CollegeBoard AP®

SYLLABUS DEVELOPMENT GUIDE

AP® Statistics

The guide contains the following sections and information:

Curricular Requirements

The curricular requirements are the core elements of the course. A syllabus must provide explicit evidence of each requirement based on the required evidence statement(s). The Unit Guides and the "Instructional Approaches" section of the *AP® Statistics Course and Exam Description* (CED) may be useful in providing evidence for satisfying these curricular requirements.

Required Evidence

These statements describe the type of evidence and level of detail required in the syllabus to demonstrate how the curricular requirement is met in the course.

Note: Curricular requirements may have more than one required evidence statement. Each statement must be addressed to fulfill the requirement.

Clarifying Terms

These statements define terms in the Syllabus Development Guide that may have multiple meanings.

Samples of Evidence

For each curricular requirement, three separate samples of evidence are provided. These samples provide either verbatim evidence or descriptions of what acceptable evidence could look like in a syllabus.

Curricular Requirements

CR1	The students and teacher have access to a college-level statistics textbook, in print or electronic format.	*See page:* 3
CR2	The course provides opportunities for students to interpret standard computer output and use graphing calculators with statistical capabilities to describe data, determine probabilities, and perform tests.	*See page:* 4
CR3	The course is structured to incorporate the big ideas and required content outlined in each of the units described in the AP Course and Exam Description (CED).	*See page:* 5
CR4	The course provides opportunities for students to develop the course skills related to Skill Category 1: Selecting Statistical Methods.	*See page:* 7
CR5	The course provides opportunities for students to develop the course skills related to Skill Category 2: Data Analysis.	*See page:* 8
CR6	The course provides opportunities for students to develop the course skills related to Skill Category 3: Using Probability and Simulation.	*See page:* 9
CR7	The course provides opportunities for students to develop the course skills related to Inference and Skill Category 4: Statistical Argumentation.	*See page:* 10

Curricular Requirement 1

The students and teacher have access to a college-level statistics textbook, in print or electronic format.

Required Evidence

- ☐ The syllabus must list the title, author, and publication date of a college-level introductory statistics textbook.

Samples of Evidence

1. The Primary Text: *The Practice of Statistics,* 6th edition, by Starnes and Tabor. 2018.

2. Online Text: *OpenIntro Statistics*, 4th edition, by Diez, Cetinkaya-Rundel, and Barr. 2019.

3. Bock, D. E., Paul F. Velleman, and Richard D. DeVeaux. *Stats: Modeling the World*. Pearson. 2014.

Curricular Requirement 2

The course provides opportunities for students to interpret standard computer output and use graphing calculators with statistical capabilities to describe data, determine probabilities, and perform tests.

Required Evidence

- ☐ The syllabus must include a description of one or more classroom activities, projects, or problem sets in which students interpret standard computer output to describe data, determine probabilities, or perform tests.

  AND

- ☐ The syllabus must include a description of one or more classroom activities, projects, or problem sets in which students use graphing calculators to describe data, determine probabilities, or perform tests.

Clarifying Terms

Standard computer output: statistical results either generated by students using tools such as Fathom™, JMP®, Minitab®, R, StatCrunch™, or provided to students in printed form

Samples of Evidence

1. All students have access to a handheld graphing calculator. Students use the calculator regularly throughout the year to construct plots, calculate probabilities, find the least squares regression line, construct confidence intervals, and perform tests of significance. The textbook presents computer output that students are required to understand in order to answer the homework questions.

2. Students will use the graphing calculator and computer-generated output for statistical analysis throughout the course. Additionally, students will be assigned a comprehensive statistical project in which they prepare a formal written report using available software to generate graphs and display the software output of inferential computations.

3. There are homework assignments where students will use graphing calculators to perform statistical analysis. Students will use spreadsheets to produce and interpret standard statistical output in class projects.

Curricular Requirement 3

The course is structured to incorporate the big ideas and required content outlined in each of the units described in the AP Course and Exam Description (CED).

Required Evidence

- ☐ The syllabus must include an outline of course content by unit title or topic using any organizational approach with the associated big idea(s) to demonstrate the inclusion of required course content. All three big ideas must be included: Variation and Distribution (VAR), Patterns and Uncertainty (UNC), and Data-Based Predictions, Decisions, and Conclusions (DAT).

Note: If the syllabus demonstrates a different approach than the unit outline in the AP Course and Exam Description (CED), the teacher must indicate where the content and big ideas of each unit in the CED will be taught.

