The Unholy Alliance: Integrating Math and Religion

Barbara Darling-Smith, Religion Department
bsmith@wheatonma.edu
H. W. Straley, Mathematics/Computer Science Department
straley_harrison@wheatonma.edu
Wheaton College
Norton, Mass.

Abstract

A three-semester effort to integrate quantitative literacy into several Religion courses at a small liberal arts college is described in this talk. The authors outline in some detail their tentative and less than successful initial efforts where they were forced to use fictional data. The use of fictional data was a very serious limitation which was changed for the second semester. The second-semester modifications also included the introduction of a set of top/bottom poster presentations by student groups. The top/bottom poster assignment led to a more successful integration of quantitative analysis into the study of religion. During the third semester the authors improved the structure surrounding the top/bottom poster process – they initiated a more motivating grading procedure. These changes enhanced the weaving of quantitative methods into the religion content.

Student groups complete the top of the poster by selecting data appropriate to their own concerns. A different student group designs the bottom of the poster by asking topical questions and making hypotheses for future study. In other words the students create questions, conjectures and observations relative to data selected by others, for perhaps varying reasons. This top/bottom poster procedure forces students to pose content-oriented questions and is appropriate to most non-mathematical disciplines.

The reactions of students, whether positive or negative, are discussed and analyzed in this presentation. The presenters will also outline a process that others interested in bringing QL to non-mathematical disciplines may find helpful. A handout including all student activities will be available and examples of top/bottom posters will be displayed.

Table of Contents

The Unholy Alliance: Integrating Math and Religion

MAA/AMS Meetings, January 2006

Barbara Darling-Smith,
Religion Department

H. W. "Chuck" Straley,
Mathematics/Computer Science Department

Wheaton College
Norton, Mass.

Wheaton College

1600 students
60% female, 40% male
Liberal Arts
Between Boston and Providence

Quantitative Analysis Program

One required QA course
Regular math or Special QA course

Examples of Special QA courses:

Voting Theory:

a 200 level Math course

Mathematics in Art:

a 100 level Math course

Euclid:

a 200 level Greek course,
Euclid read in the original

Washington Conference
Sleeping Lady Mountain Resort
August 2004

Lofty goals for Math/ Religion:
Leibniz, Pascal, Pythagoras,
A Real Academic Maze

Brought up short
QL = Basic Math in a Discipline's sophisticated context

I.E. Percent of WHAT woven into fabric of a non-math discipline

Handout
Overlays
Semester 1 handouts
Semester 2 handouts
Semester 3 handouts

Semester 1
The Baby Crawls

Religion and Ecology- 40 students

3 math lessons

- **Two examples of pollution**
  - **Chemical Plant**
  - **Fish Hatchery**

- **Third-world attitudes toward family size**
  - **Simpson's Paradox**

Data was "make believe"

An inadequate Band-Aid
Math was stuck on Religion

Semester 2
The Baby Walks

Religion in Contemporary U.S.-40 students

Real data: Thanks to the library staff

MATH PRESENTATION

Data + top of poster example
- **Select portion of data and then**
- **Develop appropriate question/analysis**

TOP/BOTTOM POSTER ASSIGNMENT

Each student group
- **Creates POSTER TOP**
- **Presents POSTER TOP to class**

Each student group
- **Is assigned different POSTER TOP**
- **Creates related conjectures, questions, etc. for POSTER BOTTOM**
- **Presents POSTER BOTTOM to class**

Semester 3
The Child Runs

Indigenous Religions- 30 students

Changes: **Grade top and bottom posters**
Include in syllabus

Schedule:

Day 1	**Hand out data**
	Present top/bottom poster examples
(50 min)	**Assign Poster Top groups**
Day 2	**Groups turn in Poster Tops for suggestions**
Day 3	**Poster Tops returned with suggestions**
Day 4	**Poster Tops presented to class**
(2 hrs)	**at dinner meeting**
Day 5	**Poster Tops returned with grades**
	Assign Poster Bottom groups
Day 6	**Groups turn in Poster Bottoms for suggestions**
Day 7	**Poster Bottoms returned with suggestions**
Day 8	**Poster Bottoms presented to class**
(2 hrs)	**at pizza party**

This semester we had a guest, Professor Straley, who discussed how to use quantitative data in determining numbers and percentages of American Indians and Alaska Natives in the US population. Then you had two poster assignments, in teams, to work with the data and speculate about reasons.

