Calculus Conversations
A 1999-2000 Carnegie Scholarship of Teaching & Learning
Project in Mathematics

Anita Salem, Mathematics & Roger Michael Rydeski

Problem Background & Goals of Investigation

During the past seven years we have made substantial changes to our three-semester

In the fall of 1999, we supplemented the activities in our reform calculus courses (lectures, computer labs, out-of-class projects, in-class collaborative group work, and worksheets) with *Calculus Conversations*, a web-based threaded discussion among students.   In response to three problems posted to the website by the instructors, students were encouraged to frame thoughtful questions and solutions of their own and to respond to questions and solutions posed by others.   The three problems (see Appendix II for a

posted at regular intervals throughout the semester, focused on ideas central to the major
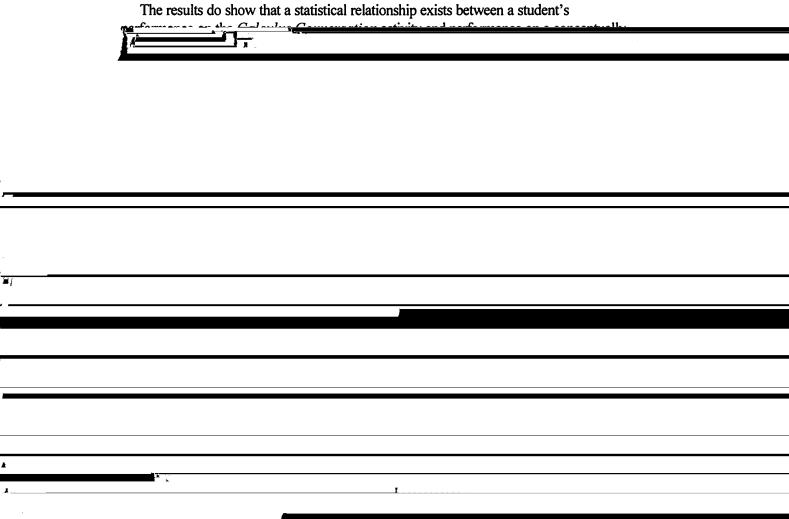
The primary question of interest was whether the quality of participation in the *Calculus Conversation* activity was related to performance on a conceptually related but contextually varied exam question. Examination of those two variables becomes important to understand the overall analysis. Calculus Conversation responses were

A statistical examination of the relationship between the *Calculus Conversation*

problem score and the related exam question is significant (p < .01). Table 4 shows the results of a Pearson's Product Moment Correlation for each set of relationships.

TABLE 4

Calculus Conversation	Exam 1 Question	Exam 2 Question	Exam 3 Question
Problem 1	.420		
Problem 2		.354	
Problem 3			.503

The results do show that a statistical relationship exists between a student's

Responses were categorized as: (D or P.) focus of response was on technical

practical issues such as graphing, collection of data, or modeling and interpretation of

...So response that indicates that a student read, understood and was...

"I would like to mainly respond to Jeff's comment that the slope of the Krusty

Problem 1

Category	Section 1 25 Students 28 Responses % of Responses	Section 2 21 Students 39 Responses % of Responses	Section 3 16 Students 20 Responses % of Responses
P or P-	75 %	95 %	85 %
C or C-	68 %	21 %	45 %
I or I-	18 %	64 %	55 %
L+ or L-	18 %	26 %	15 %
Q	11 %	28 %	0 %

