## Work Problems Chapter 11

As in Chapter 10, the work problems for this chapter will focus more on interpreting data rather than calculating statistics. The data for these problems were collected from two cohorts of high school students over four semesters. At the beginning of the study, one cohort of students were in their first semester of 9th grade, and the other cohort were in their first semester of 11th grade. Students in both cohorts completed surveys four times over a 2-year period (fall and spring of each year), giving us data from the beginning of 9th grade to the end of 10th grade for the first cohort and from the beginning of 11th grade to the end of 12th grade for the second cohort.

One of the things I asked students about was their perceptions of how much their teachers cared about students really learning and understanding the material they were being taught. We called this a Mastery Emphasis. Research has shown that many indicators of student motivation decline during the course of a school year (e.g., interest in school tends to be higher in the fall semester than it is in the spring semester). Research also has found that as students get older their interest in school tends to decline. I wanted to see if these within-year and across-grade declines could be found in students' perceptions of how much their teachers cared about them learning and understanding the material. So I calculated a repeated-measures ANOVA with four points of data collection as the within-subjects factor and two cohorts as the between-subjects factor. The results of my SPSS analyses are presented in Table 11.7. Please answer the following questions using the information presented in this table.

## Table 11.7: SPSS Output for Repeated Measures ANOVA for Work Problems

| | Grade | Mean | Std. Deviation | N |
|---|---|---|---|---|
| Mastery Emphasis, Fall, Year 1 | 9 | 3.67 | .65 | 301 |
| | 11 | 3.52 | .80 | 253 |
| | Total | 3.60 | .73 | 554 |
| Mastery Emphasis, Spring, Year 1 | 9 | 3.41 | .80 | 301 |
| | 11 | 3.49 | .79 | 253 |
| | Total | 3.45 | .80 | 554 |
| Mastery Emphasis, Fall, Year 2 | 10 | 3.58 | .73 | 301 |
| | 12 | 3.55 | .75 | 253 |
| | Total | 3.57 | .74 | 554 |
| Mastery Emphasis, Spring, Year 2 | 10 | 3.38 | .81 | 301 |
| | 12 | 3.29 | .86 | 253 |
| | Total | 3.34 | .83 | 554 |

**Tests for Between-Subjects Effects**

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Intercept | 26751.461 | 1 | 26751.461 | 19257.280 | .000 | .972 |
| Grade level | 1.164 | 1 | 1.164 | .838 | .360 | .002 |
| Error | 766.817 | 552 | 1.389 | | | |

**Tests involving Within-Subjects Effects**

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Mastery Emphasis | 23.454 | 3 | 7.818 | 23.254 | .000 | .040 |
| Mastery Emphasis * Grade Level | 3.828 | 3 | 1.276 | 3.796 | .010 | .007 |
| Error (Mastery Emphasis) | 556.738 | 1656 | .336 | | | |

1. How many of the participants in this study were in 9th grade and how many were in 11th grade in the first year of the study?

   ***n* = 301 and *n* = 253 for 11th graders in the first year of the study. This information is provided in the first part of Table 11.7.**

2. The main effect for Grade level is *not* statistically significant. What does that mean, exactly?

   **This tells us that, when the four time data collection time points are combined, there is no difference between the populations of the two cohorts that these samples represent (9th and 11th graders in Year 1, 10th and 12th graders in Year 2) in their average perceptions of a Mastery Emphasis in their classrooms.**

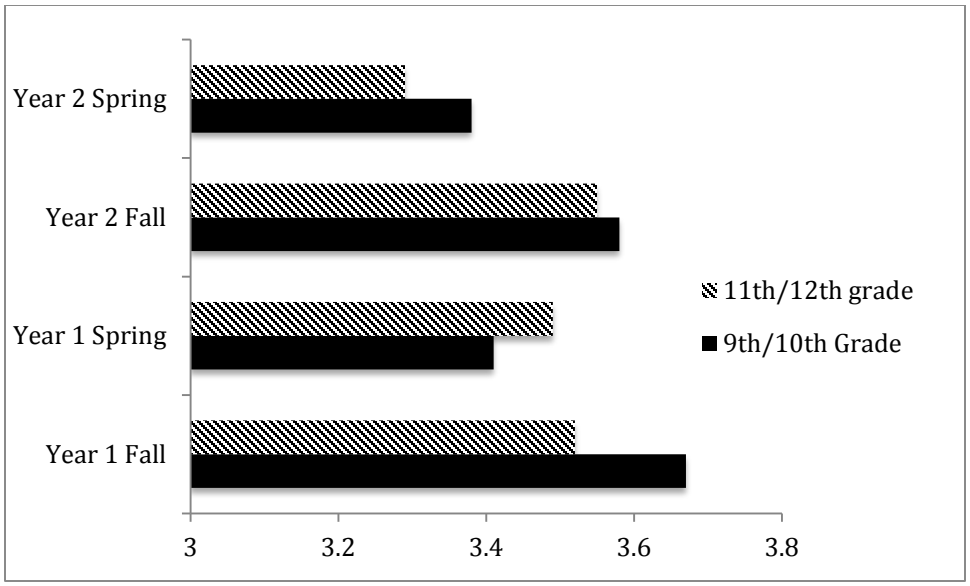
3. What is the effect size for the within-subjects effect for Mastery Emphasis?