Samples of Evidence

1. The syllabus includes a list of the following units listed in the AP Course and Exam Description (CED):
   - Unit 1: Exploring One-Variable Data (VAR, UNC)
   - Unit 2: Exploring Two-Variable Data (VAR, UNC, DAT)
   - Unit 3: Collecting Data (VAR, DAT)
   - Unit 4: Probability, Random Variables, and Probability Distributions (VAR, UNC)
   - Unit 5: Sampling Distributions (VAR, UNC)
   - Unit 6: Inference for Categorical Data: Proportions (VAR, UNC, DAT)
   - Unit 7: Inference for Quantitative Data: Means (VAR, UNC, DAT)
   - Unit 8: Inference for Categorical Data: Chi-Square (VAR, DAT)
   - Unit 9: Inference for Quantitative Data: Slopes (VAR, UNC, DAT)

2. The syllabus presents an approach that teaches collecting data first and finishing inference for categorical data before teaching inference for quantitative data.

   Chapters:
   - Sampling and Experimental Design (Unit 3 – big ideas [BIs] VAR, DAT)
   - Exploring Univariate Data (Unit 1 – BIs VAR, UNC)
   - Exploring Bivariate Data (Unit 2 – BIs VAR, UNC, DAT)
   - Probability, Random Variables, and Probability Distributions (Unit 4—Bls VAR, UNC)
   - Sampling Distributions (Unit 5—Bls VAR, UNC)
   - Confidence Intervals for Proportions and Means (Unit 6, Unit 7 – BIs VAR, UNC, DAT)
   - Significance Test for Proportions and Means (Unit 6, Unit 7 – BIs VAR, UNC, DAT)
   - Significance Test for Categorical Data: Chi-Square (Unit 8 – BIs VAR, DAT)
   - Inference for Regression: Slopes (Unit 9 – BIs VAR, UNC, DAT)

3. The syllabus presents an approach that reorganizes one-sample inference by confidence interval or significance test and creates a separate unit for two-sample inference methods.
    - VAR/UNC: Exploring One-Variable Data (Unit 1)
    - VAR/DAT: Collecting Data (Unit 3)
    - VAR/UNC: Probability, Random Variables, and Probability Distributions (Unit 4)
    - VAR/UNC: Sampling Distributions (Unit 5)
    - VAR/UNC/DAT: Confidence Intervals for a Single Proportion or Mean (Unit 6, Unit 7)
    - VAR/UNC/DAT: Significance Tests About a Single Proportion or Mean (Unit 6, Unit 7)
    - VAR/UNC/DAT: Two Sample Inference Methods (Unit 5, Unit 6, and Unit 7)
    - VAR/UNC/DAT: Exploring Two-Variable Data (Unit 2)
    - VAR/UNC/DAT: Inference for Two-Variable Data: Slopes (Unit 9)
    - VAR/DAT: Inference for Categorical Data—Chi-Square (Unit 8)

Curricular Requirement 4

The course provides opportunities for students to develop the course skills related to Skill Category 1: Selecting Statistical Methods, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- ☐ The syllabus must include a brief description of one or more classroom activities, projects, or problem sets in which students describe an appropriate method for gathering and representing data (Skill 1.C).
- ☐ The activities, projects, or problem sets must be labeled so that the corresponding skill and big idea(s) are evident.

Samples of Evidence

1. The syllabus includes a comprehensive project or series of projects where students: (a) clearly define the variables of interest, identify potential confounding variables, and plan the experimental procedure (1.B and 1.C); (b) conduct appropriate statistical analysis including descriptive statistics (1.C) and/or significance testing (1.E and 1.F). This addresses big ideas VAR, UNC, and DAT.

2. Students will describe an appropriate method for gathering data through an observational study or survey and will describe an appropriate sampling method for gathering and representing data (1.C). This addresses the big ideas of variation and distribution, and data-based predictions, decisions, and conclusions.

3. In order to address the big ideas of VAR, UNC, and DAT, students will be given a problem statement and asked to describe how best to collect data (1.C). After collecting data, students in groups will determine what inferential procedures are appropriate for the data (1.E) and whether the conditions for inference are met (4.C).

