

Outcomes Assessment Report

Hum D 105 Math Anxiety

By

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December, 2000

Abstract

The data suggests that Human Development 105, Overcoming Math Anxiety does increase math study skills and reduces math anxiety. However, tutoring, instructor help, a study buddy, and other outside influences can also be a contributing factor. Of the 36 students who have taken additional math since attending Hum D 105, 61% have passed with a C- or better, 14% with a D, E, and 25% with an EV, V, W, N, R. Of the 12 students who have either progressed on or took Math 065 and who have taken Hum D 105, (66%) passed with a C-. Overall comments regarding Overcoming Math Anxiety are favorable and recommendations for this course are offered.

Many thanks go to Bobbie Nelson for providing the Data Express information, Earl Martin and Julia Buchholz for editing, and Laura Shabel's expertise and countless hours of dedication to word processing this document.

I. INTRODUCTION

The purpose of this report is to provide the reader with quantitative data, measuring the reduction of math anxiety, increase in math study skills, and an overview of learning style in Human Development 105, Overcoming Math Anxiety, for the 1999-2000 academic year. Also provided is information on the success of Hum D 105 students who have taken math courses.

Fall quarter of 1999, Hum D 105 was linked with a Math 027, Elementary Algebra class taught by Susan Cross. The course was taught two days a week (Tuesday/Thursday), for ten weeks, prior to the algebra course. Winter 2000 the course was taught in a two-hour block on Mondays for ten weeks. Spring 2000 the course was taught in a five-week format, two days a week (Tuesday/Thursday), in two-hour blocks.

Fall, Winter, and Spring quarters, 14, 15, and 9 students, respectively, (38 total) completed the Hum D 105. Each student was given the Math Anxiety Rating scale (MARS), Math Study Skills Evaluation (MSSE), Edmonds Learning Style Identification Exercise (ELSIE), and depending upon the class, either the Gregorc or Learning Style Inventory (LSI).

II. ASSESSMENT

a) MATH ANXIETY RATING SCALE

Anxiety can be problematic for some students taking math courses. Therefore the Math Anxiety Rating Scale was used to assess each student's level of anxiety, specifically anxiety related to mathematics.

The MARS is a 98 item self-rating scale. Each item on the scale represents a situation which may arouse anxiety within a subject. The subject is to decide on the degree of anxiety aroused providing responses on a 5-point likert scale. Subjects are to describe their anxieties as they currently exist. The MARS is used as the basis for forming a desensitization therapy anxiety hierarchy, the items are inspected to identify those which arouse differing levels of anxiety. The mean score for a University of Missouri sample (N = 397) was 215.4 with a standard deviation of 65.3.

The MARS was administered on the first and last day of class each quarter. The mean scores for the first administration were 267, 255 and 267, and for the final administration, 194, 209 and 186 for fall, winter and spring, respectively. These figures indicate a decrease in anxiety toward math by the end of the class.

Difficulties with attendance and student personal problems (such as childcare issues, financial problems, too many hours of work, learning difficulties, and mental health issues) influenced the end of the quarter averages. This can be seen by looking at Table 1, item 4, fall quarter and items, 1, 3, and 7, winter quarter. It is interesting to note that the individual winter quarter under item 7 scored 141 points higher at the end of the quarter. The student mentioned coming to my class immediately after taking a final examination in math and claiming to have failed the test. Contrary to the averages, personal successes can be noted. For example, a reduction of 252 points occurred for the student in item 14 under fall quarter and a reduction of 220 points occurred for the student in item 15, winter quarter. Overall, there was a decrease in math anxiety for the majority of students in each class.

b) MATH STUDY SKILLS EVALUATION

Mathematics courses require different study procedures when compared to psychology, history, or English. Study skills are usually not taught in the K-12 arena, and particularly those needed for successful learning in math. Therefore, it is important to assess whether students have the requisite study skills necessary to negotiate the challenges in a math course.

