PennState
Eberly College
of Science

# Using Blueprints to Align Learning Objectives and Assessments

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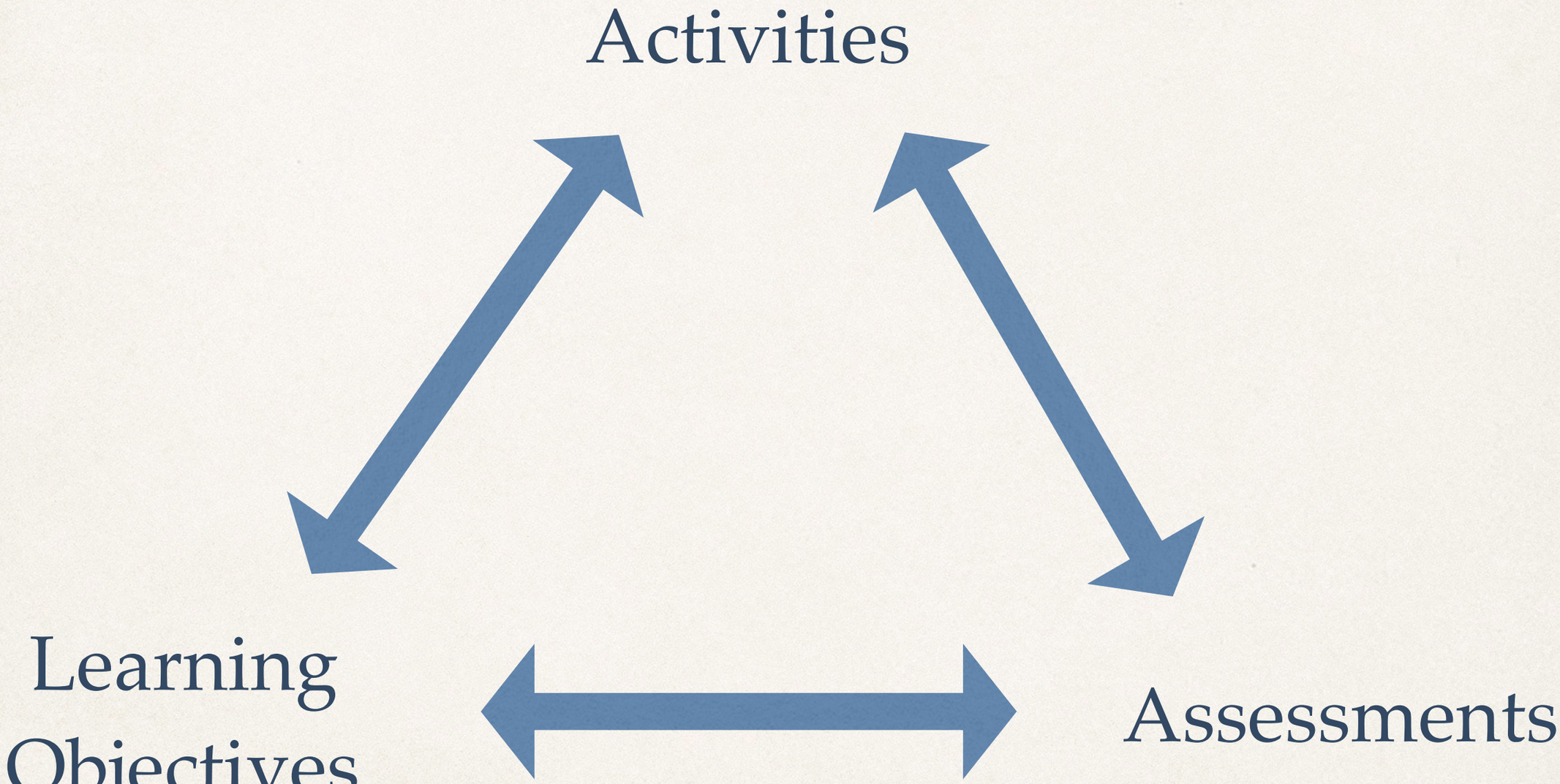
# Triangle of Effective Teaching




Biggs, J. (1999) *Teaching for quality learning at university*. Buckingham, Philadelphia: Society for Research in Higher Education & Open University Press.