Please circle the response that most closely represents your opinion on the following questions.

1) I found the quantitative section of the course to be:

of no value	*of very little value*	*of some value*	*of great value*
2	**4**	**15**	**10**

2) The quantitative presentations and course content related to each other:

poorly	*satisfactorily*	*well*
0	**15**	**16**

3) I found the content of the quantitative ideas to be:

too elementary	*of appropriate sophistication*	*too difficult*
11	**20**	**0**

4) I suggest that future quantitative presentations:

be terminated	*be reduced*	*continue as is*	*be expanded a little*
2	**3**	**17**	**9**

5) Having a mathematician take part in a religion class

took away from the class	*did not affect the class*	*added to the class*
0	**10**	**21**

Please suggest additional course areas (if any) that are appropriate for quantitative presentations and make any additional comments relative to quantitative presentations in Indigenous Religions.

"**As a student who studies in primarily humanities subjects, the prospect of math is a little aversive in a religion class. In moderation, however, it is a neat addition.**"

"I think students should be expected to do more or a more thorough analysis."

Ideas for the future

The Adolescent Drives

Top/bottom poster idea works!!

Include a grading component

Include in syllabus

Use <u>real data</u>:

Library staffs are awesome

Weave QL into the fabric of Religion (or X)

Remember:

"It's Not Math, Stupid; It's Religion (X)"

Some posters are displayed around this room. Please examine and *<u>note the errors</u>*.

The following is the gist of an article on the front page of the Athens (West Virginia) Times indicating the following. We Pollute Incorporated (WPI) a chemical company in Athens, WV claims their company does a wonderful job of protecting the New River basin from pollutants. In fact they accurately claim the percentage of pollutants from their Athens plant entering the New River Basin is .15%, much less than those from the We Keep It Clean Company (WKIC) on the other side of town which has a .35% rate of pollutants entering the New River Basin. By the way all of the numbers are accurate.

The WPI and WKIC data is shown in table below.

	WPI	WKIC
Daily Total Release Volume into Basin	**20000 gal**	**20000 gal**
Daily Pollutant Volume of into Basin	**30 gal**	**70 gal**
Percent of Pollutants released into Basin	**.15%**	**.35%**

What do you think about their claim? Could WPI be misleading the readers of the Athens Times? Justify your answer.

NOW FOR THE REST OF THE STORY. The EPA ranks chemical pollutants as very dangerous (VD), dangerous (D) and mildly dangerous (MD). The following table shows the above data when divided into the three levels of danger to the environment.

	WPI				WKIC			
	VD	D	MD	Total	VD	D	MD	Total
Total Vol. (gal)				20000				20000
Pollutant Vol. (gal)	26	3	1	30	1	2	67	70
Pollutant %	.13%	.015%	.005%	.15%	.005%	.01%	.335%	.35%

What do you think of the claim now? Do you have enough information? Justify your answer.

NOW FOR THE REST OF THE REST OF THE STORY. The EPA also considers very dangerous pollutants as 5 times as dangerous as dangerous pollutants and dangerous pollutants as 3 times as dangerous as mildly dangerous pollutants. If we assign the number 1 to mildly dangerous pollutants then what number should we assign to the dangerous pollutants? What should we assign to the very dangerous pollutants?

The EPA also defines Pollutant Danger as the product of pollutant weight and the volume of that pollutant. Complete the following table and then draw conclusions about our two chemical companies.

	WPI				WKIC			
	VD	D	MD	Total	VD	D	MD	Total
Total Vol. (gal)				20000				20000
Pollutant Vol. (gal)	26	3	1	30	1	2	67	70
Pollutant Weight			1				1	
Pollutant Danger			1				67	

Semester 1 OL 4

Not every environmentally friendly group agrees with the EPA weights assigned to very dangerous, dangerous, and mildly dangerous pollutants. The weights assigned by two such groups are shown below. What impact do these different weights have on the total pollutant dangers?