The Math Study Skills Evaluation is a 25 item self-report survey using a 3-point likert scale. Results from the survey can provide feedback on a particular study area and provide a cumulative score. A score of 70 or below means an individual has poor math skills. A range of 70-80 indicates good study skills, but there is room for improvement. A score of 90 indicates excellent math study skills. The mean scores for the first administration for each class were 63, 54, 57 and the post was 65, 72, 74 for fall, winter and spring, respectively. While there is a slight increase in the average for each class at the end of the course, clearly the data suggests there is room for improvement. However, looking at Table 2, item 13, Winter quarter, and item 9, Spring quarter, there is an increase in points for each individual by 32 and 33 points respectively. In other cases, particularly for students in the class Fall quarter, there was no significant gain. In fact, a few students had a worse score at the end of the course or came out the same. Overall however, there was improvement in math study skills by the end of the quarter.

c) EDMONDS LEARNING STYLE IDENTIFICATION EXERCISE

There is a wide body of research that supports the fact that individual students have particular styles of learning. Learning style inventories were administered to students as a means to enhance their own personal understanding of how they learn, and how to use this information when they study, memorize material, prepare for tests, interpret story problems and so on.

The Edmonds Learning Style Identification Exercise (ELSIE) is a 50 item, orally administered assessment which measures the way in which a person is programmed to learn most effectively and to identify one's pattern of internalization of his or her native language. For example, particular individuals will hear a word and initially have a mental image (visual) of an object or activity, mental image (written word) of a word spelled out, receive meaning from the sound (auditory) without any visualization, or have a fleeting kinesthetic (activity) emotional or physical reaction. A student ranks each word according to the above criteria and at the end totals each column. Each score is then converted to a plus or minus band score. A profile can vary for each individual and particular strengths can be emphasized for a particular learning style. Band scores for each student can be averaged to formulate an overall profile for each particular class. Table 3 provides an ELSIE profile for Fall, Winter and Spring classes, respectively. It is important to note that each student compared to another has a significantly different learning profile, and that each class is different with respect to learning as well. For example the Written Word and Auditory category scores for Fall quarter are significantly different when compared to spring. The Spring quarter class Activity score indicates that kinesthetic activities are not preferred for learning whereas written word is. Significant differences can be noted between each class, within each class, and between each student. It is also interesting to note that regardless of learning style, students are able to reduce their anxiety by the end of the quarter.

d) GREGORC and LEARNING STYLE INVENTORY

To further supplement the student's understanding of their learning style, the Gregorc was administered Fall and Winter quarter. Profiles were also gathered for these classes and significant differences were similarly noted as with the ELSIE. I chose not use the Gregorc Spring quarter since students during Winter quarter had difficulty understanding and defining the terms used in the inventory. Rather, I chose to use the Learning Style Inventory (LSI). The LSI

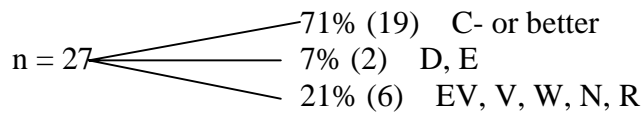
is 12-item self-descriptive device which assesses an individual’s preferred learning style via how that person deals with ideas and day-to-day situations. Categories are created on how one perceives (concrete, abstract) new information and how we process what we perceive (active, reflective). These categories are then combined into four basic styles of learning. However, these will vary for each particular individual.

III. DATA EXPRESS ON THE LAST THREE HUM D 105 COURSES

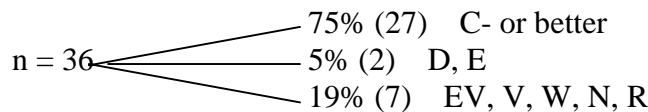
The charts below are a summary of Tables 4, 5, and 6. (Table 7 offers a summary of all math classes taken by those students who have taken Hum D 105). Of the 27 students who took their last math class **BEFORE** taking Hum D 105, 19 received a C- or better. There were 36 students who took Hum D 105 and **CONCURRENTLY** were enrolled in a math course. Twenty-seven of those students received a C- or better. **AFTER** taking Hum D 105, there were 22 students who, in their last math class, received a C- or better.

Of the twelve students who took Math 065, eight students (66%) passed with a “C” grade or better. Also, two students have passed Math 137 and one student Math 140.