# Lesson: Learning Objectives

PennState Eberly College of Science | STAT 200 | Elementary Statistics

**Start Here!**

- Welcome to STAT 200!
- Search Course Materials
- Faculty login (PSU Access Account)

**Lessons**

- Lesson 0: Statistics: The "Big Picture"
- Lesson 1: Gathering Data
- Lesson 2: Turning Data Into Information
- Lesson 3: Probability - 1 Variable
- Lesson 4: Probability - 2 Variables
- Lesson 5: Probability Distributions
- Lesson 6: Sampling Distributions
- Lesson 7: Confidence Intervals
- Lesson 8: Hypothesis Testing
- Lesson 9: Comparing Two Groups
- Lesson 10: One-Way Analysis of Variance (ANOVA)
- Lesson 11: Association Between Categorical

Home

## Lesson 12: Inference About Regression

Printer-friendly version

In Lesson 11 we examined relationships between categorical variables. In this lesson, we will examine the relationships between two quantitative variables. Recall from Lesson 2, **quantitative variables** have numerical values with magnitudes that can be placed in a meaningful order. The main topics in this lesson are correlation (Pearson's $r$) and simple linear regression; both involve two quantitative variables.

**Lesson 12 Learning Objectives**

Upon completion of this lesson, you should be able to do the following:

- identify situations in which correlation or regression analyses are appropriate.
- within a given scenario, identify the explantory and response variables.
- interpret scatterplots.
- compute and interpret Pearson $r$ correlation coefficients.
- explain how outliers can influence correlation and regression analyses.
- compute and interpret the coefficient of determination ($R^2$).
- interpret the results of a simple linear regression analysis.

# Lesson: MyStatLab Homework

**Lesson 12 Learning Objectives**

Upon completion of this lesson, you should be able to do the following:

- identify situations in which correlation or regression analyses are appropriate.
- within a given scenario, identify the explantory and response variables.
- interpret scatterplots.
- compute and interpret Pearson *r* correlation coefficients.
- explain how outliers can influence correlation and regression analyses.
- compute and interpret the coefficient of determination ($R^2$).
- interpret the results of a simple linear regression analysis.

**My Selections (12)** ▸ View Assignment Details Questions: 12

| | # | Question ID / Media | Section / Book Association | Estimated time: 14m 22s+ | Points: 26 | |
|---|---|---|---|---|---|---|
| | 1 | 2.1.1 | Identify variable types. | 1m 24s | | 2 |
| | 2 | 3.2.11 | Find a correlation coefficient and/or interpret aspe... | 1m 56s | | 1 |
| | 3 | 3.2.16 | Find a correlation coefficient and/or interpret aspe... | 59s | | 4 |
| | 4 | 3.2-10 (tb) | Find a correlation coefficient and/or interpret aspe... | | | 1 |
| | 5 | 3.2-12 (tb) | Find a correlation coefficient and/or interpret aspe... | | | 1 |
| | 6 | 3.4-2 (tb) | Identify potential or actual misuse of regression o... | | | 1 |
| | 7 | 12.1.1 | Find and interpret a prediction equation. | 3m 12s | | 4 |
| | 8 | 12.1.3 | Use a prediction equation. | 3m 26s | | 5 |
| | 9 | 12.1-12 (tb) | Find and interpret a prediction equation. | | | 1 |
| | 10 | 12.1-14 (tb) | Use a prediction equation. | | | 1 |
| | 11 | 12.2.18 | Compare/interpret slopes and/or correlations of re.. | 3m 25s | | 4 |
| | 12 | 3.2-4 (tb) | Find a correlation coefficient and/or interpret aspe... | | | 1 |

# Lesson: Lab Activity

**Lesson 12 Learning Objectives**

Upon completion of this lesson, you should be able to do the following:

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- compute and interpret Pearson *r* correlation coeffici
- explain how outliers can influence correlation and r
- compute and interpret the coefficient of determinati
- interpret the results of a simple linear regression an

**Lesson 12: Regression** **NAME** **Lab Assignment**

**Answer the following questions showing all work. For questions that require Minitab Express, include the appropriate output (copy + paste) along with an explanation. Use an alpha level of .05 unless otherwise specified.**

**1. Use the file SP16STUDENTDATA.MTW to answer the following questions. (40 points)**

**A. Create a scatterplot with height on the X-axis and shoe size on the Y-axis.**

**B. Describe the scatterplot that you made in part A in terms of direction, shape, strength, and outliers.**

**C. Would it be appropriate to compute a Pearson's *r* as a measure of the relationship between these two variables? Why or why not?**

