

California State University, San Bernardino
Doctor of Education in Educational Leadership Program
College of Education
EDUC 700
Course Syllabus

Course: EDUC 700 Scientific Inquiry

Instructors:

Office & Office Hours:

Office Contact for:

Office Contact for:

Time/days/location:

The College of Education of California State University, San Bernardino (CSUSB) is dedicated to the development and support of wise, reflective professional educators who will work toward a just and diverse society that embraces democratic principles. The reflective educator:

- ❖ Possesses rich subject matter knowledge.
- ❖ Uses sound pedagogical judgment.
- ❖ Has practical knowledge of context and culture.
- ❖ Acknowledges the relativism associated with variations in the values and priorities of both their peers and their students.
- ❖ Is comfortable with the uncertainty of the outcomes of instructional decisions.

(College of Education *Conceptual Framework*, 2000)

Catalog Description

EDUC 700: Scientific Inquiry - Overview of basic tools and methods required for scientific inquiry. Guided practice in the critical review of current educational literature, hypothesis development, and design of basic quantitative and qualitative methods. Content coverage to include research designs, sampling techniques, data collection strategies, basic psychometrics, descriptive and inferential statistics, and ethical treatment of research participants. (4 units)

Program Objectives and Student Learning Outcomes Addressed by This Course

The following list is extracted from the full list of student learning outcomes and identifies those particular to this course, identifies the course learning objectives and identifies the leadership core concept to which the student learning outcomes are aligned.

Students Will Become:

I. Designers and users of quantitative research to effectuate reform and increase student achievement.

- a. Who understand the relationship and relationship and relevance of various theories of knowledge to the study and application of research methodologies in education.
- b. Who understand the differences between quantitative and qualitative design and how epistemological perspectives are reflected in those research methodologies.
- c. Who understand how theoretical paradigms and perspectives are reflected in those research methodologies.
- e. Who understand frequency distributions and their meaning.
- f. Who understand contingency tables and how to test variable relationships.
- g. Who understand the concept of reliability and validity.
- h. Who understand central tendency, variability, standard normal distributions, and likelihood of getting an exact mean.
- i. Who understand the concept of effect size in evaluation studies and how to calculate them on SPSS.
- j. Who understand the conception of hypothesis testing, the null hypothesis, the concepts of Type I and Type II errors, t-test, analysis of variance (ANOVA), and procedures for running t-tests and AVOVA on SPSS or similar programs.
- k. Who understand the ideas of predicting one variable from another (correlation/regression) and explanatory power versus reliability of finds when interpreting correlations and regression.

Activities are Aligned with Student Learning Outcomes to Achieve the Course Objectives.

Students will engage in and be evaluated through the following activities:

1. Course Assignments.
2. Seminar Participation
3. Examinations.

Objectives: By the end of the course, students will be able to:

1. Search and use the scientific literature to answer and pose research questions.
2. Write testable, scientific hypotheses.
3. Develop methodology capable of producing defensible results.
4. Explain the difference among true experimental designs, quasi-experimental designs, and other non experimental designs.
5. Describe threats to valid inference, as well as employ methods to avoid these threats.
6. Identify scales of measurement given variable descriptions.
7. Evaluate the reliability and validity of inferences based upon common types of educational testing.
8. Compute and explain basic descriptive statistics.

9. Develop a basic plan of statistical analysis given a simple hypothesis.
10. Write a basic research proposal.

Purpose and Course Design. This is the first of a sequence of courses designed to enable you to become an empirically-based practitioner. “Empirically-based” simply implies that, when possible, decisions you make in the field are grounded upon scientific observation of data. Part of what makes any profession a “science” is that questions are answered and problems addressed not just by intuition, logic, or personal experience, but rather by systematic observation of actual events and behaviors. Policy then can be justified as “best practice” based upon results of research. As a general rule, and across most situations, data beats intuition.

Does this mean you have to write a grant and conduct research before you can make a decision? That would not be practical. The first bit of good news, however, is that many competent scientists already have completed incredible volumes of research, dealing with almost every educational topic and problem imaginable! Most likely, you already subscribe to professional journals, and you already have begun your task of absorbing trends, models, and theories relevant to your field of practice. But, the obligation to be “up-to-date” is somewhat daunting, research articles can be terribly confusing, and – perhaps worst of all – you probably have noticed that sometimes results of different studies are inconsistent or downright conflicting (often depending on who sponsored the research!). Nevertheless, one of the factors that should distinguish a doctoral-level practitioner from a non-doctoral practitioner should be their sophistication in the use of the professional literature. One of the goals of this sequence of courses will be to enable you to read scientific literature with an evaluative eye, judging its relevance to your own problems and circumstances.

And part of what makes one capable of evaluating research is to have participated in the activity oneself. Learning by doing is hard to beat! By completing the process of developing a literature-based proposal, stating testable hypotheses, finding and/or designing adequate measures, collecting the data, analyzing the data, and forming subsequent conclusions about the relevance of the results to theory and practice, you will become more capable of evaluating the practice and conclusions of others. Much of the task comes down to learning new vocabulary. Nevertheless, once words are learned, the concepts are relatively simple.

