# OUR EXPERIENCE WITH HYBRID AND ONLINE LEARNING IN INTRODUCTORY STATISTICS AT BRIGHAM YOUNG UNIVERSITY

StatTutor lessons (one for each statistical concept in introductory statistics) were developed using Flash Macromedia and QuickTime movies from 1997 through 2004.

## What is StatTutor?

- Animated presentations of statistical concepts with explanations
- Includes:
  - Videos of real life applications help students buy in need to know statistics.

Hear
  - Audio adds one more sense to the learning proces

See
  - Animations give visual explanations not possible in

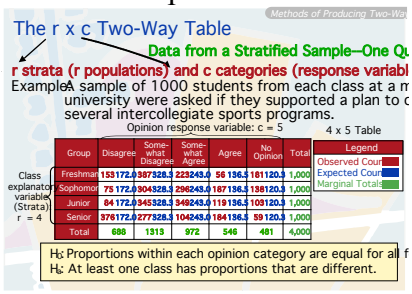
Do
  - Applets aid understanding.

Videos

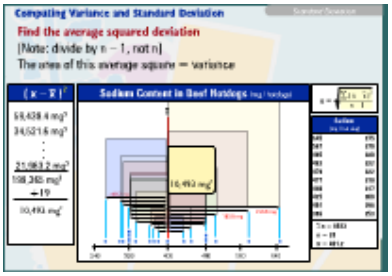
## How We Are Using StatTutor at Brigham Young

- Two hybrid sections of introductory statistics (200
  - 75% are Flash lessons presented in class by an inst
  - Remaining are StatTutor lessons viewed online in lie
  - Quiz on Blackboard with deadline for each StatTutc
  - Instructors decided which lessons are best done in
- Two all online sections of introductory statistics (20
  - All are StatTutor lessons viewed online outside of c
  - Quiz on Blackboard with deadline for each StatTutc
  - Activity held in class once a week.
  - Optional question/answer session once a week.
- Four regular sections of introductory statistics (200
  - Students view no lessons online outside of class.