**D. Compute the correlation (Pearson's *r*) for the relationship between height and shoe size and use the five-step hypothesis testing procedure to determine if the correlation is statistically significant.**

**E. How would you explain the results that you found in parts A through D to a friend with no knowledge of statistics?**

**F. How would you explain the results that you found in parts A through D to a statistics professor?**

# Lesson: Quiz

Respondus

ANGEL

Canvas

# Lesson: Alignment

**Lesson 12 Learning Objectives**

Upon completion of this lesson, you should be able to do the following:

- identify situations in which correlation or regression analyses are appropriate.
- within a given scenario, identify the explantory and response variables.
- interpret scatterplots.
- compute and interpret Pearson *r* correlation coefficients.
- explain how outliers can influence correlation and regression analyses.
- compute and interpret the coefficient of determination ($R^2$).
- interpret the results of a simple linear regression analysis.

| Learning Objective | MyStatLab | Lab Assignment | Quiz |
|---|---|---|---|
| identify situations in which correlation or regression analyses are appropriate. | | X | X |
| within a given scenario, identify the explantory and response variables. | X | X | X |
| interpret scatterplots. | X | X | X |
| compute and interpret Pearson *r* correlation coefficients. | X | X | X |
| explain how outliers can influence correlation and regression analyses. | X | | X |
| compute and interpret the coefficient of determination ($R^2$). | X | X | X |
| interpret the results of a simple linear regression analysis. | X | X | X |

# Item Analysis - Quiz

## _Lesson 12 Quiz Item Analysis Report

16 Questions - 32 Minutes

View, Grade or Delete Submissions > Item Analysis

**Assessment Response Summary**

| | |
|---|---|
| Assigned: | 41 |
| In Progress: | 0 / .00% |
| Completed: | 33 / 80.49% |
| Average completion time: | 18 minutes |
| Reliability | ? |
| Average question difficulty | 72.70% |

**Display Options**

- ☐ Show all question text
- ☐ Show all answer option text
- ☐ Show Question Set text

Display response data: As Delivered

| Question | Type | Points | Sample Size | Mean | Difficulty ▲ | Discrm. | Std. Dev. | Std. Error |
|---|---|---|---|---|---|---|---|---|
| 41: R from r-square 2 (view)(regrade) | Multiple Choice | 1 | 6 | 0.2 | 16.7% | .83 | .373 | .152 |
| 39: Correlation to Rsq 10 (view)(regrade) | Multiple Choice | 1 | 9 | 0.2 | 22.2% | .93 | .416 | .139 |
| 40: R from r-square 1 (view)(regrade) | Multiple Choice | 1 | 14 | 0.3 | 28.6% | .53 | .452 | .121 |
| 14: Simple Regression - Rsq 2 (view)(regrade) | Multiple Choice | 1 | 14 | 0.3 | 28.6% | .03 | .452 | .121 |
| 44: R from r-square 5 (view)(regrade) | Multiple Choice | 1 | 10 | 0.3 | 30% | .88 | .458 | .145 |
| 42: R from r-square 3 (view)(regrade) | Multiple Choice | 1 | 13 | 0.3 | 30.8% | .56 | .462 | .128 |
| 43: R from r-square 4 (view)(regrade) | Multiple Choice | 1 | 11 | 0.4 | 36.4% | .71 | .481 | .145 |
| 58: Simple Regression - Line Interpret 4 (view)(regrade) | Multiple Choice | 1 | 13 | 0.4 | 38.5% | .3 | .487 | .135 |
| 28: Simple Regression - Correlation 7 (view)(regrade) | Multiple Choice | 1 | 27 | 0.4 | 44.4% | .73 | .497 | .096 |
| 34: Sig of r 5 (view)(regrade) | Multiple Choice | 1 | 9 | 0.4 | 44.4% | .61 | .497 | .166 |
| 27: Simple Regression - Correlation 5 (view)(regrade) | Multiple Choice | 1 | 24 | 0.5 | 45.8% | .74 | .498 | .102 |
| 38: Correlation to Rsq 9 (view)(regrade) | Multiple Choice | 1 | 6 | 0.5 | 50% | .74 | .500 | .204 |
| 35: Simple Regression - Correlation to Rsq 2 (view)(regrade) | Multiple Choice | 1 | 17 | 0.5 | 52.9% | .77 | .499 | .121 |
| 66: Simple Regression - Correlation 9 (view)(regrade) | Multiple Choice | 1 | 11 | 0.5 | 54.5% | .31 | .498 | .150 |
| 54: Compute Residual 3 (view)(regrade) | Multiple Choice | 1 | 16 | 0.6 | 56.3% | .38 | .496 | .124 |
| 62: Assumptions T/F (view)(regrade) | True or False | 1 | 14 | 0.6 | 57.1% | .43 | .495 | .132 |

