

**ANNUAL ASSESSMENT REPORT  
AND  
STRATEGIC PLANNING UPDATE  
Year: 2009**

**Area or Unit Name:** MATHEMATICS AND STATISTICS

**Area or Unit Leader:** Kent Pearce **Email:** kent.pearce@ttu.edu

**Phone Number:** ( 806 ) 742 - 2566 **Ext:** 226

**Mail Stop:** 1042

## Section 1. Goals and Accomplishments

**Goal 1:** Recruit, retain, and graduate a larger, more academically prepared, and more diverse student body.

- A grant from the National Science Foundation Scholars in Science, Technology, Engineering and Mathematics Program helped to establish the South Plains Mathematics Scholars Program. The program provides annual scholarships of up to \$10,000 to students from underrepresented groups or of financial need, who plan to pursue a degree in mathematics. Eight additional students were accepted in this program in 2009, bring the total to 20 students who are being supported on this program. Additionally, a faculty mentor was assigned to each scholarship recipient.
- From departmental scholarship endowments, the department awarded \$137,000 in scholarships to 74 students.
- The department continues to host the following annual events that help to attract potential students from underrepresented groups in the West Texas area: 1) TexPREP-Lubbock, a summer academic program that fosters student interest in mathematics and engineering; 2) the Emmy Noether High School Mathematics Day attracted grade 8-12 female students from local schools to the TTU campus for a day of activities designed to encourage young women to seek careers in mathematics; 3) the Joy of Thinking program, which provides girls' math clubs in several local middle schools; and 4) the TTU Summer Math Academy, which provides an opportunity for high school students to conduct mathematics research under the guidance of a faculty member.

**Goal 2:** Enrich the educational experience at the undergraduate and graduate level.

- To obtain a more comprehensive assessment of basic knowledge and understanding of mathematics among graduating seniors and national comparative data, the department continued to administer the Educational Testing Service Major Field Exam during the spring and fall semesters.
- The department modified its embedded assessment process for measuring student learning outcomes in core courses by framing questions for assessment of student learning outcomes during the construction of the final exams (rather than tagging questions for that purpose after the fact).
- The department continued its second year of the two-year cycle for reviewing four core curriculum courses each semester (so that over a four semester cycle all 16 will be reviewed).
- Faculty have been engaged with directing undergraduate research, with 9 or more faculty participating over each of the past four years.
- The department provided support of \$4980 to 15 graduate students to make presentations at professional conferences.
- The department administered 55 preliminary exams to graduate students, the highest number over the past six years. The pass rate for students taking these exams was 69%.

**Goal 3:** Advance research, creative endeavors, and professional activities.

- Faculty authored 94 scholarly journal publications that appeared in print. In addition, three books authored by faculty were published. For the 45 faculty submitting annual reports, there were also 34 peer-reviewed articles accepted for publication and 58 papers submitted. Eighty-four percent of the faculty either had a peer-reviewed publication appear, accepted or submitted.
- Faculty members gave 116 presentations at professional conferences, workshops, or colloquia at other universities.
- Eleven faculty served on editorial boards for 23 journals, including several as editor or associate editor.
- Five faculty served on federal review panels and 31 faculty served as referees for journals.
- The department hosted two conferences supported by the National Science Foundation that attracted scholars of international reputation: 1) the 9th Annual Red Raider Mini-Symposium; 2) MAA-PREP Workshop In Mathematical Biology.
- Faculty were awarded \$2,380,437 in external funding from 22 external grants, the highest value over the past six years.

**Goal 4:** Develop partnerships and collaborations with the community, government and private entities, and other academic institutions (K-12, community colleges, and universities) that enhance the educational, research and service mission of the department.

- The department continued its outreach to area schools with 22 faculty participating in activities such as TexPREP Lubbock, the Joy of Thinking, the Emmy Noether High School Mathematics Day, the TTU Summer Mathematics Academy.
- Two faculty members served as contest directors for the Number Sense event at the Lubbock Interscholastic League, and another was part of the administration of the UIL Mathematics Competition at Coronado High School.
- Faculty from the department have received funding from the National Science Foundation and from the Greater Texas Foundation for outreach activities to students and educators. The *West Texas Middle School Math Partnership* is a five-year professional enrichment and research project targeting middle school math teachers in West Texas. The *GK-12: Building Bridges: Integrating Mathematics, Science and Engineering Education on the South Plains* is a five-year program to prepare doctoral students to teaching in STEM programs. The *Middle School Math and Science* is a program to provide opportunities for math and science teachers to deepen their understanding of STEM content and pedagogical content knowledge.

