

Activity and Web-based Probability & Statistics Workshop

Adaptation, Implementation, & Assessment

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These Materials are Great But

- How do I implement in my particular classroom or at my institution?
- How do I grade?
- How much of the materials should I use?

It Depends!

It Depends On ...

- How much freedom/flexibility you have in your teaching of course
 - How set is the course syllabus, text, etc.?
 - Our experience
 - ASU - complete freedom
 - UAH - more probability oriented, some flexibility but mostly traditional topics
 - MTSU – more statistics oriented, a good bit of flexibility

It Depends On ...

- Classroom Facilities
 - Sometimes have use of computer lab, sometimes not...
- Course emphasis
 - More traditional two semester sequence
 - Emphasizing Statistics or Probability

“Just in Time Probability”

Vs.

“Just in Time Statistics”

It Depends On ...

- Types of Students & Their Mathematics Background
 - Math Majors
 - Computer Science and/or Engineering
 - Education
 - Mixture
- Other Issues
 - Time available
 - Full Discovery vs. “Guided Discovery”

Types of Courses in Which We Have Implemented Materials

- ASU

- Applied Prob & Stats I (CS, Math Ed, Math)

- UAH

- Introduction to Probability (Engineering, CS, Math, Math Ed)

- MTSU

- Probability & Statistics
- Mathematical Statistics (limited)
- Probability & Statistics for Teachers (Master's level for Mathematics Education)

Adaptations & Implementations

- Combine Virtual Lab Applets & in-class activities
- Use web-based demos and tactile simulations in-class & use computer simulations out-of-class
 - Works when access to lab during class time limited
- Out-of-class written reports on activities & computer simulations
 - Gives students time to think about what they have done
 - Adds a “writing component” to the class
- Full use of computer lab (mostly discovery-based)

Some Favorite Activities (so far) for Teaching Probability:

- You can see most of our modified activities in the Teaching Materials of our [Project Website](#)
- Why our favorites?
 - Easy to implement, students “got it”, can be used on several levels to emphasize different topics, can be revisited throughout the semester as topics arise.

Friendly Observers Revisited

- Motivates Discussion/Exploration of the Following Topics
 - Empirical vs. Theoretical Distributions, Counting Techniques, Model Identification (Ball & Urn), Hypergeometric Distribution, Design of Experiments, Hypothesis Testing, p-values, Statistical Significance, Simulation as a Tool
- Can use early in the semester and revisit
- Nice tactile in-class simulation
- Can use VL Ball & Urn Applet instead of Minitab
- Web Version (Created at Seigris's Workshop last summer!)
 - Warning: Untried in the classroom!

