will be extremely valuable in the current context of global relations of the US with these countries.

REALIZED OUTCOMES

Planning, implementation, analysis and interpretation of results of the personality type demographics as described above demonstrate that the following outcomes have been realized.

- Identification of ways to improve team dynamics
- Modification of teaching/learning styles to better suit the personality demographics
- Broadening of the knowledge-base on personality type of students in programs

- Publication of research results in conferences/publications

IMPACT ON ACADEMIC PROGRAMS

This study has the potential to shape the process of building personality based teams for projects in courses that require them. Personality type results could potentially be used as an advising tool to help some students in the selection of a degree granting program to pursue. Knowledge of personality type demographics of students can also help the instructor to use suitable teaching-learning strategies and methods to match such demographics for enhanced learning outcomes.

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BIOGRAPHICAL INFO

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