

EDRM 611 Applied Statistical Method I
Department of Graduate Psychology and Counseling
School of Education
Final Examination, Summer 2016
Friday, July 1, 2016
3 hours

Instruction: This examination consists of 2 parts. Part 1 consists of 6 research scenarios. Part 2 consists of 2 questions.

Part I
Research Scenarios

Direction: This part consists of 6 research scenarios. For each scenario, indicate the appropriate analysis strategy (statistical technique) and explain why you believe you have chosen the correct analysis strategy.

1. Mr. Barnes, a psychology professor, wanted to determine the factors that may be related to the psychological well-being of romantically-involved college students. For this study, he administered a battery of tests to three sections of General Psychology in a large mid-western university. The battery of tests were designed to measure shyness, romantic relationship quality, attachment anxiety, and attachment avoidance. His sample consisted of 336 females and 62 males.

Answer: The first scenario suggests a regression test analyses because it presents one dependent variable (the psychological well-being of romantically-involved college students) and several independent variables shyness, romantic relationship quality, and attachment avoidance.

2. Andrew believes that the movie *Scream 2* is scarier than the original *Scream*. To test his hypothesis, he recruited 20 college students and randomly assign them to watch either *Scream* (n=10) or *Scream 2* (n=10). A heart monitor was attached to each person while they watched the movie. Heart rates were recorded every 2 minutes. The average heart rate for each person was used as a measure of fear (being scared).

Answer: The second scenario suggests an analyses following the independent sample T test. The reasons: 1. the variances of the dependent variable in the two population are equal, 2. The data are independent (scores are not related each other), and

3. The dependent variable is expected to be normally distributed within each population.

At the end, I have 2 randomly assigned groups and I am comparing heart rates among the 20 college students to see who is more scared.

3. Mr. Hayward, Head of the Department of Mathematics, at AAA University was interested in knowing how well a particular cohort of Mathematics Majors did during Fall Semester, 2012. AAA being a large university, there were 178 students in this particular cohort. He wanted to know their demographic background (gender, ethnicity, socio-economic status, type of high school they graduated from (private, public) and family (single parent, two-parent). He was also interested to know how well they did in Calculus, College Physics, College Chemistry, English Composition and Religion 1.

Answer: The scenario three above shows a different perspective and/or analyses.

It does not suggest any type of comparison among the variables (differences, relationships, and/or prediction/explain). Based in this analyses, it suggests a descriptive statistic (frequencies, mean and standard deviation).

4. Kim was interested in factors that may influence life satisfaction among older women who live alone. For this study, he recruited 275 women over the age of 65 who live alone. He asked each person to complete a battery of tests measuring perceived health status, self-esteem, depression, and life satisfaction. He also asked each participant to indicate their monthly allowance.

Answer: This scenario four also suggests I have to run a multiple regression analyses. Multiple regression attempts to predict a normal dependent variable coming from a combination of many normally distributed and independent variable. So, in this case I have the dependent variable as the life satisfaction among older women who live alone, and several independent variables: perceived health status, self-esteem, depression, and life satisfaction.

5. In a study, Ahn and Song were interested in determining the effect of *Tai Chi* exercise on the quality of life in patients with Type 2 Diabetes. For the study, they recruited 60 diabetic patients. At the beginning of the study, each person was asked to complete a Quality of Life Inventory. Thereafter, each person participated in one hour of Tai Chi exercise per session, twice a week for 16 weeks. At the end of the 16 weeks, participants were asked to complete the Quality of Life Inventory again.

Answer: The scenario five suggest I run a paired sample T test. Some assumptions I can relate to this test is that the dependent variable is normally distributed in the two conditions of the analyses. So, in the scenario I will compare their original scores with the scores after the intervention.

6. Suppose I am teaching three statistics classes and I want to test the hypothesis that teaching methods affect student achievement. In one class, I use the *Punish* Method (I wandered around with a large cane and beat anyone who asked silly questions or got questions wrong). In the 2nd class, I use the *Reward* Method (I encourage students to discuss things that they find difficult and to give anyone working hard a bar of chocolate). In the 3rd class, I use the *Indifferent* Method (I am indifferent and neither punish nor reward student's effort). At the end of eight weeks, I administer a midterm examination.

