

**TEACHING  
INTRODUCTORY  
STATISTICS  
TO  
COLLEGE  
STUDENTS**

Presentation to Xi'an Statistical Institute  
Xi'an, China

By  
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## **INTRODUCTION**

### Milo Schield

- Bachelor of Science (B.S.), Physics, Mathematics  
Iowa State University, Ames, Iowa, USA
- Master of Science (M.S.), Physics, Mathematics  
University of Illinois, Urbana, Illinois, USA
- Doctor of Philosophy (Ph.D), Physics  
Rice University, Houston, Texas, USA

## **STATISTICAL EXPERIENCE**

- 10 years: Senior Operations Research Analyst  
Large Insurance Company: Property/Casualty
- 2 years: Senior Consultant,  
National Consulting Company (CPA)
- 13 years: College Professor,  
Chair: Department of Business & Accounting

## **RECENT PRESENTATIONS**

- 06/98 International Conference, Singapore (ICOTS)
- 05/98 Making Statistics Effective in Business School
- 08/97 American Statistical Association, Los Angeles
- 12/96 University of Wales, Wales, Great Britain
- 11/96 University of Edinburgh, Edinburgh, Scotland
- 10/96 University of York, York, England
- 09/96 University of Nottingham, Nottingham, England
- 08/96 American Statistical Association
- 07/96 Statistical Conference, Sydney, Australia
- 06/96 Teaching Statistics, Sydney, Australia
- 06/96 Making Statistics Effective, Anchorage, Alaska

# CONTACT

**Mr Juli Wang, Director Statistical Education Center,  
State Statistical Bureau (SSB)**

**Mr Wang wrote an excellent article:  
“The Chinese Statistical Education System”  
published by International Statistical Institute**

**I also received help from Cuanzhong Sun  
([csun@comp.uark.edu](mailto:csun@comp.uark.edu))**

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**I am a teacher. I want to teach statistics better.**

**I want to thank the Xi'an Statistical Institute for  
inviting me to give a short presentation on statistical  
education.**

**Thank you**

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## **Statistics has two meanings:**

### **Statistics are numbers:**

- Counts, percents, and rates
- Mean, median, percentiles and standard deviations

### **Statistics is a science**

- Theorems: Binomial central limit.
  - Confidence interval, hypothesis tests
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## **Statistics can be classified as follows:**

METHOD	USER
Theoretical	Mathematicians
Applied	
Experimental	Scientists, Agriculture
Observational	Administrators, Business

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# TWO KINDS OF STUDIES:

## **Experiment:**

Scientists take control of factors.

A good experiment is repeatable

A good experiment with human subjects is controlled

## **Observational studies:**

There is no control of the factors

Examples: stock markets, population

Effect of a new policy in education

Effect of a new policy in economics

This is common and very difficult

**Students in commerce need to learn how to deal with statistics based on observational studies.**

# THE PROBLEM

METHOD	Availability of Textbooks
Theoretical	Many good books
Applied	
Experimental	Many good books
Observational	<b><u>Very few books.</u></b>

**There is a lack of books on observational statistics for administrators and students in business, commerce and social sciences.**

Most statistics books deal with

- experiments,
- controlled studies,
- repeatable studies.

Administrators, government officers, military officers, economists need education in reading and interpreting statistics – observational statistics.

They need a textbook that is based on observational statistics – not on experiments. They need to learn how to read and interpret statistics

# CONTENT FOR A COURSE IN OBSERVATIONAL STATISTICS

1. Learn to distinguish experiments and observational studies
2. Learn to read tables of counts, percents and rates. Learn how to make comparisons: differences, ratios and percentage change.
3. Learn how to interpret tables: to beware of lurking variables, to beware of a reversal in an association (Simpson's Paradox).
4. Learn how to interpret summary statistics (mean, median). Learn how to explain a difference in summary statistics.
5. Learn about association and causation.
  - Association is not causation
  - Association is a sign of causation
  - Find a lurking (confounding) variable

These users must learn how to think about statistics. They must learn what questions to ask about statistics.

# CONCLUSION

Teaching the use of statistics as evidence is very difficult. It is easier to teach theoretical statistics. This is a difficult job. But our students need this kind of teaching. It is closer to philosophy, it deals more with words and less with numbers.

I would like to communicate with those who

- are writing college books on statistics
- are selecting books for use in colleges

China must focus on educating students with what they need to do their work.

Most students do not need theoretical statistics. Most students do not need experimental statistics.

Many students need to work with observational statistics. By educating these students properly with what they need, we will do our students a great service.

Thank you.