THE GRANADA CONJECTURES ON
THE FUTURE OF STATISTICAL EDUCATION

In tribute to the work of
Doctors Juan D. Godino and Carmen Batanero
in advancing the quality of statistical education.

Presented by
Professor Milo Schield
Augsburg College
Minneapolis, Minnesota USA
www.augsburg.edu/ppages/~schield

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Department of Mathematical Education
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THE GRANADA CONJECTURES
on
THE FUTURE OF STATISTICAL EDUCATION

1. **The teaching of statistical inference *will decrease*.**

2. **The respect for educational thinking that is not philosophically based *will decrease*.**

3. **The teaching of statistical literacy *will increase*.**

4. **The teaching of Bayesian reasoning *will increase*.**

1. The teaching of statistical inference *will decrease*.

The following is for the United States:

Among college graduates 50 years ago (estimated),

- **15% studied statistical inference**
- **50% studied calculus.**

Among college graduates today (Schield, 1999a),

- **50% study statistical inference**
- **15% study calculus.**

Fifty years from now,

- ***15%* will study statistical inference**
- **15% will study calculus.**

Why will the study of statistical inference decrease?

For the same reason the study of calculus has decreased.
50 years ago, Business majors had to take calculus.
Today, Business majors must (have to) take statistics.

Business majors are the largest group taking statistics.

But, Business majors do not need traditional statistical inference to make basic business decisions.

If chance is the primary issue in a business decision,
then that problem is “academic” (not “significant”).

2. The respect for educational thinking that is not philosophically based *will decrease*.

Education is about

– a metaphysical (physical) reality

– people and their behavior.

Mathematics is about

– epistemological (mental) constructs

– counts, measures, variables and functions.

Any study of reality must be philosophically based; otherwise that study becomes a floating abstraction (a Platonic construct).

In mathematics, one construct is as good as another – so long as it is either a premise or a logical conclusion.

In education, one theory is *not* as good as another.

The primary problem in education is the HALO effect: People see what they want to see.

The 2nd problem in education is the INFINITY problem: There are an infinite number of ways to teach a subject.

Without philosophy, there is no way to decide whether one way of teaching is better (or worse) than another.

Without a philosophical foundation, mathematical education will become unproductive and disrespected.

3. The teaching of statistical literacy *will increase.*

"Statistical Literacy" is the study of *statistics as evidence in arguments about causality.*

Most college students are unable to properly

- **describe a rate or percentage in a table or graph**
- **form a comparison of two rates or percentages.**

Statistical Literacy focuses on reading tables & graphs.

Most college students are unable to identify whether

- **a statistic is used as a premise or as a conclusion**
- **an argument is deductive or inductive.**

Statistical literacy focuses on arguments.

These are the foundations of statistical literacy.

Statistical Literacy focuses on Observational Studies.

Observational studies are common in political science, business, education, sociology, history and economics. They are the basis for many political decisions.

The bias of confounding factors is the major problem.

Although there is no test for confounding, there are certain mathematical requirements (Schield, 1998).

In large datasets, chance is not the primary problem.

Statistical literacy focuses on how to strengthen arguments involving observational statistics as evidence – with considerable focus on the problem of confounding.

4. The teaching of Bayesian reasoning *will increase*.

Frequentist reasoning is deductive. The reasoning about confidence intervals and p-values is ultimately inductive.

- **What is a 95% Confidence Interval?**

Suppose I have two samples from the same population:
One is a 95% interval, the other is a 99% interval.
Is the 99% interval "better" than the 95% interval?

Does the 99% interval give one more confidence in acting as though that particular interval included the fixed population parameter?

- **What is a 5% p-value?**

Suppose I have two samples from the same population:
One has a 5% p-value; the other has a 1% p-value.
Is the 1% p-value "better" than the 5% interval?

Is the sample statistic *less likely to be due to chance* in the 1% sample than in the 5% sample?

Conclusion: The Bayesian focus is not so much on the values of priors as on the understanding of the meaning and value of confidence intervals and hypothesis tests for decision-making. (Schield, 1996 and 1997).

The need to use statistics in decision-making will require an increased teaching of Bayesian reasoning.