Audio explanations




Animations

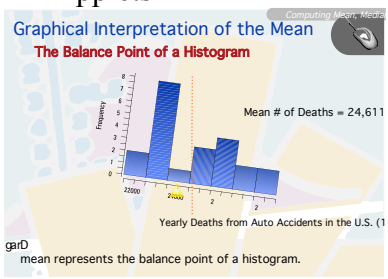


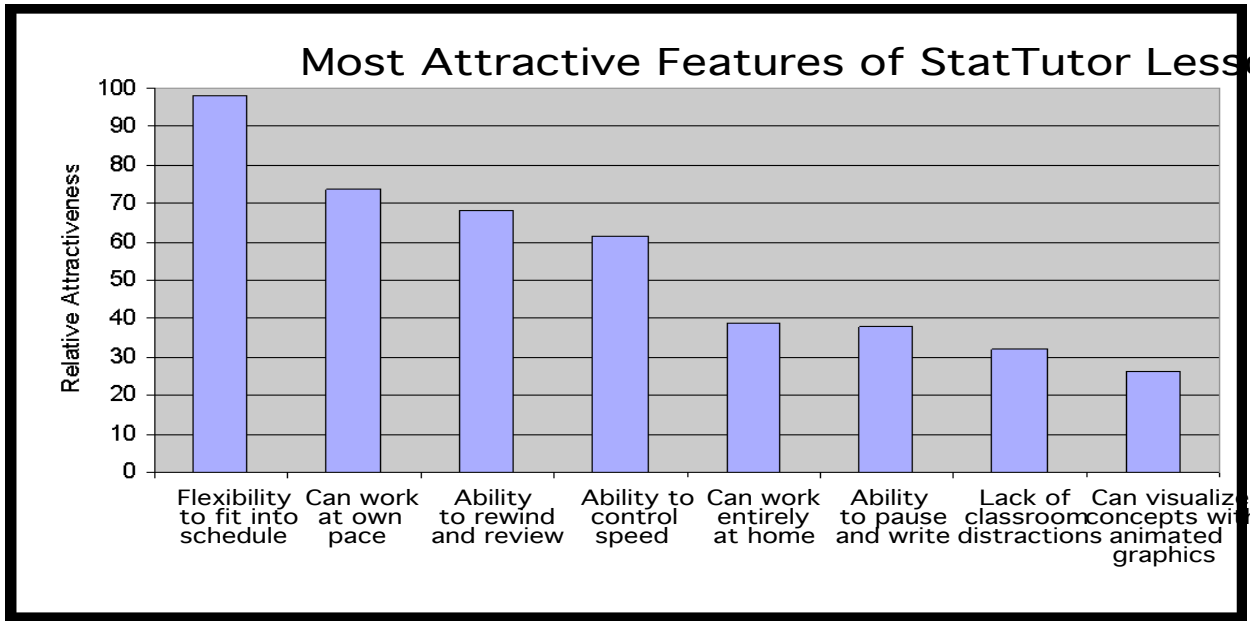

## What We've Learned So Far

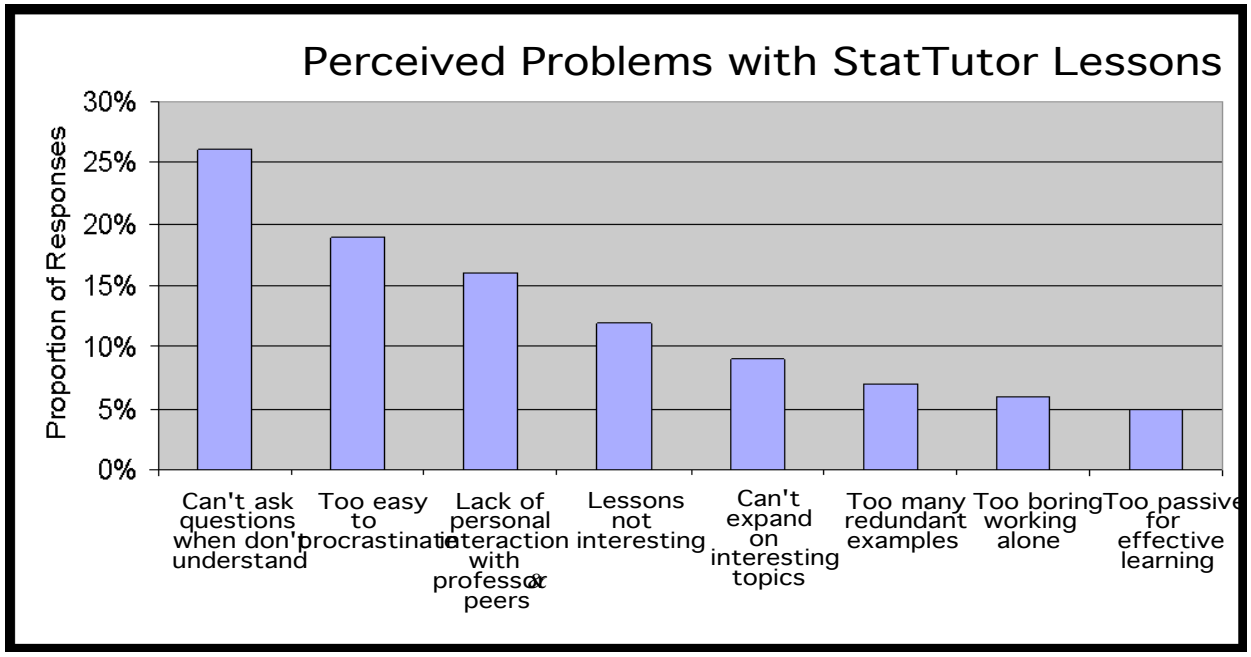
- 79% rate StatTutor as "Good" (58%) or "Excellent
  - Increase from 68% last year with partial online
- Gender mix of 60% males and 40% females.
- 65% listed StatTutor as primary learning source.
- Exam scores higher for good students--lower for pc

| | Mean Scores on Stat 221 Exam | | | | | |
|---|---|---|---|---|---|---|
| | All Students | A Students | B Students | C Students | D Students | Failing Students |
| Regular | 82.4 | 93.8 | 85.3 | 75.9 | 66.0 | 54.9 |
| Hybrid | 83.9 | 94.0 | 85.5 | 75.5 | 66.4 | 50.7 |
| All online | 82.7 | 94.6 | 85.6 | 75.7 | 65.1 | 52.0 |
| P-value | | 0.034 | | | | 0.018 |

Applets






## Reasons for Using StatTutor

- Free up class time for:
  - activities
  - discussions of real life applications
  - emphasizing statistical thinking instead of det
  - assessment
  - focusing on difficult concepts
- Provide makeup for missed classes
- Give students with English as a second language or having trouble an opportunity to replay audio over

## Summary

- 90% favored StatTutor; 20% said StatTutor was
- 89% of students felt they learned "as well" or "be regular classroom lecture.