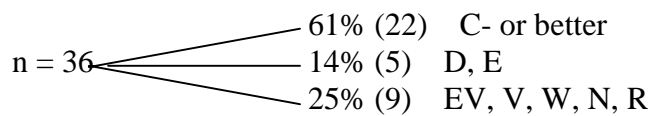
Last Math Class **BEFORE** Hum D 105



Last Math Class **DURING** Hum D 105



Last Math Class **AFTER** Hum D 105



IV. STUDENT COMMENTS

The following are comments provided by students via end of the course evaluations, correspondence, and word of mouth:

“I now know what way I study best. I learned how to relax so I can get the information in my head. Through all of this I am raising my math grade from a D to a B. (Big Difference).”

“I came into this class with a severe, almost disabling amount of math anxiety. Because of...I have been able to feel comfortable with him helping me conquer my math anxiety.”

This course has literally changed my life. It has made me realize I can do the math courses and get my degree.”

“You have given me the skills to be successful in something that I never thought I would do well in.”

“Realizing the type of learner I am and what skills and strategies to use as a result of that helped me quite a bit. I also realize that I need to work harder at math and my attitude in order to relieve math anxiety, although I have benefited from the class.”

“Great class, highly recommend it to everyone with anxiety. My scores proved (MARS etc.) that this class is well worth offering each quarter.”

“I believe that all the math instructors should incorporate the knowledge gained from this class into their own teaching style.”

“I am very grateful this course was offered, it really saved me.”

Per a letter sent to the Commission on Colleges of the N.A.S.C., a student reported, “I have found it to be the most beneficial course I have ever taken. It has absolutely changed my perspective on mathematics as well as my entire approach to new subject matter and test taking strategies.”

At the beginning of this academic year, one student conveyed that she received D and F grades in high school. She did okay in Math 027 and decided to take Hum D 105 along with Math 028. She received an A in Math 028, and in Math 065 this past summer. She is now in Math 140 and claims that math is her favorite subject. She also mentioned her overall confidence about herself and towards life has changed.

V. RECOMMENDATIONS AND CONCLUSIONS

In summary, data from the MARS reveal that overall student anxiety does decrease by the end of the class no matter whether the course is in a five or ten week format. The mean scores on the MSSE indicate a slight increase from the beginning to the end of class; however, the average scores don't reflect the substantial gains made by individual students. Nonetheless, an evaluation of the instructional approach on math study skills and how it can be improved is necessary. The results on the various learning style devices highlight the fact that each class and individual have a particular style of learning.

Results from Data Express on 38 students who have taken Human Development 105 and a math course indicate that 61% (22) of the students passed their last math class with a “C” grade or better. Fourteen percent (5) of the students received a below average or failing grade and 25% received an EV, V, W, N and R grade. The greatest number of students passing a math course occurred while concurrently attending Hum D 105.

There have been a number of student criticisms toward the course regarding presentation of material or format. Some students would prefer not having the relaxation and anxiety material first; they would rather have the study skills portion at the beginning of the quarter. Other students would prefer to have the class on a daily basis for four to five weeks rather than the two hours for two days a week which has been the current format for last spring quarter and this current quarter.

The following are other recommendations for improving Hum D 105 and campus considerations:

- Offer multiple sections of Hum D 105, including the evening,
- Offer the MARS and MSSE or a similar device to students in math courses, or when students are taking the placement test.
- Procure the Winning at Math Study Skills Computer Evaluation Software and make it available in the computer labs and tutoring center. (Perhaps it can be used in conjunction with the computerized math courses),
- Further evaluate the instructional approach currently taught on math study skills so that overall class averages will increase.

In closing, the purpose of this report was to provide the reader with quantitative data measuring the reduction of math anxiety, increase in math study skills, and an overview of learning style in Human Development 105, Overcoming Math Anxiety for the 1999-2000 academic year. Data Express information and student comments were also provided. The evidence is clear that the majority of students are benefiting from this human development course.

It is also important to note that there are many biases not accounted and controlled for in this study. For example, just because there was a decrease in student anxiety from the beginning to the end of the quarter, doesn't mean that it was solely the result of Hum D 105. Other factors were more than likely involved with the reduction of anxiety. The same can also be said for the increase of math study skills. The experience with a tutor, instructor, and study buddy can also influence study skills. Thus, further research must be done in this area.

