

Domain	Probability and Informed Decisions	
Cluster	Use probability to evaluate outcomes and make decisions.	
Standard(s)	M.ASHS.23	Interpret results from a randomized experiment comparing two treatments. Use simulations to decide if experimental results are significant. Instructional Note: Develop informally the comparison of an observed result and an established probability value (for example $p \leq 0.05$).

Content Examples:

- » Simple Hypothesis Testing:
<https://www.youtube.com/watch?v=5D1gV37bKXY>
- » Idea Behind Hypothesis Testing:
<https://www.youtube.com/watch?v=dpGmVV0-4jc>

Relevant Content:

Vocabulary:

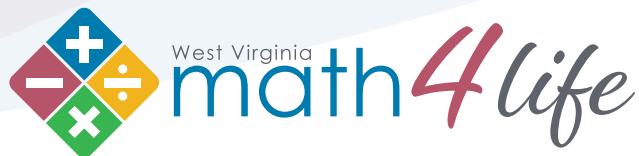
- » Alternative Hypothesis: The alternative hypothesis is the claim we are trying to find evidence for in a significance test.
- » Comparison: Comparison is an experiment design principle that uses a design that compares two or more treatments.
- » Completely Randomized Design: A completely randomized design is a design in which the experimental units are assigned to the treatments completely by chance.
- » Confounding: When two variables are associated in such a way that their effects on a response variable cannot be distinguished from each other.
- » Inference: Inference is when we draw conclusions that go beyond the data at hand.
- » Null Hypothesis: The null hypothesis is the claim we weigh evidence against in a significance test. Often, the null hypothesis is a statement of “no difference”.
- » Quantitative Variable: A quantitative variable is a variable that takes numerical values that are quantities – counts or measurements.
- » Response Variable: A response variable is a variable that measures an outcome of a study.
- » Sampling Variability: Sampling variability involves the principle that different random samples of the same size from the same population produce different estimates.
- » Simulation: A simulation is an imitation of chance behavior, based on a model that accurately reflects the situation.

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- » Statistically Significant: When the observed results of a study are too unusual to be explained by chance alone, the results are called statistically significant. If the P-value is smaller than alpha, we say that the results of a statistical study are significant at level, α . In that case, we reject the null hypothesis and conclude that there is convincing evidence in favor of the alternative hypothesis.
 - » Treatment: A treatment is a specific condition applied to the individuals in an experiment. If an experiment has several explanatory variables, a treatment is a combination of specific values of these variables.
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Assessment Links or Tasks:

- » Is Anchored Putting Better? Activity
https://261d9fb9-63bc-4936-a892-1fe3dbcf2042.filesusr.com/ugd/4c04a2_3cb492d8db3c4601bb28af9c0a8a6f38.pdf
Is Anchored Putting Better? Answer Key
https://261d9fb9-63bc-4936-a892-1fe3dbcf2042.filesusr.com/ugd/4c04a2_e1cd785d3e134fe9a773754cb8081285.pdf
See the following instructions: [Inferences for Experiments Lesson Plan](#)
 - » How to Experiment Well Activity
https://261d9fb9-63bc-4936-a892-1fe3dbcf2042.filesusr.com/ugd/4c04a2_2d9b93dba4f94b72b737bd38339ad32e.pdf
How to Experiment Well Answer Key
https://261d9fb9-63bc-4936-a892-1fe3dbcf2042.filesusr.com/ugd/4c04a2_2459f76d08db45658f1379c76e1694dd.pdf
See the following instructions: [How to Experiment Well Lesson Plan](#)
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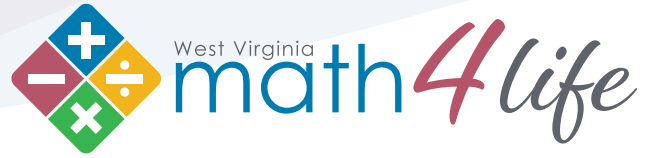
Inference for Experiments Lesson Plan



Learning Targets

- (1) Outline an experiment that uses a completely randomized design.
- (2) Explain the concept of statistical significance in the context of an experiment.
- (3) Use simulation to determine if the difference between two means or two proportions in an experiment is significant.

How to Experiment Well Lesson Plan



Learning Targets

- (1) Describe how to randomly assign treatments using slips of paper or technology.
- (2) Explain the purpose of random assignment in an experiment.
- (3) Identify other sources of variability in an experiment and explain the benefits of keeping these variables the same for all experimental units.