Diversity and Inclusion Objectives

1. Create an inclusive and respectful classroom environment where all students feel like they belong and where student discussions, opinions, and ideas are valued and appreciated.
2. Establish communication expectations and encourage open and honest dialogue so that students can understand the ideas of others and experience both similarities and differences between one another.
3. Design and implement student-centered assessments that provide opportunities for students to express their learning in different manners and modalities.
4. Create and structure assignments that recognize issues of diversity and inclusion and include a variety of problems in different contexts and settings.
5. Use systematic methods for grading activities, assignments, and exams and for promoting effective classroom participation.
6. Make appropriate and sensitive statements when discussing data-analysis results that involve gender, race, and ethnicity.
7. Demonstrate equity, inclusion, and unbiasedness when assigning numerical codes to indicator variables associated with gender, race, and ethnicity.

Student learning objectives

Upon completion of this unit, students should be able to

1. Formulate a multiple regression model that includes one binary categorical predictor and one quantitative predictor.
2. Describe the advantages of fitting one regression equation rather than separate regression equations – one for each level of the qualitative predictor.
3. Properly code a binary categorical predictor variable so that it can incorporated into a multiple regression model.
4. Figure out the effect of using different coding schemes.
5. Interpret the regression coefficients of a linear regression model that contains a binary categorical predictor.

Introduction (10 minutes)

- Provide an overview of the lesson and of the concepts and skills students need to attain the learning objectives stated in the lesson.
- Present a quick review of linear regression topics covered in previous lessons, including:
  - Assumptions of multiple linear regression.
  - Formal statement of a multiple regression model.

  - Main components of a multiple regression model (e.g., response variable, predictor variables, regression parameters, and error term).

- Remind students of R commands that will be used in the lesson, including:
  - dim( ) and head( ) – used to describe datasets.
  - ggplot( ) – used to create data visualizations and graphics.
  - lm( ) – used to fit linear models.

Explicit Instruction and Guided Practice/Interactive Modeling (20 minutes)

- Distribute a copy of the *Activity 3 for Statistics* handout to the students.
- Go over the Overview, Salaries Dataset, Example 1, and Example 2 sections of the handout by using an interactive-lecturing whole-class discussion approach.
- While you present this material, make an intentional effort to include the whole class in the discussion.
- Ask deliberate questions to give students the opportunity to demonstrate their prior knowledge of the subject and how it applies to the current material.
- As you workout Example 1 and Example 2, explain how to create the dummy variable for the variable *sex* and how to set up the regression model. Ask students about the interpretation of the regression parameters. They should be able to explain the meaning of the regression parameters based on what they have learned about regression so far in the course.
- When explaining how to code a binary categorical variable, tell students that the standard approach is to use the values 0 and 1. Explain, for instance, that a gender dummy variable can be created with the value 1 for males and 0 for females, or the other way around. Emphasize that the decision to who to assign the value 0 (or, the value 1) is arbitrary. Tell the students that they will have the opportunity to verify the subjective and arbitrary nature of the coding approach when they complete Activity 1, Activity 2, and Activity 3 towards the end of the class.
- After running the R lm (linear model) function in Examples 1 and 2, have students interpret the output of the regression fit.
- Finally, explain the procedures students have to follow in completing the in-class activities (Activity 1, Activity 2, and Activity 3 in the *Activity 3 for Statistics* handout). Quickly go over the instructions to complete these activities and ask the students if they have questions about them.

Activity (25 minutes and at home portion)

- Have students work independently in the completion of Activity 1, Activity 2, and Activity 3 during the next 25 minutes.

- In each of the three activities, the students are required to use R to recode the variable *sex* as specified and to fit a model by using the R lm( ) function. Tell the students to run the appropriate R commands with their computers to accomplish this task.
- While students are completing the activities, the instructor should walk around the classroom monitoring students' work, clarifying instructions, giving additional directions if needed, encouraging participation, and intervening when necessary to help students correct misconceptions.

Assessment (2 minutes)

- Right after the students complete the in-class activities, distribute a handout that contains a set of homework exercises intended to assess student knowledge of the topics covered in the lesson.
- Explain to the students that this assignment will be collected at the following class meeting, right at the beginning of the class.

Review and closing (3 minutes)

- Utilize the last 5 minutes of the class period to bring the lesson to a closure. Recall and summarize the major points of the lesson, and answer questions students may have.

Teaching notes

This lesson requires the use of technology. The calculations necessary to fit the regression models discussed in the lesson are so tedious and time-consuming that, if performed manually, students' understanding would be impaired. Although all the calculations and graphics in the lesson were performed with R statistical software program, an instructor could easily adjust the lesson, if he/she decided to use a different program.

References

1. Bart, M. (2016). Diversity and Inclusion in the College Classroom | Faculty Focus Special Report. Retrieved from http://provost.tufts.edu/celt/files/Diversity-and-Inclusion-Report.pdf
2. Camm, J. D., Cochran, J. J., Fry, M. J., Ohlmann, J. W., Anderson, D. R., Sweeney, D. J., & Williams, T. A. (2017). Essentials of Business Analytics. Boston, MA: Cengage Learning.
3. Anderson, D. R., Sweeney, D. J., Williams, T. A., Camm, J. D., & Cochran, J. J. (2014). Statistics for Business and Economics. Boston, MA: Cengage Learning.