TABLE 1
Math Anxiety Rating Scale - Individual Student Scores

	Fall '99	Winter '00	Spring '00
	<u>Pre / Post</u>	<u>Pre / Post</u>	<u>Pre / Post</u>
1.	166 / 137	185 / 243	185 / 175
2.	177 / 153	194 / 206	227 / 156
3.	186 / 131	196 / 245	241 / 160
4.	213 / 281	225 / 129	243 / 246
5.	235 / 217	229 / 192	267 / 151
6.	262 / 218	236 / 154	269 / 199
7.	266 / 143	240 / 381	279 / 132
8.	269 / 215	245 / 158	285 / 183
9.	274 / 190	264 / 234	409 / 267
10.	314 / 163	266 / 252	
11.	320 / 277	274 / 152	
12.	320 / 197	281 / 158	
13.	359 / 274	294 / 254	
14.	377 / 125	338 / 236	
15.	357 / 137		

<u>Fall '99</u>	<u>Winter '00</u>	<u>Spring '00</u>
* Pre - 3738 / 14 = 267	3824 / 15 = 255	2405 / 9 = 267
* Post - 2721 / 14 = 194	3131 / 15 = 209	1671 / 9 = 186

* Averages (pre and post) for each quarter.

TABLE 2
Math Study Skills Evaluation - Individual Student Scores

	Fall '99	Winter '00	Spring '00
	<u>Pre / Post</u>	<u>Pre / Post</u>	<u>Pre / Post</u>
1.	92 / 80	84 / ?	71 / 85
2.	71 / 79	74 / 78	66 / 82
3.	70 / 69	63 / 57	65 / 75
4.	68 / 56	63 / 73	62 / 67
5.	67 / 88	61 / 95	61 / 86
6.	63 / 71	60 / 74	52 / 85
7.	63 / 69	57 / 82	62 / 52
8.	60 / 51	53 / 67	46 / 46
9.	57 / 54	53 / 81	42 / 74
10.	57 / 68	51 / 73	
11.	56 / 63	50 / 67	
12.	56 / 72	41 / 74	
13.	52 / 46	38 / 70	
14.	51 / 49	36 / 44	
15.		0 / 63	

Fall '99
* Pre - 883 / 14 = 63
* Post - 915 / 14 = 65

Winter '00
700 / 13 = 54
935 / 13 = 72

Spring '00
517 / 9 = 57
662 / 9 = 74

* Averages (pre and post) for each quarter.

TABLE 3
Edmonds Learning Style Identification Exercise
Individual Student Band Scores

Fall Quarter (n=11)

<u>Visual</u>	<u>Written</u>	<u>Listening</u>	<u>Activity</u>
+3	-1	-2	+3
+1	-1	-4	+2
+1	-1-2	-4	+2
0	+1	-1	+1
+3	-3	-3	-1
0	-4	-3	+4
+1	-3	-4	+3
+1	+1	-4	0
-1	+1	+1	+1
+2	-3	-3	+4
+2	-3	-3	+4
+2	-3	-2	0
+1	-1	+4	-3
+11	-3	-1	+1
<u>0</u>	<u>0</u>	<u>0</u>	<u>+1</u>
10	-17	-16	11
+90	-1.5	-1.45	+1

Winter Quarter (n=12)

<u>Visual</u>	<u>Written</u>	<u>Listening</u>	<u>Activity</u>
0	-1	+3	0
-1	0	-3	+4
+1	-4	0	+1
0	+4	-4	0
0	-2	0	+1
+1	0	0	+4
+2	0	-2	0
0	+3	-4	0
0	0	-4	+2
0	0	0	+1
+1	-4	-1	0
<u>-3</u>	<u>+3</u>	<u>+4</u>	<u>0</u>
+1	+1	+11	+11
+ .83	- .83	+ .91	+ .91

Spring Quarter (n=9)

<u>Visual</u>	<u>Written</u>	<u>Listening</u>	<u>Activity</u>
+1	0	-3	+4
+1	-3	-2	0
0	+4	-4	-4
0	+3	+3	-4
+1	0	+3	-1
0	+1	+2	-3
-1	+2	+4	-4
+1	-2	-3	+3
<u>0</u>	<u>+4</u>	<u>-3</u>	<u>+3</u>
+2	9	-40	-9
.22	+1	-.40	-1