POLLUTANT WEIGHTS

Group	Very Dangerous (VD)	Dangerous (D)	Mildly Dangerous (MD)
Save New River	3	2	1
W. V. Green	2	1.5	1

Complete each of the following tables for the above pollutant weights.

1) Use Save New River weights.

	WPI				WKIC			
	VD	D	MD	Total	VD	D	MD	Total
Total Vol. (gal)				20000				20000
Pollutant Vol. (gal)	26	3	1	30	1	2	67	70
Pollutant Weight								
Pollutant Danger								

2) Use W. V. Green weights.

	WPI				WKIC			
	VD	D	MD	Total	VD	D	MD	Total
Total Vol. (gal)				20000				20000
Pollutant Vol. (gal)	26	3	1	30	1	2	67	70
Pollutant Weight								
Pollutant Danger								

Semester 2 OL 1

No 79,80

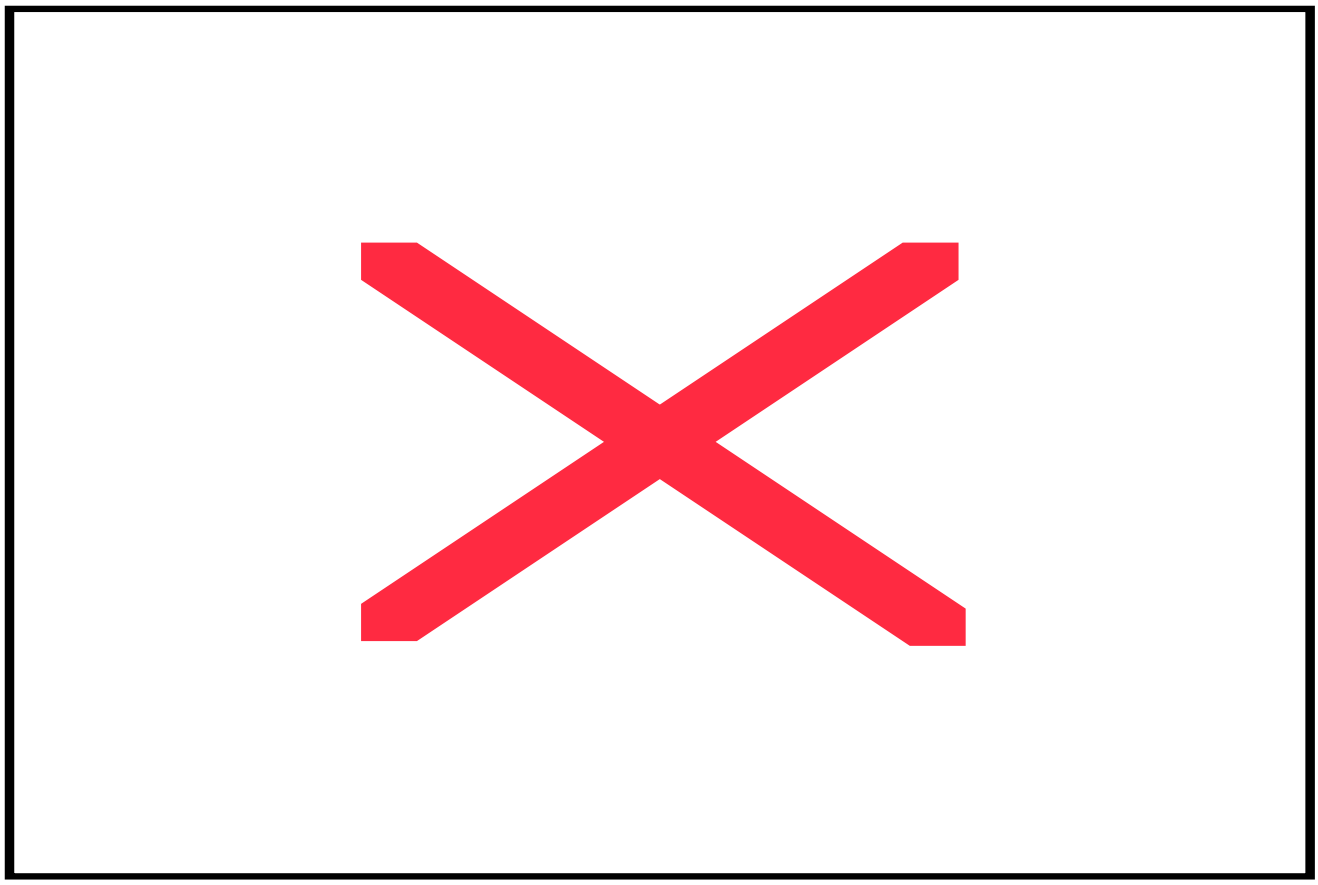
Analysis of Numbers of Unitarians from 1990 to 2001