**Goal 5:** Support and effectively utilize human resources by enhancing the quality of the work experience for faculty and staff in Mathematics and Statistics.

- The department appointed three visiting assistant professors who interacted with permanent faculty on research and outreach programs.
- Multimedia equipment was for classroom usage was purchased and installed on all first floor classrooms and half of the basement classrooms.
- All of the machines and monitors in Lab 009 were upgraded to facilitate student computing access in that lab.
- The department continues to maintain site license arrangements that provide faculty and students with accessibility to SAS, Matlab, Mathematica and Femlab. Additionally, the number of SAS licences and the number of Matlab toolboxes licences were increased.

**Goal 6:** Promote a strong positive image for Mathematics and Statistics locally, regionally, and nationally.

- One faculty member was recognized with a Professing Excellence Award from the Student Housing Association.
- Approximately one quarter of the faculty serve on editorial boards for archival journals and approximately 70% are reviewers for journals or federal funding agencies.
- The department hosted two conferences that attracted scholars from across the nation and around the world to Texas Tech University.
- The department continues update its webpage to provide departmental information about programs and activities. The department collected and prepared alumni, faculty and department information for a new release of its newsletter series.

**Goal 7:** Strengthen the department's fiscal stability while enhancing performance, assessment, and public accountability.

- The department received \$2,380,436 in external funding and F&A in the amount of \$374,935.



## Section 2. Universal Quantitative Data

<i>Fall Semester</i>	2004	2005	2006	2007	2008	2009
<b>Student Information</b>						
Headcount						
Undergraduate	203	193	175	170	157	185
Masters	42	45	44	48	55	63
Doctoral	45	45	43	44	49	56
Law	0	0	0	0	0	0
Total	290	283	262	262	261	304
Entry Scores						
SAT	1158	1240	1173	1184	1149	1200
GRE-verbal	474	478	483	436	427	441
GRE-math	697	740	741	743	742	752
Semester Credit Hours						
Undergraduate	27885	27050	26920	27700	28486	29081
Masters	718	604	650	743	887	643
Doctoral	604	618	469	428	560	746
Law						
Total	29207	28272	28039	28871	29933	30470
Number of Lecture Classes						
Taught & Avg Class Size	# Avg.	# Avg.	# Avg.	# Avg.	# Avg.	# Avg.
Lower Division	189 43	187 41	179 43	176 44	181 44	176 45
Upper Division	25 32	26 34	27 30	30 32	32 30	31 33
All Undergraduate	214 42	213 40	206 41	206 42	213 42	207 43
Graduate	22 14	20 13	23 12	18 14	21 15	18 18
All Students	236 39	233 38	229 38	224 40	234 39	225 41
<b>Faculty Information</b>						
FTE						
Professor-Lecturer	56.9	56.42	57.12	60.27	58.5	50.5
Graduate Asst. Teaching	40	38.25	35.25	36.5	42.77	43.5
Total	96.9	94.67	92.37	96.77	101.27	94
Headcount						
Professor-Lecturer						
Total	59	59	60	65	60	53
Minority	1	1	2	3	2	2
Tenured/Tenure Track						
Total	45	42	41	43	44	41
Tenured	29	29	29	31	34	33
Teaching Load						
SCH/FTE for total faculty	301	299	304	298	296	324
Student Faculty Ratio	20:1	20:1	20:1	20:1	20:1	22:1
Faculty Salaries vs Peer (Full-time Faculty - 9 Mo.)						

<b>Fiscal Year</b>	<b>2003-2004</b>	<b>2004-2005</b>	<b>2005-2006</b>	<b>2006-2007</b>	<b>2007-2008</b>	<b>2008-2009</b>
<b>Degrees Awarded</b>						
Undergraduate	36	50	45	29	40	33
Masters	29	27	24	23	18	14
Doctoral	6	5	11	4	4	5
Law	0	0	0	0	0	0
<b>Total</b>	<b>71</b>	<b>82</b>	<b>80</b>	<b>56</b>	<b>62</b>	<b>52</b>
<b>Classes Taught by Tenured/Tenure Track</b>						
% Lower Div. Classes Taught	21	20	21	14	14	13
% Ugrd Classes Taught	29	28	28	21	23	21
<b>Financial Information</b>						
Teaching Salaries	4496018	4516986	4607568	4634527	4954907	
Dept. Op. Expenses	408035	182039	167213	197423	208228	
<b>Total</b>	<b>4904053</b>	<b>4699025</b>	<b>4774781</b>	<b>4831950</b>	<b>5163135</b>	
Cost per SCH	81	79	84	83	89	
Cost per SCH In Const. \$	79	74	77	74	76	
<b>External Funding</b>						
<b>Sponsored Projects</b>						
Value by Home Department	406122	527683	1334823	822977	1543853	2380437
Value by Submitting Unit	378072	370149	1192357	822977	1406093	2380437
Fundraising*	287417	39700	121865	62081	44324	179589
*As provided by Development						