Curricular Requirement 5

The course provides opportunities for students to develop the course skills related to Skill Category 2: Data Analysis, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- ☐ The syllabus must include a brief description of one or more classroom activities, projects, or problem sets in which students do one or more of the following:
  - describe data presented numerically or graphically (Skill 2.A)
  - construct numerical or graphical representations of distributions (Skill 2.B)
  - calculate summary statistics, relative positions of points within a distribution, correlation, and predicted response (Skill 2.C)
  - compare distributions or relative positions of points within a distribution (Skill 2.D)
- ☐ The activities, projects, or problem sets must be labeled so that the corresponding skill(s) and big idea(s) are evident.

Samples of Evidence

1. The course will include a comprehensive statistical project for which students will complete a formal written report that will include appropriate graphical representations of data collected for the project (VAR: 2.A and 2.B) and the calculation of appropriate numerical measures of the center and spread of the collected data (VAR: 2.C).

2. Students collect data from their class, such as how many states and provinces they have visited. They are asked to calculate the five-number summary and construct a boxplot. They are then asked to construct a histogram and a stem leaf plot. Students discuss with a partner the benefits of each type of graphical display. This activity addresses skills 2.A, 2.B, 2.C, 2.D and big ideas VAR and UNC.

3. Students are given a set of histograms and a set of summary statistics. Students must match the appropriate summary statistics to the histograms. This provides practice for skill 2.D and big ideas of variation and distribution, and patterns and uncertainty.

Curricular Requirement 6

The course provides opportunities for students to develop the course skills related to Skill Category 3: Using Probability and Simulation, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- ☐ The syllabus must include a brief description of one or more classroom activities, projects, or problem sets in which students do one or more of the following:
  - Determine relative frequencies, proportions, or probabilities using simulation or calculations (Skill 3.A)
  - Determine parameters for probability distributions (Skill 3.B)
  - Describe probability distributions (Skill 3.C)
- ☐ The activities, projects, or problem sets must be labeled so that the corresponding skill(s) and big idea(s) are evident.

Samples of Evidence

1. Students are given a two-way table and asked to calculate conditional probabilities (Skill 3.A/UNC).

2. In one assignment or activity, students study outcomes of chance events by constructing relative frequency histograms of simulated experiments with discrete random variables (3.A/UNC). In another assignment or activity, students compute probabilities using the normal distribution (3.B, 3.C/VAR, UNC).

3. The class conducts the Coke®/Pepsi® taste test activity from AP Central to introduce significance tests. Students use dice to simulate the distribution of the number of correct identifications based on random guessing. This simulation is then used to estimate the probability of obtaining the class result if the guesses were purely random. This activity addresses Skill 3.A and the big ideas variation and distribution, and patterns and uncertainty.

Curricular Requirement 7

The course provides opportunities for students to develop the course skills related to Inference and Skill Category 4: Statistical Argumentation, as outlined in the AP Course and Exam Description (CED).

Required Evidence

- ☐ The syllabus must include a brief description of one or more classroom activities, projects, or problem sets in which students perform and interpret statistical inference to justify conclusions using one of the following procedures and all corresponding skills:
  - confidence intervals (Skills 1.D, 3.D, 4.A, 4.B, 4.C, and 4.D)
  - significance tests (Skills 1.E, 1.F, 3.E, 4.A, 4.B, 4.C, and 4.E)
- ☐ The activities, projects, or problem sets must be labeled so that the corresponding skills and big idea(s) are evident.

Samples of Evidence

1. The class is asked which brand has a higher proportion of yellow candy: Skittles® or M&M's®? The class agrees on an alternative hypothesis (1.F) and then finds the proportion of yellow candies in each sample. They identify the correct test for their hypothesis and verify the conditions (1.E, 4.C). They carry out the test (3.E) and present their conclusion (4.A, 4.B, 4.E). The big ideas of VAR, UNC and DAT are used.

2. In a project or class activity, students are required to collect bivariate quantitative data. To test if there is a linear relationship between the variables, they must recognize that they should conduct a *t*-test on the slope and write hypotheses (1.E, 1.F, 4.C, VAR, UNC). They need to check that conditions are met and if so, carry out the test (3.E, VAR, UNC). Using the results of the significance test, they must make an appropriate conclusion (4.A, 4.B, 4.E, DAT). Students will explain their findings in an oral presentation or a written report.

3. In a classroom activity, students are given data on the lengths of brook trout obtained from two local rivers. They must identify the appropriate method of confidence interval (1.D), check that the conditions are met and construct the interval (3.D, 4.C). Using the interval, they must support or refute the claim that there is no statistically significant difference between the fish in the two rivers (4.A, 4.B, 4.D). All three big ideas (VAR, UNC, and DAT) are addressed.