Group	1990 (in thousands)	2001	Percent Increase
Unitarian	502	629	_____
Population	175,440	207,980	_____
Non Christian	5,853	7,740	_____
Christian	151,496	159,506	_____
All Religions	157,349	167,246	_____

Analysis of Numbers of Unitarians from 1990 to 2001

Group	1990 (in thousands)	2001	Percent Increase
Unitarian	502	629	25.3%
Population	175,440	207,980	18.5%
Non Christian	5,853	7,740	32.2%
Christian	151,496	159,506	5.3%
All Religions	157,349	167,246	6.3%

Semester 2 OL3

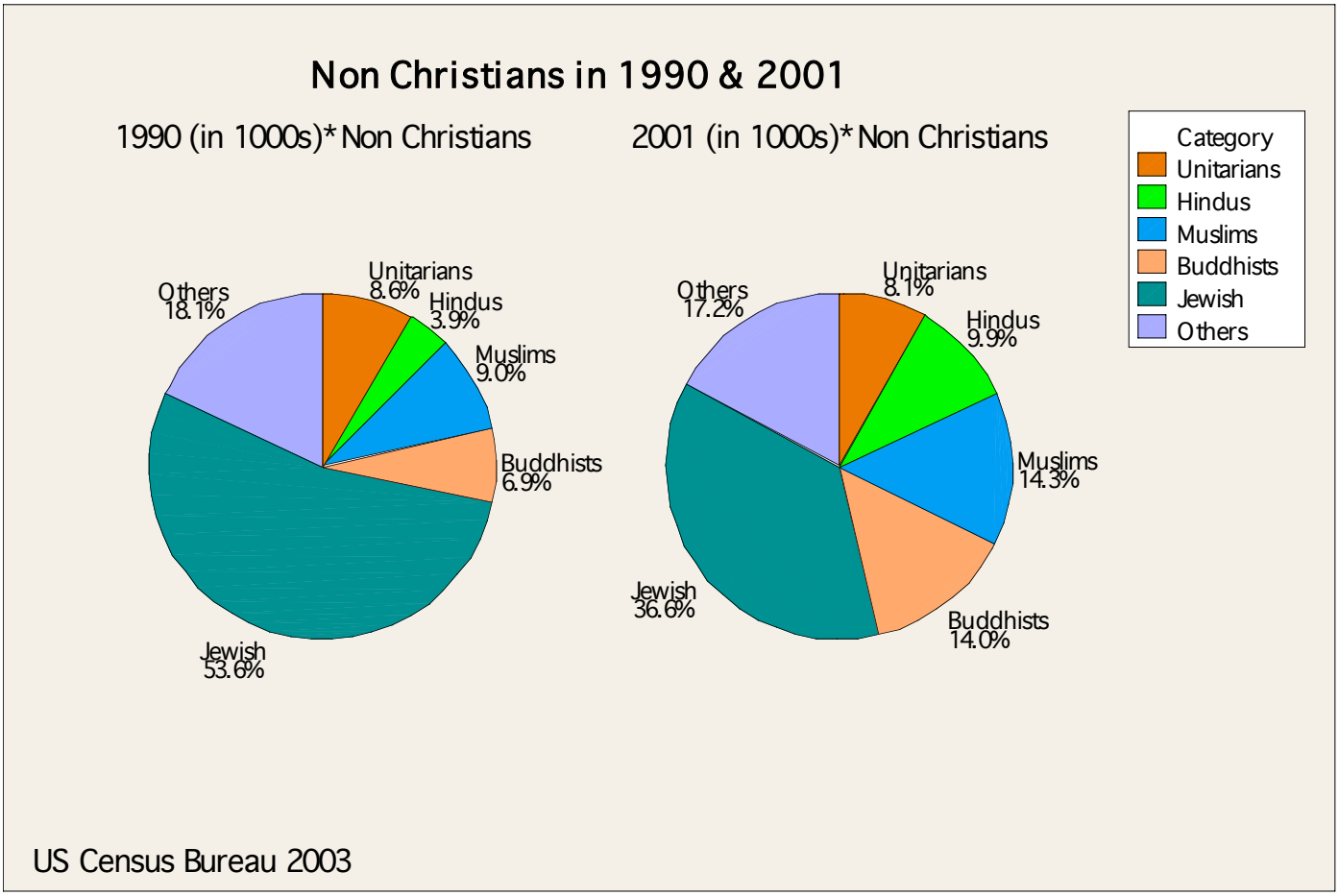


Non Christian U. S. Growth for 1990 to 2001

Non Christians	1990 (in 1000s)	% of total	2001 (in 1000s)	% of total
Unitarians	502	_____	629	_____
Hindus	227	_____	766	_____
Muslims	527	_____	1104	_____
Buddhists	401	_____	1082	_____
Jewish	3137	_____	2831	_____
Others	1059	_____	1328	_____
Total	_____		_____	

Non Christian U. S. Growth for 1990 to 2001

Non Christians	1990 (in 1000s)	% of total	2001 (in 1000s)	% of total
Unitarians	502	8.6%	629	8.1%
Hindus	227	3.9%	766	9.9%
Muslims	527	9.0%	1104	14.3%
Buddhists	401	6.9%	1082	14.0%
Jewish	3137	53.6%	2831	36.6%
Others	1059	18.1%	1328	17.2%
Total	5853		7740	


Non Christians in 1990 & 2001
1990 (in 1000s)* Non Christians
2001 (in 1000s)* Non Christians