TABLE 4
Last Math Class **BEFORE** Hum D 105

Grade

n = 27

	011	014	017	027	028	055	120	140
3 – 11% (A)	1	1					1	
5 – 19% (B)		2	1	1		1		
11 – 41% (C)		1	5	3	2			
2 – 7% (D)	1			1				
0 (E)								
0 (EV)								
0 (V)								
2 – 7% (R)				2				
2 – 7% (W)					1			1
2 – 7% (N)			1	1				

TABLE 5
Last Math Class **DURING** Hum D 105

Grade	n = 36								
	011	014	017	027	028	055	065	137	140
15 – 42% (A)		1	1	9	1	2	1		
7 – 19% (B)		1	1	4					1
5 – 14% (C/S)			1	2			2		
0 (D)									
2 - 5% (E)				2					
0 (EV)									
1 - 3% (V)		1							
2 – 5% (R)				1			1		
4 – 11% (W)		1		1	2				
0 (N)									

TABLE 6
Last Math Class Taken and also
Completed Human Development 105

Grade in Last Math Class n = 36

	014	017	027	028	055	065	137	140
A 9 students = 25%	1	1	1	2	1	3		
B 8 students = 22%		1		1		4	1	1
C 5 students = 14%		2		1		1	1	
D 2 students = 5%		1				1		
E 3 students = 8%			1			2		
EV 1 student = 3%						1		
V 2 students = 6%	1		1					
N 2 students = 6%			1					1
W 4 students = 11%			1	3				
TOTALS	2	5	5	7	1	12	2	2

Note: Thirty-eight students completed Human Development 105. Two students did not go on in math because one was in an Accounting class and another focused on passing the Nursing examination.

TABLE 7

	Math classes taken prior to Hum D 105	Grade earned in math class during Hum D 105	Math classes taken after Hum D 105
Student 1	0	027 (S)	028 (D), 065 (EV)
Student 2	0	027 (A)	028 (A), 065 (A-)
Student 3	017 (C+)	027 (A)	028 (A-)
Student 4	014 (A)	027 (D+)	028 (A), 065 (A), 137 (C)
Student 5	120 (A)	027 (C+)	028 (W)
Student 6	014 (C), 017 (D), 017 (C)	027 (D+)	027 (D+), 027 (W)
Student 7	0	027 (A)	027 (A), 028 (A), 065 (A-)
Student 8	014 (A), 017 (C)	027 (B)	028 (B+), 065 (B+)
Student 9	011 (B-), 014 (A), 017 (B), 027 (D+)	027 (B)	028 (C-), 065 (E)
Student 10	0	027 (A-)	028 (A-), 065 (B-)
Student 11	0	027 (B)	028 (B)
Student 12	014 (B-), 017 (C)	027 (E)	027 (V)
Student 13	017 (C+), 027 (U), 027 (D)	027 (B)	028 (W)
Student 14	014 (A-), 017 (C), 027 (C-)	027 (A)	028 (N), 065 (ER), 065 (B)
Student 15	N/A	N/A	N/A
Student 16	0	055 (A-)	065 (B+)
Student 17	027 (C)	028 (W)	0
Student 18	011 (D)	014 (V)	0
Student 19	014 (A), 014 (C+), 017 (N)	017 (C+)	0
Student 20	014 (C), 027 (W), 017 (C)	027 (W)	027 (N)
Student 21	011 (A), 014 (W), 014 (B-)	017 (B-)	0
Student 22	017 (B-), 027 (ER)	027 (A)	028 (B), 065 (D)
Student 23	120 (C), 027 (D-R)	027 (A)	028 (A)
Student 24	014 (B-)	014 (W)	0
Student 25	0	055 (A)	0
Student 26	027 (N), 027 (C+), 028 (C+)	065 (C)	137 (B)
Student 27	014 (A)	027 (A-)	0
Student 28	0	014 (A-)	0
Student 29	N/A	N/A	N/A
Student 30	017 (A-), 027 (C)	028 (W)	028 (C+)
Student 31	017 (B)	027 (E)	0
Student 32	0	065 (ER)	065 (E)
Student 33	027 (C), 028 (C)	065 (C)	0
Student 34	140 (V), 140 (W)	140 (B)	0
Student 35	011 (A), 017 (Z), 026 (A), 027 (W), 027 (A), 028 (W)	017 (A)	0
Student 36	055 (B+)	065 (A)	140 (N)
Student 37	027 (B)	028 (A)	065 (A)
Student 38	0	014 (B+)	017 (D+)