# Mid-Terms and Final

| Question Set | # of Qs on Exam | Points | Questions on exam | Question Writer |
|---|---|---|---|---|
| **Lesson 7 - Confidence Intervals** | | | | |
| Theory / Interpretation | 1 | 1 | 1-5 | Harold |
| Statistics versus parameters | 1 | 1 | 6-10 | Harold |
| Standard error of p-hat | 1 | 1 | 11-15 | Harold |
| Standard error of x-bar | 1 | 1 | 16-20 | Kristen |
| Margin of error | 1 | 1 | 21-25 | Kristen |
| CI of p | 1 | 1 | 26-30 | Kristen |
| CI of μ | 1 | 1 | 31-35 | Fei |
| **Lesson 8 - Hypothesis Testing** | | | | |
| Writing hypotheses | 1 | 1 | 36-40 | Fei |
| Using p values | 1 | 1 | 41-43 | Fei |
| Definitions | 1 | 1 | 44-48 | Dan |
| Minitab output | 1 | 1 | 49-53 | Dan |
| Test statistic: Proportion | 1 | 1 | 54-58 | Dan |
| Test statistic: Mean | 1 | 1 | 59-63 | Cody |
| Errors | 1 | 1 | 64-68 | Cody |
| **Lesson 9 - Comparing Two Groups** | | | | |
| Test statistic: Paired | 1 | 1 | 69-73 | Cody |
| Conclusion based on *p* | 1 | 1 | 74-78 | Whitney |
| Hypothesis testing theory | 1 | 1 | 79-83 | Whitney |
| **Lesson 10 - One-way ANOVA** | | | | |
| Assumptions | 1 | 1 | 84-89 | Orsay |
| Definitions | 1 | 1 | 90-94 | Orsay |
| Writing hypotheses | 1 | 1 | 95-99 | Orsay |
| Making conclusions | 1 | 1 | 100-105 | Scott |
| **Lesson 11 - Association between Categorical Variables** | | | | |
| Reading a contingency table | 1 | 1 | 106-110 | Scott |
| Statistical significance theory | 1 | 1 | 111-115 | Scott |
| Writing hypothesis | 1 | 1 | 116-119 | Xiaojiao |
| Conclusion to chi-square test | 1 | 1 | 120-124 | Xiaojiao |
| Risk | 1 | 1 | 125-127 | Xiaojiao |
| Relative risk | 1 | 1 | 128-132 | Stefanie |
| Odds ratio | 1 | 1 | 133-137 | Stefanie |
| **Lesson 12 - Inference about Regression** | | | | |
| Correlation to $R^2$ | 1 | 1 | 138-142 | Stefanie |
| Interpreting *r* | 1 | 1 | 143-147 | Andrea |
| Interpreting scatterplot | 1 | 1 | 148-151 | Andrea |
| Simple linear regression- general | 1 | 1 | 152-156 | Andrea |
| Simple linear regression- interpreting | 1 | 1 | 157-161 | Mengzhao |
| Cautions | 1 | 1 | 162-165 | Mengzhao |
| Interpreting $R^2$ | 1 | 1 | 166-169 | Mengzhao |
| **Questions that Overlap Lessons** | | | | |
| Choosing the correct hypothesis test | 3 | 3 | 170-184 | 1 pt each |
| **Open-ended Questions** | | | | |
| Given output explain the results | 2 | 4 | 185-186 | 2 pts each |
| **Total # of questions** | **40** | **42** | | |

STAT 200 Mid-Term II

1. TheoryInterpretation 1 (1.0 point)
The 95% confidence interval for the mean height of all World Campus STAT 200 students is 66.914 inches to 67.633 inches. If all other factors are held constant, how would the width of the interval change if you constructed a 99% confidence interval?

a. The width would decrease (i.e., it would be more narrow).
b. The width would not change.
*c. The width would increase (i.e., it would be wider).