Category
Unitarians
Hindus
Muslims
Buddhists
Jewish
Others
Unitarians 8.6%
Hindus 3.9%
Muslims 9.0%
Buddhists 6.9%
Jewish 53.6%
Others 18.1%
Unitarians 8.1%
Hindus 9.9%
Muslims 14.3%
Buddhists 14.0%
Jewish 36.6%
Others 17.2%
US Census Bureau 2003

Semester 3 OL 1

Figure 1 table 1

TOP OF POSTER IDEAS/THOUGHTS

American Indian/Alaska Native	number	% of AI&AN alone or in combination
AI&AN alone or in combination	4,119,301	100.0%
AI&AN alone	2,475,956	60.1%
AI&AN in combination only	1,643,345	39.9%
AI&AN & White only	1,082,683	26.3%
AI&AN & Black or African American only	182,494	4.4%
AI&AN & White & Black or African American	112,207	2.7%
AI&AN & Some other race only	93,842	2.3%
AI&AN & any other combinations	172,119	4.2%

AI = American Indian
AN = Alaska Native

BOTTOM OF POSTER IDEAS/THOUGHTS

US Population in 2004	293,655,404
US Population in 2000	281,421,906
US Population in 1990	248,709,873

% of US population Black or African Amer. 12.3%

self described as 2 or more races
6,826,228 or 2.4 % of US Population

note 97.6% of US Citizens consider themselves of one race
yet only 60.1% of AI&AN consider themselves of one race
Is relationship between Religion and Ethnicity involved?
THOUGHTS AND CONJECTURES