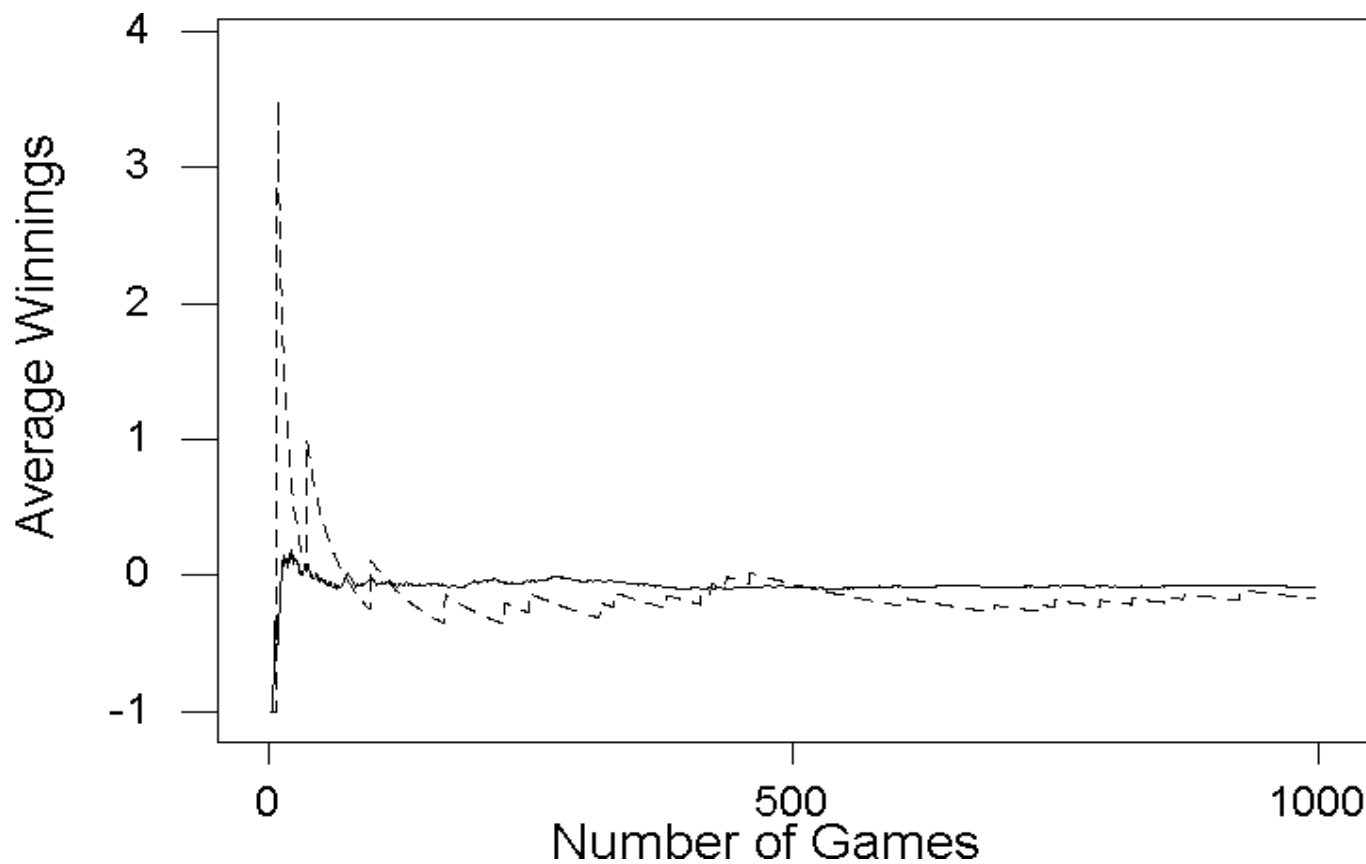
Random Babies/Random CDs

- Motivates Discussion/Exploration of the Following Topics:
 - Empirical vs. Theoretical Distributions, Counting Techniques, Model Identification (Matching Problem), Simulation as a Tool
- Nice in-class tactile simulation
- Can use VL Matching Applet instead of Minitab
- Students Seem to Like Weirdness of It