Answer: The last scenario, number six, suggests I run an "Anova Test to see which class performed higher on their midterm exam. ANOVA is a statistical method used to compare the means of two or more levels/groups. So one-way ANOVA is when we have one factor with at least two levels, and the levels are independent.

Part II SPSS Outputs

Direction: This section consists of three research scenarios with accompanying data analysis (outputs). For each output, report and interpret the analysis. Be sure to use supporting evidence (including effect sizes) in your reporting and interpretation. You DO NOT need to create tables. However, you should reference the appropriate tables in the SPSS outputs in your reports.

1. Mr. Ernst and her team of researchers investigated daily dietary intake of calcium among a cross section of 113 healthy women ages 20-88. The researchers formed 4 as groups as follows: 1 (20-45.9), 2 (46-55.9), 3 (56-65.9) and 4 (66 and older). Calcium from food intake was measured in mg/day. Test the hypothesis that the daily dietary calcium across the four age groups are similar. Let $\alpha=0.05$. Her analysis is found in **OUTPUT 1**. In your report and interpretation, include all relevant summary tables.

Table 1
Descriptive Statistics

Groups	N	M	SD
20-45.9	22	1448.36	629.13
46-55.9	14	992.64	627.26
56-65.9	29	873.83	304.74
66 and older	48	851.73	385.91
Total	113	991.02	508.48

Table 1 shows that the 20-45.9 group ($M=1448.36$, $SD=629.13$) is numerically higher for the group 46-55.9 ($M=992.64$, $SD=627.27$), the group 56-65.9 ($M=873.83$, $SD=304.74$), and the group 66 and older ($M=851.73$, $SD=385.91$).

Table 2
ANOVA

Groups	SS	df	MS	F	P	ES
Between Groups	5931208.04	3	1977069.35	9.36	0.000	.205
Within Groups	23026499.92	109	211252.29			
Total	28957707.96	112				

Table 2 shows that the ANOVA is significant ($F_{(3, 112)}=9.36$, $p<0.001$) which means that there are significant differences between the groups. The effect size is small ($ES=.21$). This is not homogeneity between the groups ($F_{(3, 109)}=4.31$, $p=0.007$). This means that we will use the Games Howell for further analysis.

Table 3.
Post Hoc

Groups	M	2	3	4
1. 20-45.9	1448.36		*	*
2. 46-55.9	992.64			
3. 56-65.9	873.83			
4. 66 and older	851.73			

*p<0.01

Table 3 shows that the calcium from food intake in women that were 20 to 45.9 (M=1448.36) was significantly (p<0.01) higher than the women that were 56-65.9 (M=873.83) years old. The calcium from food intake in women that were 20 to 45.9 (M=1448.36) was significantly (p<0.01) higher than the women that were 66 and older (M=851.73).

Overall the women that were between the ages of 20-45.9 had higher levels of calcium than all other groups.

- Mr. Miller observed that Christian secondary schools in his country has had dwindling enrollments during the past several years. He suspected that commitment to Christian education may be to blame. He embarked on a study to examine commitment to Christian education and the factors that may account for such commitment. He developed an Attitude toward Christian Education Questionnaire and administered it so a cross-section of parents of school-age children who were affiliated with the Lutherans, Baptists, Methodists, Baptists and Catholics churches. His questionnaire was designed to measure parents' perception of Christian schools with respect to the following: academic excellence, school community relations, spiritual environment, quality of instructional staff, financing Christian education, affordability of Christian education, safe and learning environment, knowledge and awareness of Christian education, and commitment to Christian education. His analysis is found in **OUTPUT 2**. Report Mr. Miller's analysis, result and interpretation. Include all relevant summary tables.