Semester 3 OL 4

Table 2

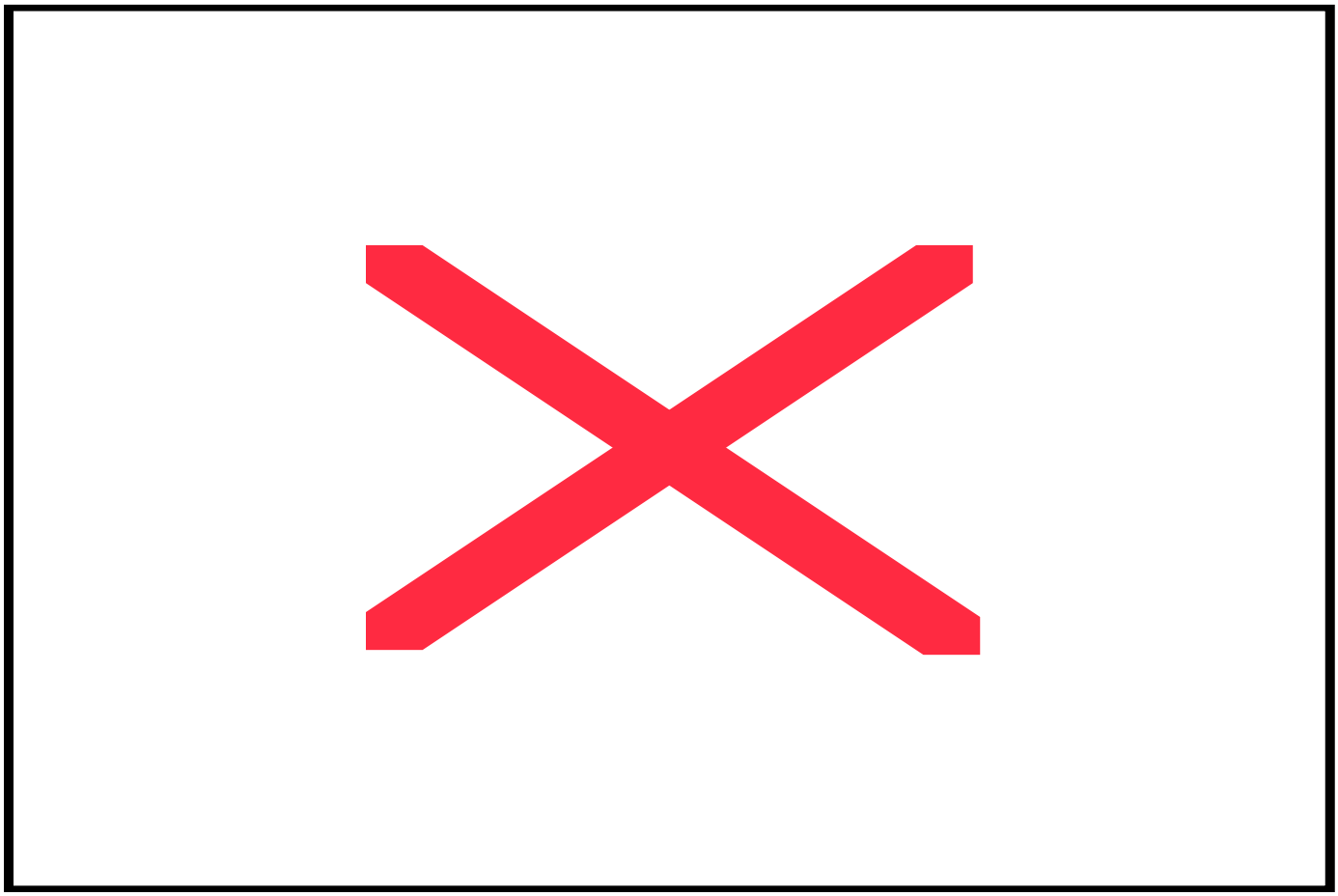
Semester 3 OL 5

Table 4 table 3

Semester 3 OL 6

Table 5

Semester 3 OL 7



Semester 3 OL 8