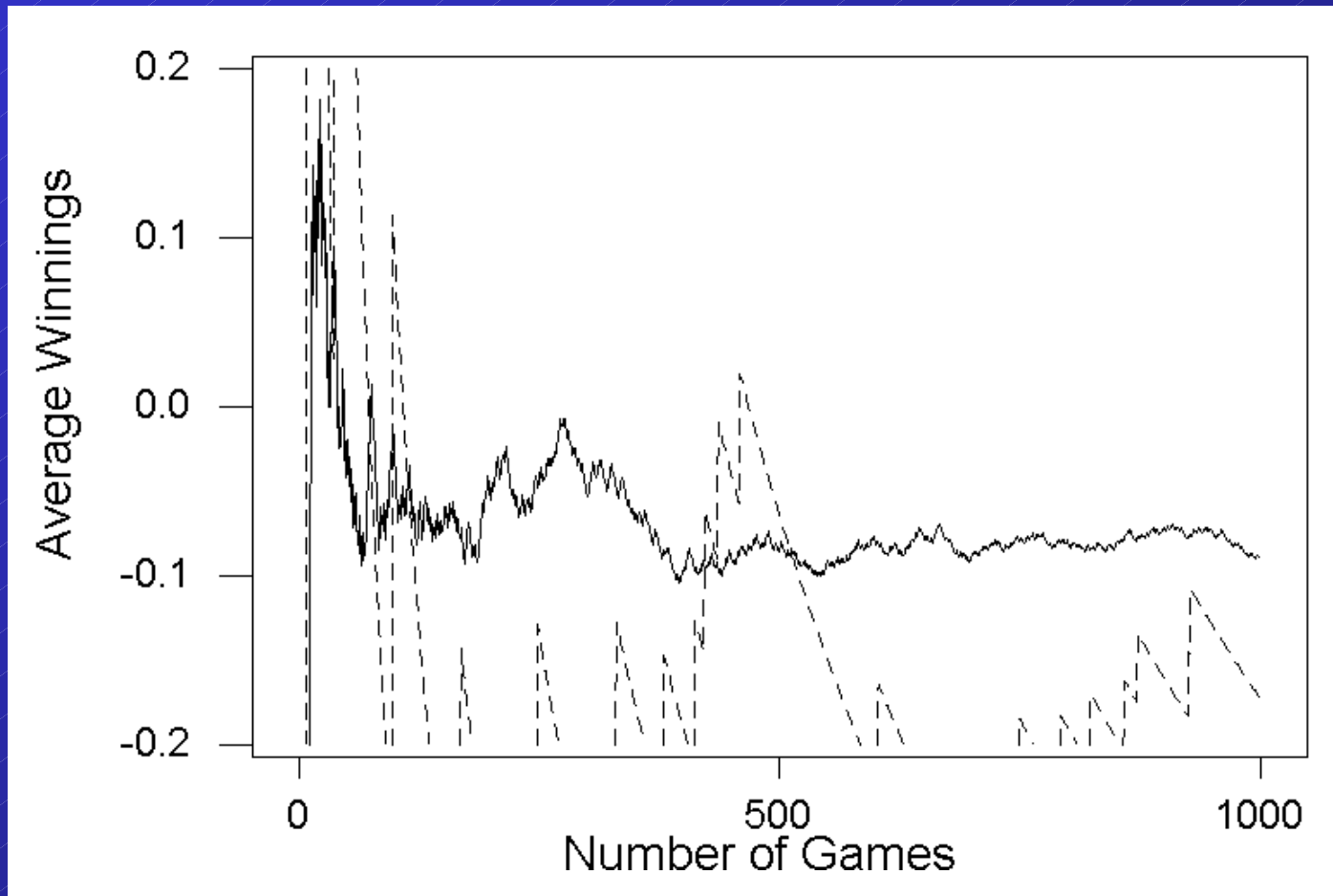
Roulette

- Motivates Discussion/Exploration of the Following Topics:
 - Mathematical Expectation (as Long-Run Average), Variation, the Gambler's Ruin, Gambling Strategies, Sequences & Series(!)
- Can use VL Roulette Applet (but need Minitab for cumulative graphs – would be nice to be able to export data from VL)

Roulette: Cumulative Graph I



Roulette: Cumulative Graph II



Sampling Sim

- Motivates Discussion/Exploration of the Following Topics:
 - Central Limit Theorem, Statistic vs. Parameter, Random Samples, Sample Size, Sampling Distributions, Averaging Reduces Randomness
- Uses very nice applet available for free
- VL does have some similar applets:
 - Sample Mean Experiment

Penny Ages

- Motivates Discussion/Exploration of the Following Topics:
 - Sampling Distributions, Discrete and Continuous Distributions, Central Limit Theorem
 - Uses Minitab for simulations
- A good activity for report writing

Other Cool Items on VLPS:

- Homework Problems
- Venn Diagram Applet
- Binomial Coin Experiment Applet
 - Perform as a tactile simulation early in the semester
 - Run VLPS applet afterwards
- Quick graphs of Chi-Square and other distributions

Teaching Future Teachers

- Activity-based and web-based materials
 - Model the teaching methods pre-service teachers need to use in their classrooms
 - Support NCTM Standards
 - Work well as supplements to the AP Statistics curriculum

Student Feedback

- Overall positive attitudes
 - Like Minitab
 - Enjoy activities
- Content learning
 - Activities reinforces learning
 - Writing enhances learning
- Collecting Quantitative Data Also
 - Preliminary Results