



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF MECHANICAL ENGINEERING

EMM 406: RESEARCH METHODOLOGY

DATE: Tuesday 10th April, 2012

TIME: 11.00 a.m. – 1.00 p.m.

INSTRUCTIONS

Question ONE is compulsory.

Answer any other TWO questions

Question one (30 marks)

Read the following extract submitted by a graduate student and answer the questions that follow.

Title: The Effects of using Computer as a Tool in Teaching Selected Topics in High School Physics

This study investigated the relative effects of using computers as a tool in teaching selected topics in Physics. It also looked into the relationship between the attitude of students who used the computers as a tool and their achievement in the subject.

The following hypotheses were put forward:

- 1) Students exposed to computers as a tool in learning Physics scored higher in the posttest than the students in the control group.

- 2) Students who have favorable attitude toward using computers as tools in physics will *a) achieve higher in physics* and *b) have more favorable attitudes toward physics, than students with less favorable attitudes.*
- 3) These variables are positively correlated with one another: *a) attitude toward Physics, b) attitude toward use of computer, and c) achievement in Physics.*

How the experiment was done?

Sixty senior high school students from the two sections of a High School in University X were matched according to average grade and physics grade during the first grading. The teaching period lasted for two weeks.

Students in the Experimental Group were taught with six IBM microcomputer units which were used in presenting/introducing selected topics on Waves, Light, and Sound.

In the control group, the students were taught with other kinds of teaching aids such as slides and transparencies. The researcher taught both groups. An achievement test and an attitude inventory toward physics and computer use were administered as pretest and posttest to the students. The groups' scores on these instruments were then compared. The t-test and Pearson correlation technique were applied to the data.

The experimental group scored significantly higher than the control group in the pretest. However, no significant difference was found in the two groups' posttest scores on the achievement test, not even after applying analysis of covariance, using the pretest score as a covariate. Neither did the groups differ in their mean grade scores over the 2-week teaching period. The experimental group had a more positive attitude toward computers than the control group.

The control group showed a consistently higher score on attitude toward physics than the experimental group, but the difference was not significant.

The correlation between attitude toward physics and achievement as measured by the test was close to zero.

Required

- i) Explain the significance of this study (3 marks)
- ii) What is (are) the dependent and the independent variables? (3 marks)
- iii) What variables were controlled? (2 marks)
- iv) What strategy was used to control the effects of the initial non-comparability of the groups? (4 marks)
- v) Explain which design was used in the study. (3 marks)
- vi) What factors might have affected the internal validity of the study? (3 marks)
- vii) What explanations might be put forward for the non-significant differences? (4 marks)
- viii) Explain the test statistic(s) that was used in testing hypothesis 2). (3 marks)
- ix) If you were to do the study, what modifications in design and procedure would you apply in order to improve internal and external validity of the study? (5 marks)

Question two (20 marks)

- a) Describe the classical experimental design for both natural social researches. (5 marks)
- b) I design an experiment to investigate the relationship between viewing violence and committing violent acts. I randomly assign a group of children to watch an adult get angry at a doll. The adults hit and kick the doll repeatedly, shouting things like "Sock him in the nose," "Kick him in the leg." A different group of children (also chosen via random assignment) doesn't get to watch the doll beating. Then I give all of the kids a really frustrating task. I observe how they treat a doll in the testing room. I count the number of times the kids hit the doll. The ones who watched the adult hit the doll are more likely to hit the doll themselves.
 - i) Propose a hypothesis for the experiment. (2 marks)
 - ii) What is the mediating variable and explain how to test its effect in this experiment?

- iii) How would you operationally define the treatment and control groups (3 marks)
- iv) What's my operational definition of "viewing violence"? (4 marks)
- v) Can I conclude that viewing violence causes violent actions? Why or why not? (2 marks)
- (4 marks)

Question three (20 marks)

a) In an investigation of pain sensitivity, a researcher asks subjects to immerse their arms in ice water for 60 seconds. He records (1) number of seconds to the initial report on pain; (2) rating of pain following 20 minutes of immersion; (3) rank order subjects based on the number of seconds to the first report on pain; and (4) whether subjects did or did not report pain by 10 seconds following immersion. Explain of these four measurement rules, which is the most clearly ratio, interval, ordinal and nominal?

(8 marks)

b) Supposing Researcher X wishes to do a study on the health conditions of a poverty group. The topic is so general or so broad that he decides to narrow it down to something manageable and workable. He starts defining the major concepts which are health conditions and poverty group.

He defines health conditions to include both physical and mental well-being, Poverty group is made up of families considering the poverty helpline for a family of six in a certain year. He then specifies the issues or concerns of his study which he limited to the number of family members who had been ill many times in the past year. He also includes in his concerns what the family members usually eat, as well as, their work and recreational activities since they have direct effect on the health of the person.

For area coverage, he specifies that the study should be confined to the Kiambu county. The respondents will be the head of the family and the study should be completed within a year. The data that will be gathered are quantitative in nature.

To facilitate his task of defining his research problem, Researcher X is advised to read literature, both foreign and local, on health and on poverty groups, with a special focus on the specific concerns of his study. He should also visit the families and have knowledge about them,

through observations and random interviews. He may also get inputs from members of organizations which have projects for the poor.

Finally, Researcher X is advised to be resourceful in looking for other means that will help him/her refine further and make more explicit his research problem.

Required:

- i) Identify the possible research title of the aforementioned research situation. (2 marks)
- ii) State the general purpose of your study. (2 marks)
- iii) Give one specific problem that pertains to the characteristics or attributes of the respondents. (2 marks)
- iv) Give another specific problem that shows the relationship between the respondents attributes and their health conditions? (2 marks)
- v) Who are the respondents? How are you going to select them? (3 marks)
- vi) How will you gather the data? What type of data will you get? (4 marks)
- vii) What key terms are you going to define? How will you define each? (4 marks)

Question four (20 marks)

- a) Discuss the appropriate criteria for selecting statistical tests (5 marks)
- b) You are working in an engineering organization that has branches throughout the country. The managing Director is mindful of the fact that managers of the branches need to talk over common problems on a regular basis. That is why there have always been monthly meetings. However, she is becoming increasingly concerned that these meetings are not cost-effective. Too many managers see them as an unwelcome intrusion. They feel that their time would be better spent pursuing their principal job objectives. Other managers see it as a 'day off': an opportunity to recharge the batteries. She has asked you to carry out some research on the cost-effectiveness of the monthly meetings. You have defined the research question you are seeking to answer as 'what are the managers' opinions of the value of their monthly meetings? Your principal data collection method will be a questionnaire to all managers who attend the monthly meetings.

Required

- i) Discuss to what extent is the use of the questionnaire effective in this case especially when one is keen to triangulate these findings. (5 marks)
- ii) How might you ensure that your instrument has:
 - 1) Inter-rater reliability (3 marks)
 - 2) Content validity (3 marks)
- ii) What type of questions would be appropriate in construction the questionnaire and why. (4 Marks)

Question five (20 marks)

After reading a government report, about the increase in road accidents, the ministry of roads and public works what to understand why there is an increase in road accidents among teenage drivers. Assume you are the managing director of a research firm and you have been approached to conduct this research.

- i) Identify the type of research this is and why? (2 marks)
- ii) Indicate the significance of this study (3 marks)
- iii) Outline three assumptions you would make in this study (3 marks)
- iv) Explain three key approaches you would follow when doing the critical review of the literature for this study (6 marks)
- v) Explain whether you would use the theoretical framework or conceptual framework in this study and why. (6 marks)