Table 4
Descriptive and Multiple Regression Table

Variables	N	M	SD	2	3	4	5	6	7	8	9
1 Commitment to Christian Education	389	4.25	.52	.55*	.55*	.63*	.62*	.48*	.01	.61*	.64*
2 Academic Excellence	389	3.70	.57		.60*	.54*	.65*	.37*	.14*	.51*	.50*
3 School Community Relations	389	3.81	.64			.63*	.66*	.30*	.04	.49*	.53*
4 Spiritual Environment	389	4.36	.59				.65*	.45*	.02	.55*	.48*
5 Quality of instructional staff	389	3.95	.68					.44*	.04	.61*	.55*
6 Financing Christian Education	389	4.06	.62						-.01	.43*	.41*
7 Affordability	389	3.17	.82							.02	-.10*
8 Safe Learning environment	389	3.88	.61								.49*
9 Knowledge and Awareness of Christian Education	389	3.94	.67								

*p<0.05

Table 4 shows the commitment to Christian education has a mean of 4.25 (SD=.52), the mean for academic excellence is 3.70 (SD=.57), the mean for school community relations is 3.81 (SD=.64), the mean for spiritual environment is 4.36 (SD=.59), the mean for quality of instructional staff is 3.95 (SD=.68), the mean for financing Christian education is 4.06 (SD=.62), the mean for affordability is 3.17 (SD=.82), the mean for safe learning environment is 3.88 (SD=.61), the mean for knowledge and awareness of Christian education is 3.94 (SD=.67).

The variables that are most correlate to commitment to Christian education are spiritual environment (r=.63, p<0.05), quality of instructional staff (r=.62, p<0.05), safe learning environment (r=.61, p<0.05) and knowledge and awareness of Christian education (r=.64, p<0.05). The full model is significant ($F_{(8, 388)}=73.29$, p<0.001, $R^2=.607$). About 60.7 % of the

variance in commitment and Christian education can be explained by linear combination of the predictors.

The most influential and significant predictors are Knowledge and Awareness of Christian Education (B=.30, p<0.001), spiritual environment (B=.22, p<.001), safe learning environment (B=.20, p<0.001), Financing Christian Education (B=.11, p=0.006).

The other predictors are not significant; therefore, I am going to run a restrict model.

Table 5
Full Model

Model	b	SE	B	t	p
Constant	.88	.16			
2 Academic Excellence	.06	.04	.06	1.29	.198
3 School Community Relations	.03	.04	.04	.81	.418
4 Spiritual Environment	.20	.04	.22	4.68	.000
5 Quality of instructional staff	.06	.04	.08	1.45	.149
6 Financing Christian Education	.09	.03	.11	2.76	.006
7 Affordability	.01	.02	.02	.598	.550
8 Safe Learning environment	.17	.04	.20	4.49	.000
9 Knowledge and Awareness of Christian Education	.23	.03	.30	7.11	.000

$F_{(8, 388)}=73.29, p<0.001, R^2=.607$

Model Equation:

$$Y = .88 + .06(x_2) + .03(x_3) + .20(x_4) + .06(x_5) + .09(x_6) + .01(x_7) + .17(x_8) + .23(x_9)$$

- x2 Academic Excellence
- x3 School Community Relations
- x4 Spiritual Environment
- x5 Quality of instructional staff
- x6 Financing Christian Education
- x7 Affordability
- x8 Safe Learning environment
- x9 Knowledge and Awareness of Christian Education

Table 6
Restricted Model

Model	b	SE	B	t	p
Constant	.97	.15			
4 Spiritual Environment	.25	.04	.29	6.89	.000
6 Financing Christian Education	.09	.03	.11	2.90	.004
8 Safe Learning environment	.20	.04	.23	5.58	.000
9 Knowledge and Awareness of Christian Education	.27	.03	.34	8.68	.000

$F_{(4, 391)}=141.36, p<0.001, R^2=.594$

Model Equation:

$$Y=.97+.25(x4)+.09(x6)+.20(x8)+.27(x9)$$

x4 Spiritual Environment
 x6 Financing Christian Education
 x8 Safe Learning environment
 x9 Knowledge and Awareness of Christian Education

The restricted model is statistically significant ($F_{(4, 391)}=141.36, p<0.001, R^2=.594$). When I removed the non-significant variables the variance only decreased by 1.3%. About 59.4% of the variance of commitment to Christian education can be explained by spiritual environment ($B=.29, p<.001$), financing Christian education ($B=.11, p=0.004$), Safe Learning environment ($B=.23, p<0.001$), and Knowledge and Awareness of Christian Education ($B=.34, p<0.001$). We can conclude that the commitment to Christian education is most influenced by Knowledge and Awareness of Christian Education, Spiritual environment, the Safe Learning environment, and Financing Christian Education which are important factors.