TABLE 5b

Problem 2

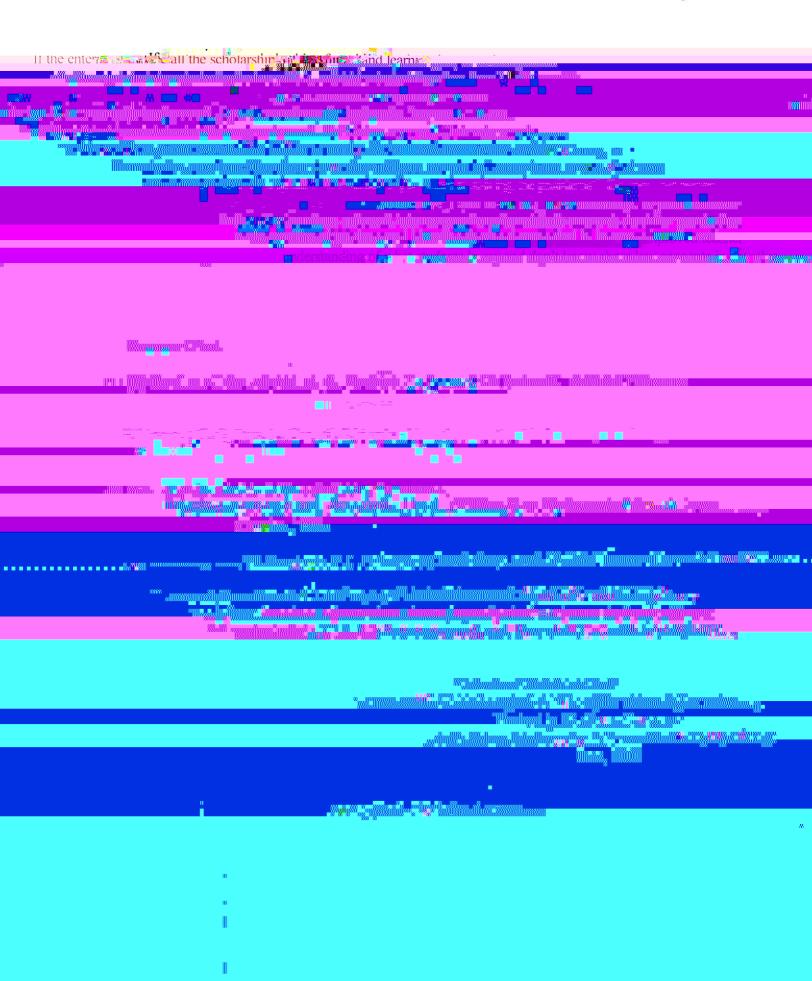| Category	Section 1 25 Students	Section 2 21 Students	Section 3 16 Students

Discussion

Following the on-line student-to-student conversation was like watching students formulate mental rough drafts of their understanding and their misunderstanding. According to Graeber, "one needs to understand students' current knowledge if one wants to amend or extend what they know." [3] While admitting that the quantitative and qualitative analysis of this project produced results that were informative, of most interest and value to the instructors was the window that this activity provided into how students
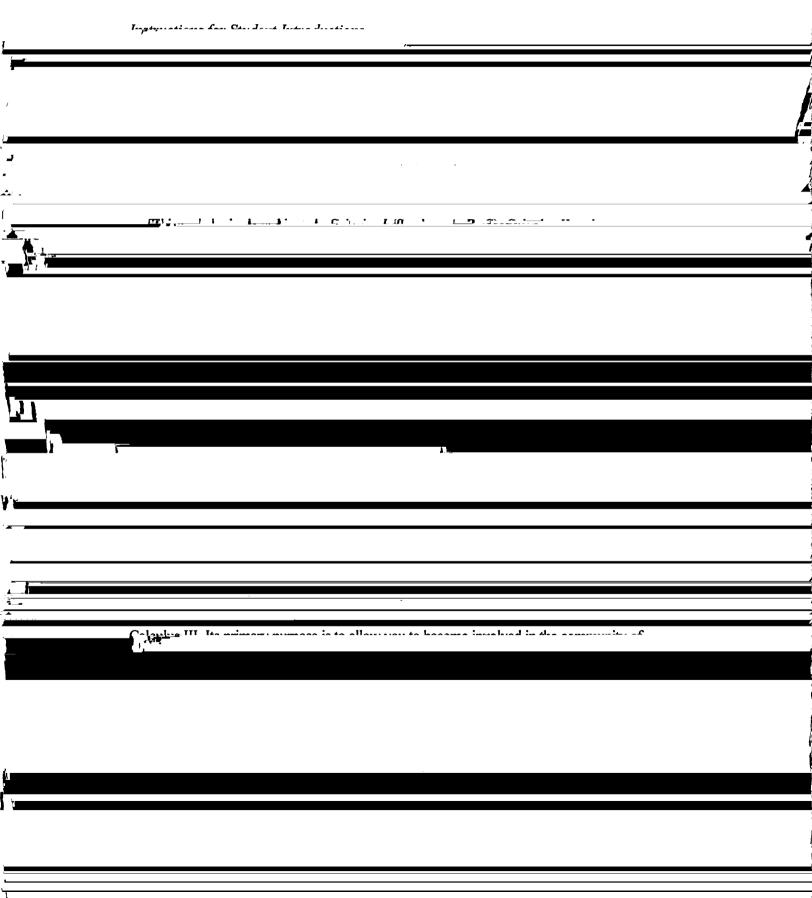
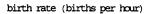If the enter... all the scholarship of teaching and learning...