# MATHEMATICS AND STATISTICS

## Area/Unit Specific Information

### Section 3a. Quantitative Information

Calendar Year	2004	2005	2006	2007	2008	2009
<b>Faculty</b>						
<b>Research</b>						
# Peer Reviewed Publications	74	75	67	87	75	94
% Faculty Active	95	98	98	95	91	83
# Books Published	1	1	0	3	1	3
# Presentations	85	121	89	98	101	116
% Faculty Active	67	83	58	70	65	70
# Faculty serving on Editorial Boards	12	14	11	13	16	11
# Faculty Reviewing for Journals, Books	28	31	28	29	31	31
# Faculty reviewing for Federal Funding Agencies	7	7	7	7	8	5
<b>Awards and Distinction</b>						
Local	4	3	4	3	4	4
National/International	0	4	3	1	0	0
# Fellows	3	4	4	4	4	3
# New Fellows	0	1	0	0	0	0
# Phi Beta Kappa Members	3	3	4	4	5	5
# New PBK members	0	0	1	0	1	0
<b>Department</b>						
<b>Scholarships and Endowments</b>						
# Endowments	28	28	28	28	28	29
Total of Endowments	1210684	1534719	1620170	1814347	1809103	1732097
Amount of Scholarships Awarded	29000	41000	44000	74800	115000	137000
# of Scholarships Awarded	26	34	49	54	56	77
<b>Graduate Program</b>						
PhDs awarded	6	5	11	4	3	6
Masters awarded	29	27	24	22	16	15
% Faculty directing graduate students	71	71	63	66	65	65
# PhD Students	45	45	43	48	59	55
# Masters Students	42	45	44	44	55	65
Total # Graduate Students	97	90	87	91	104	110
Total # Full Time	82	80	80	82	93	101
# of GTA funded from AOF	72.5	74	68	68	70	70
\$ from AOF	1114733	1308364	1019600	1149376	1167904	1093176
# supported by Add Grad Tuition	0	2	3	18	6	2
\$ Grad Tuition	0	35800	21900	79907	14800	30488
# supported -Misc	5	8	11	5	10.5	15.5
\$ from misc	73000	42656	80300	12230	225330	314470
<b>Outreach</b>						
# Faculty serving as McNair Mentors	1	1	1	1	1	0
# of McNair Students	1	1	1	1	1	0
# Faculty serving as Clark Scholar Mentors	2	1	0	0	1	1
# of Clark Scholar Students	2	1	0	0	1	1
# Faculty Participating in Formal Outreach Activities	22	22	28	21	19	22
# Faculty directing undergraduate research projects			10	15	10	9
<b>Alumni Placement</b>						
# placements in graduate school	11	14	7	12		
<b>Facilities Improvements</b>						
\$ Expended	48500	32000	31300	54,000	87615	158000
<b>Program Assessment</b>						
<b>Graduate Student Performance on Preliminary Examinations</b>						
# of Preliminary Examinations Administered	50	43	42	32	31	55
% Preliminary Examinations Passed	56	53	33	75	81	69
<b>Employment Success of PhD and Masters Graduates</b>						
% of PhD Recipients Employed	100	100	91	75	100	83
% of Masters Recipients Employed or Admitted to Graduate School	95	96	100	96	90	80