**No significant difference between average test score who viewed lessons online versus those presented les instructor>= NO HARM DONE**

Also no difference within demographics:
- Gender
- Age
- Major

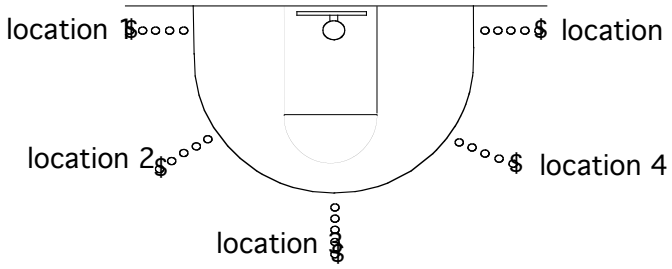
## *ACTIVITY DEMONSTRATING SAMPLING DISTRIBUTION IN HYPOTHESIS TESTING*

### *by P. B. Collings*

1. Record your 25 consecutive random digits here:

*Students are asked to obtain 25 random digits from either their calculator or from a random number table. If they use a random number table, be sure to tell them not to use the top row or else many will. I tell them to pick 25 random digits that no one else is likely to pick.*

2. Every year at the National Basketball Association all-star game, a three-point shoot out competition is held. At five locations around the three-point line each player takes five shots. For each ball that goes through the hoop, a player gets one point. That is, except for the fifth of each set of five shots. This ball is called the money ball because the player gets two points if the fifth ball goes through the hoop. The player's score is his total points.




Now you get to simulate playing in the three-point shoot out. Each of your digits represents one shot. If the digit is even, you made your shot. If the digit is odd, you missed your shot. Each even digit counts 1 point except for every fifth digit which represents a money ball shot worth 2 points. Here is an example:

| | Location 1 | Location 2 | Location 3 | Location 4 | Location 5 |
|---|---|---|---|---|---|
| Digits | 0 0 2 7 6 | 6 7 2 7 9 | 8 3 2 9 4 | 3 7 7 3 8 | 6 5 5 3 3 |
| Points | 1 1 1 0 2 | 1 0 1 0 0 | 1 0 1 0 2 | 0 0 0 0 2 | 1 0 0 0 0 |

Total points = 14 points (Note: 0 is an even digit.)

Now it's your turn. For each digit listed in #1 above, record your points for each shot:

What are your total points?

3. As your teacher creates the plot on an overhead, copy and reproduce it here.

8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

*After the students have computed their points, I ask them to call out their scores and make a dotplot on an overhead. These values usually work. Once a student got a 7 and another student got a 24—both are very unlikely. If you have fewer than 30 students, I recommend that you have each student do this twice.*

4. Using our assignment for random digits, what are we saying our three-point shooting percentage is? *50%*

5. What does the plot tell us? *Plot tells us possible points that could be made in the three-point shoot out for a 50% three point shooter.*

   Does it give a distribution? If so, what distribution? *All possible scores for a 50% three-point shooter and how often each score occurs.*

6. What is the minimum score possible? *0* What is the maximum score possible? *30*
   What is the average score? *15*

7. Suppose a player scores 14, 16 and 17, respectively in three rounds of the shoot out. Could this player have the shooting percentage given in #4 above? Why or why not?

   *Yes, because these scores are possible.*

8. Suppose a player scores 20, 22 and 23, respectively in three rounds of the shoot out. Could this player have the shooting percentage given in #4 above? Why or why not?

   *No, because these scores are not very likely.*

9. Describe the hypotheses we are testing in #7 and #8 above.
   *One hypothesis is that the player is a 50% three-point shooter. The other is that the player shoots better than 50% in three-point shooting.*

10. If a player is a 50% three-point shooter, is he likely to score 14, 16 and 17? *Yes*

11. If a player is a 50% three-point shooter, is he likely to score 20, 22 and 23? *No*

12. If a player scores 14, 16 and 17, can we be fairly certain that he makes **exactly** 50% of his three point shots?
    *No, because he might be a 49% or a 51% three-point shooter.*

13. If a player scores 20, 22 and 23, can we be fairly certain that he is better than 50% in his three point shooting?
    *Yes* Are we 100% positive? *No*

14. What is the difference between the following two questions?
    A. *What is the probability that a player is a 50% three-point shooter?*

    B. *If a player is a 50% three-point shooter, what is the probability that he scores 22 or higher in the three point shoot out?*

15. Which question in #14 asks about P-value? *Question B*

Moral: P-value is a conditional probability; it is the probability of getting a test statistic (as extreme as or more extreme than observed) IF the null is true. It is NOT the probability that the null is true.