elaborating to a response from another classmate. You may want to pose a problem that bears some relationship to the original question. After reading your classmates, you may want to ...

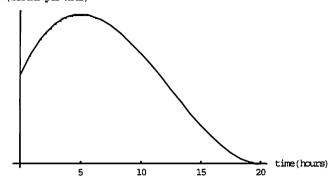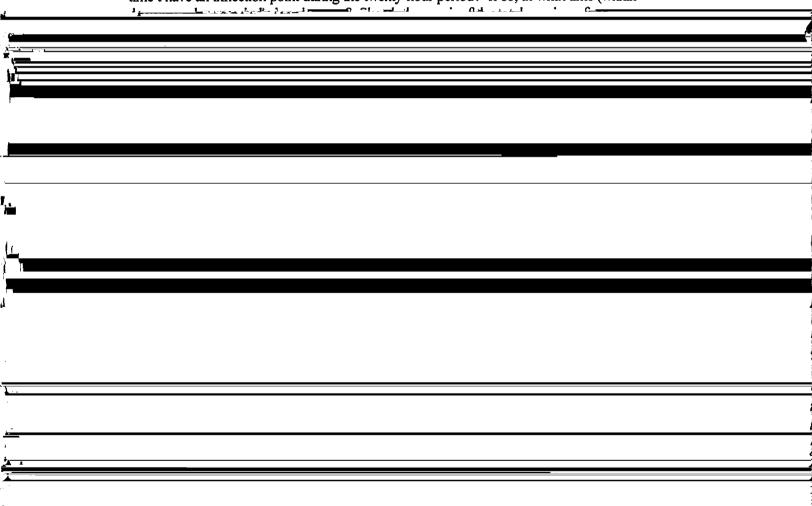question.   It goes without saying that all responses should be respectful of the ideas of others.

Suppose that you are given the formula for a function $f(t)$ and you have no idea how to

calculate the derivative, $f'(t)$. Describe how you could obtain a good approximation for

birth rate (births per hour)

time(hours)

Explain what the birth rate curve tells you about the total number of individuals born (during the twenty-hour period) by time t. Does the graph of the total number born by time t have an inflection point during the twenty-hour period? If so, at what time (within

individuals born (during the twenty-hour period) by time t.

Appendix III - Quantitative Analysis for Specific Populations

Tables 7 a, b, and c show the average scores of students on the Exam Question by activity score and by gender.

TABLE 7a

Tables 8 a, b, and c show the average score of students on the Exam Question by

Calculus Conversation Grade on Problem 1		Mean	N	Standard Deviation
	College	.00	2	.00
1	High School	50.00	2	.00

repeating student is one who has typically taken Calculus in High School and is repeating the experience at the college level.

TABLE 9a

Calculus Conversation Grade on Problem 1		Mean	N	Standard Deviation
	First-time	33.33	3	28.87
1	Repeater	.00	1	--

Coded *Calculus Conversation* Activity Score for Question 1

Section	Problem Grade = 1	Problem Grade = 2	Problem Grade = 3	Problem Grade = 4
1	4			21
2			3	18
3			7	9

TABLE 10b

Coded *Calculus Conversation* Activity Score for Question 2

CLASS C (JK)	57	75	86	96	93
OVERALL	68	74	85	78	91

TABLE 11b
Calculus Conversation Problem 2