Success rate of Application of Bachelor Degree Receipts to Graduate Schools # of Bachelor Degree Receipts Applying to Graduate School % Success Rate of Applicants	19	17	12	10		
	95	94	96	100		
Success Rate of BA students taking the TExES exam # of Examinations Attempted \$ Success Rate	97	32	60	42	44	
	52	59	55	82	93	
Assesment of Undergraduate Student Learning-Calculus I % students displaying mastery of basic concepts % students displaying mastery of computational skills % students displaying mastery of multi-step problem solving			63		66	66
			52		56	55
			37		58	66
Assesment of Undergraduate Student Learning-Calculus II % students displaying mastery of basic concepts Average score on questions covering basic concepts (See Commentary) % students displaying mastery of computational skills Average score on questions covering computational skills (See Commentary) % students displaying mastery of multi-step problem solving Average score on questions covering multi-step problems solving (See Commentary)			28		31	34
			51			46
			29		57	36
			64			51
			44		46	44
			75			58
Assesment of Undergraduate Student Learning-Logic, Rigor, Proof % students who can write induction proofs Average score for induction proofs % students who can write direct proofs Average score for direct proofs % students who can write proofs by contradiction Average score for proofs by contradiction % students who mastered rules of logic Average score for rules of logic % students who can communicate technical ideas effectively Average score for communicating ideas effectively			75	58	60	48
			60	67	69	58
			71	59	54	58
			58	59	56	64
			71	55	46	53
			58	59	50	56
			71	71	75	57
			58	68	69	54
			71	70	57	58
			58	61	55	55
Assessment of Graduate Student Learning % students who mastered advanced mathematical concepts Average score for advanced mathematical concepts (see commentary) % PhD graduates with published research (see commentary) % students who demonstrated good writing skills (see commentary) % students who demonstrated good oral communication skills (see commentary)			57	68	53	
			81	75	78	
			45	75	100	50
			79	80	71	82
			76	82	70	80
Assessment of Undergraduate Mastery of Basic Calculus: Differentiation (% showing competency. See commentary) Differentiation (Average Score. See commentary) Integration (% showing competency. See commentary) Integration (Average Score. See commentary) Multistep Problems (% showing competency. See commentary) Multistep Problems (Average Score. See commentary) Applications (% showing competency. See commentary) Applications (Average Score. See commentary) Infinite Series (% showing competency. See commentary) Infinite Series (Average Score. See commentary)				79	69	77
				72		79
				50	61	40
				58		49
				53	52	62
				59		70
				76	55	53
				70		64
						40
						49
Senior Performance on National ETS Field Exam Average Percentile Rank: Complete Exam Median Percentile Rank: Complete Exam Average Percentile Rank: Calculus problems Average Percentile Rank: Algebra problems (see commentary) Average Percentile Rank: Nonroutine problems (see commentary)				50	90	35
				55	80	20
				70	95	40
				15	70	15
				30	90	75
Assesment of General Education Expected Learning Outcomes						
Apply arithmetic, algebra, geometry and statistics to solve problems M1430(% showing competency. See commentary) M1550(% showing competency. See commentary) M2300(% showing competency. See commentary) M2350(% showing competency. See commentary) M1300(% showing competency. See commentary) M1320(% showing competency. See commentary) M1351(% showing competency. See commentary) M2371(% showing competency. See commentary)					48	
					47	
					38	
					36	
						65
						48
						50
						48
Represent and evaluate basic mathematical information M1331 (% showing competency. See commentary) M2370 (% showing competency. See commentary) M1430(% showing competency. See commentary) M1550(% showing competency. See commentary)				56		
				76		
					41	
					37	



M2300(% showing competency. See commentary)					27	
M2350(% showing competency. See commentary)					44	
M1300(% showing competency. See commentary)						64
M1320(% showing competency. See commentary)						69
M1351(% showing competency. See commentary)						50
M2371(% showing competency. See commentary)						93

Use mathematical and logical reasoning to evaluate the validity of an argument						
M2370 (% showing competency. See commentary)				88		
M2300(% showing competency. See commentary)					34	
M1300(% showing competency. See commentary)						71
M1351(% showing competency. See commentary)						12
M2371(% showing competency. See commentary)						76

Interpret mathematical models and draw inferences from them						
M1331 (% showing competency. See commentary)				71		
M2345 (% showing competency. See commentary)				79		
M2370 (% showing competency. See commentary)				47		
M2371 (% showing competency. See commentary)				100		
M1430(% showing competency. See commentary)					33	
M1550(% showing competency. See commentary)					63	
M2300(% showing competency. See commentary)					54	
M2350(% showing competency. See commentary)					67	
M1300(% showing competency. See commentary)						23
M1351(% showing competency. See commentary)						51
M2371(% showing competency. See commentary)						83