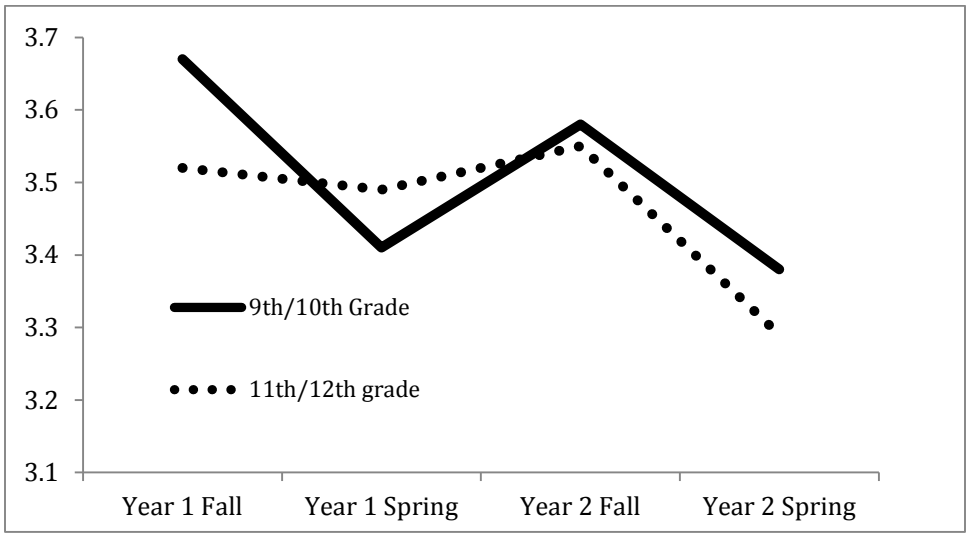
   **Looking in the bottom portion of Table 11.7, we can see that the partial eta squared for the within-subjects effect of Mastery Emphasis is .040. This tells us that 4% of the total variance in perceptions of a Mastery Emphasis in the classroom is explained by changes in these perceptions across the four time points of data collection.**

4. Is the interaction between Mastery Emphasis and Grade Level statistically significant? What does this interaction tell you?

   **Looking in the bottom portion of Table 11.7, we can see that the *F* value for this interaction is statistically significant ($F_{(3, 1656)} = 3.796$, $p = .010$). This tells us that the changes in perceptions of the Mastery Emphasis over the four time points of data collection were significantly different depending on the grade level of the students.**

5. Create two graphs of the means, first a column graph and then a line graph. Be sure to include all four time points for each of the grade levels.




6. Using the information from the graphs that you created and the statistics about the main effects and the interaction effects, write a summary statement about what you now know about how students perceptions of the their teachers' emphasis on Mastery (i.e., learning and understanding) change over a 2-year period during high school, and how those changes are similar or different for early and later grade levels in high school.

   **From the statistics and the graphs (particularly the line graph), we can see that the pattern of means for the 11$^{th}$12$^{th}$ grade cohort was flat for the first three time periods, but then dropped sharply from Time 3 to Time 4. In contrast, the pattern for the 9$^{th}$/10$^{th}$ grade cohort indicated a decline in perceived Mastery Emphasis from the fall semester to the spring semester in both years. These different patterns caused the statistically significant interaction effect but no significant main effect**

**for grade level. The general decline over time for both cohorts, but especially the $11^{th}/12^{th}$ grade cohort, produced the main within-subjects effect for Mastery Emphasis (i.e., Time).**