General Feedback:
If the interval width increases, there is a greater probability that it may contain the true population parameter, hence increasing confidence. Additionally, the statistical multiplier values increase as the confidence level increases, thereby increasing the margin of error and the width of the confidence interval.

2. TheoryInterpretation 4 (1.0 point)
Which of the following statements regarding the t distribution is true?

a. The total area under a t-distribution with 10 degrees of freedom is greater than the area under the standard normal curve (i.e., z distribution).
*b. The t-distribution with 10 degrees of freedom is flatter and the tails are higher than the standard normal curve (i.e., z distribution).
c. The t-distribution with 10 degrees of freedom more closely resembles the standard normal curve (i.e., z distribution) than the t-distribution with 50 degrees of freedom.

General Feedback:
The t-distribution becomes taller and narrower as df increases. When the

# Item Analysis - Mid-Term

## _Midterm II Item Analysis Report

75 Minutes - One Attempt

Reports > Item Analysis

**Assessment Response Summary**

| | |
|---|---|
| Assigned: | 42 |
| In Progress: | 0 / .00% |
| Completed: | 34 / 80.95% |
| Average completion time: | 63 minutes |
| Reliability | ? |
| Average question difficulty | 76.80% |

**Display Options**

- ☐ Show all question text
- ☐ Show all answer option text
- ☑ Show Question Set text

Display response data: As Delivered

| Question | Type | Points | Sample Size | Mean | Difficulty | Discrm. | Std. Dev. | Std. Error |
|---|---|---|---|---|---|---|---|---|
| **Question Set**: CI General Theory (view)() | | | | | | | | |
| 1: TheoryInterpretation 1 (view)(regrade) | Multiple Choice | 1 | 6 | 0.7 | 66.7% | .1 | .471 | .192 |
| 2: TheoryInterpretation 4 (view)(regrade) | Multiple Choice | 1 | 9 | 0.6 | 55.6% | .78 | .497 | .166 |
| 3: TheoryInterpretation 6 (view)(regrade) | Multiple Choice | 1 | 3 | 0.7 | 66.7% | .96 | .471 | .272 |
| 4: TheoryInterpretation 7 (view)(regrade) | Multiple Choice | 1 | 8 | 0.8 | 75% | .23 | .433 | .153 |
| 5: TheoryInterpretation 8 (view)(regrade) | Multiple Choice | 1 | 8 | 0.8 | 75% | .84 | .433 | .153 |
| **Question Set**: Interpretation of CI (view)() | | | | | | | | |
| 6: Interpretation of CI 1 (view)(regrade) | Multiple Choice | 1 | 9 | 1 | 100% | ? | ? | ? |
| 7: Interpretation of CI 2 (view)(regrade) | Multiple Choice | 1 | 12 | 0.8 | 75% | .31 | .433 | .125 |
| 8: Interpretation of CI 3 (view)(regrade) | Multiple Choice | 1 | 2 | 1 | 100% | ? | ? | ? |
| 9: Interpretation of CI 4 (view)(regrade) | Multiple Choice | 1 | 5 | 0.6 | 60% | .47 | .490 | .219 |
| 10: Interpretation of CI 5 (view)(regrade) | Multiple Choice | 1 | 6 | 1 | 100% | ? | ? | ? |
| **Question Set**: Statistics versus Parameter (view)() | | | | | | | | |
| 11: Statistics vs Parame (view)(regrade) | Multiple Choice | 1 | 13 | 0.5 | 46.2% | .46 | .499 | .138 |
| 12: Statistics vs Parame 2 (view)(regrade) | Multiple Choice | 1 | 11 | 1 | 100% | ? | ? | ? |
| 13: Statistics vs Parame (view)(regrade) | Multiple Choice | 1 | 5 | 0.2 | 20% | -.8 | .400 | .179 |
| 14: Statistics vs Parame 5 (view)(regrade) | Multiple Choice | 1 | 5 | 0.4 | 40% | -.68 | .490 | .219 |
| **Question Set**: Computing SE of x-bar (view)() | | | | | | | | |
| 15: Standard Error of xb (view)(regrade) | Multiple Choice | 1 | 8 | 0.9 | 87.5% | .47 | .331 | .117 |

# Questions? / Contact Information

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