### Section 3b. Qualitative Information.

- Assessment Note: The Educational Testing Service Field exam was administered to seniors during the spring and fall semesters. The exam is basically divided into two parts: algebra and calculus.
- Assessment Note: The algebra part involves linear algebra, combinatorics and algebra. The calculus part involves basic calculus, some advanced calculus, and multi-step and conceptual questions that are called non-routine.
- Assessment Note: To assess the student learning outcomes related to mastery of logic, rigor and proof, and communication skill, instructors teaching the writing intensive courses, M3310, MATH 3360 and MATH 4350 were surveyed. The instructors rated the overall ability of the students on a scale of 0-100, and also reported the percentage of students who had achieved mastery of the skills.
- Assessment Note: The four expected learning outcomes for the mathematics core curriculum were mapped to questions on departmental finals of core courses. A course section taught by every instructor was selected by stratified random sampling. An average percentage score on each was calculated and a total score was reported by taking a weighted average across sections. A score of 70-75% was declared as knowledgeable and the number of students in order to compute the % of demonstrating mastery of a learning outcome.
- Assessment Note: Each long semester four of the sixteen mathematics core curriculum are scheduled to be surveyed. For Fall 2009 the four mathematics core curriculum courses surveyed were: Math 1300, Math 1320, Math 1351 & Math 2371. For M1300, the percentage results reported correspond to sample sizes of N=95; for M1320, the percentage results reported correspond to sample sizes of N=106; for M1351, the percentage results reported correspond to sample sizes of N=132; for M2371, the percentage results reported correspond to sample sizes of N=29.
- Assessment Note: To assess graduate student competency in oral and written communication skills, a survey of the advisory committee and the graduate advisor was undertaken. Faculty were asked to rate the competency of the students on a scale of 0-100 and those who scored 70 and above were deemed to be satisfactory.

**Commentary:**

The department has, for several years, made a concerted effort to focus more attention on assessment of the expected learning outcomes for the mathematics core curriculum courses. All faculty syllabi contain student learning outcomes for each course and assessment measures relevant to those learning outcomes, which in many cases are provided by templates taken from the Departmental Handbook.

During the past three years, new assessment initiatives related to degree program outcomes included the use of the Educational Testing Service Major Field Exam administered to senior majors, and greater use of embedded assessment utilizing departmental finals.

In previous years' SPAR commentary it was noted that a primary concern of the department was to grow research capacity as measured by external funding. The total of external funding of research for this year (2009-2009) has exceeded \$2 million, the highest figure in departmental history. The number of appearing publications and scholarly presentations at professional meetings are also up as compared to the recent five-year history.

The department has awarded 29 PhDs in the past five years, which is slightly below the targeted expectation of 6 per year. There appears to have been a monotonic decrease in awarded MS/MA degrees over the last five years which has been countered in 2010.

The department has a strong record of outreach activities that typically involve more than 50% of the faculty. Over the last seven years, faculty have hosted annual events such as TexPREP-Lubbock and the Emmy Noether High School Mathematics Day. More recently, the Joy of Thinking program and the TTU Summer Math Academy have hosted and sponsored by the faculty.

In addition to these programs, the department has good record of providing research experiences to our undergraduates, with 9 or more faculty directing undergraduate research over each of the past four years.

**Implementation Plan:**

More work remains to be done in the areas of systematizing the collection of assessment data, in particular that which is gathered from the mathematics core curriculum courses, undergraduate intensive writing courses (Math 3310, MATH 3360, MATH 4350) and the core graduate course on which the preliminary examinations are based. Part of this systematizing was addressed this past academic year (relative to the process of extracting assessment data via embedded questions on final exams) by constructing prototype questions for extraction purposes in advance rather than sifting the SLOs against the body of final exam questions after the fact.

At the undergraduate level, the department needs to improve its collection mechanisms of data from graduates and alumni to represent their experiences back into the curriculum evaluation process.

At the graduate level, in order to systematize the collection of data needed to assess written and oral communication skills, a questionnaire will be developed and distributed to thesis/dissertation advisory committee members at the time of a defense.

Currently the department supports about 90 graduate teaching assistants with most support coming from AOF salaries. With the current size of the faculty (and only 2/3 of the faculty directing students), the department needs to emphasize and reward faculty involvement in graduate student direction. Increasing research funding would be a critical factor in growing the graduate program and increasing research capacity of the department and align the department with university strategic goals. Currently, about 60% of the faculty are consistently actively seeking external funding and this figure should be improved.