The other reason to learn how to conduct research is that you will want to do your own. Whether or not you publish is not the most important issue. Whether or not you are capable of using data to evaluate and influence the success of your organization is. The literature will not provide direct, conclusive answers to all of the unique problems and circumstances you face. Also, incredible amounts of data already are collected in every educational organization, and much of this is made public. Others will be more than happy to tell you what this data means. Your credibility may depend in part on your ability to analyze and interpret the data independently. Good data is often badly misinterpreted.

And you will still use logic, intuition, and good old common sense! But you may notice that your “common sense” starts to become grounded by what has been learned scientifically. When you need to make a quick decision, you may discover that it is consistent with a theoretical model that has years of empirical support. Judgments based only upon one’s own life experience can be flighty and easily influenced by the latest trend or an influential speaker. Long-term policies built upon data-based principles enable consistency and stability necessary for institutional success. The confidence you will need to practice at the level to which you aspire will not come just from the fact that they will call you “Dr.” That confidence will come from your ability to make decisions that are more than “good guesses.”

This course specifically will take you through the process of using the literature, stating interesting, testable hypotheses (fancy word for “questions”), and developing a research methodology for testing those hypotheses. Aspects of the research methodology will include treatment of subjects, principles of measurement, and matching the design and measures to appropriate statistical tests. While basic statistics will be reviewed, and students will be introduced (re-introduced) to SPSS, numbers-crunching will NOT be a large part of this course. The end product of this class will be a proposal. A proposal does not include actual numerical results – only an analytic plan. Skills needed to produce the results section and subsequent discussion will be the focus of additional courses to follow in this sequence.

Readings. (Additional readings listed in course schedule)

Slavin, R.E. (2007). **Educational Research in an Age of Accountability.** Allyn & Bacon.

Written in a very clear and user-friendly style, this text focuses on understanding the intent of the researcher, the procedures, and the results so that students can use appropriate research findings to inform school change. This text emphasizes how responses to the accountability movement in schools can be focused around using and understanding scientific inquiry. It balances quantitative and qualitative research methodology and discusses action research and mixed methods in detail.

Principles for conducting research and criteria for evaluating its overall credibility are presented in a concise manner. Students are shown how to analyze and evaluate research, and judge the usefulness of the findings for educational practice. In addition, students are shown how this knowledge can translate to their own classrooms.

Gerber, S.B. & Finn, K. V. (2005). *Using SPSS for Windows, 2nd ed.* Springer. The second edition of this popular guide demonstrates the process of entering and analyzing data using the latest version of SPSS (12.0), and is also appropriate for those using earlier versions of SPSS. The book is easy to follow because all procedures are outlined in a step-by-step format designed for the novice user. Students are introduced to the rationale of statistical tests and detailed explanations of results are given through clearly annotated examples of SPSS output. Topics covered range from descriptive

statistics through multiple regression analysis. In addition, this guide includes topics not typically covered in other books such as probability theory, interaction effects in analysis of variance, factor analysis, and scale reliability. This book can be used in two ways: as a stand-alone manual for students wishing to learn data analysis techniques using SPSS for Windows, or in research and statistics courses to be used with a basic statistics text. The book provides hands-on experience with actual data sets, helps students choose appropriate statistical tests, illustrates the meaning of results, and provides exercises to be completed for further practice or as homework assignments.

Evaluation. Half of the quarter grade will be based upon two in-class exams, a mid-term and a final. These will be equally weighted (each worth 25 of the quarter grade). Exams will be short essay. For each exam, 12 questions will be asked, of which the student will answer 10 (I always believe in a couple of degrees of freedom!). Items will be equally weighted (each worth 10% of the exam grade). The exams will be graded on a curve. The difference between the top score and 100% will be added to every exam score.

The remaining 50% of the quarter grade will be based on the evaluation of the course project, a research proposal. Because the focus of this course is using and doing research, each student will submit a plan for a research project. The sequence of the course is designed to follow the sections of a research proposal. Also, throughout the quarter, critical pieces or draft sections of the project will be due to the instructor for review and feedback. This should help ensure the successful completion of a quality project. The instructor will assign a percentage score to the project based on the grading scale given above. The final quarter grade will be based 25% on the midterm exam, 25% on the final exam, and 50% on the quality of the research proposal.

Midterm Exam – 25%
 Final Exam – 25%
 Research Proposal – 50%

The grading scale for the exams and the course will be:

93+ -----A	80-82 -----B-	67-69 -----D+
90-92 -----A-	77-79 -----C+	63-69 -----D
87-89 -----B+	73-76 -----C	60-62 -----D-
		<60 -----F

Schedule of Topics and Assignments. With the exception of the first session, all reading assignments should be completed before each class.

Week 1 – Introduction and Overview. (Slavin, Chapter 1). Review of Literature Search Procedures, Anatomy of a Research Paper, Description of Project. (Slavin, Chapter 15)

Week 2 – Data, Research & Accountability. (Slavin, Chapter 1). Randomized (True) Experimental Designs. (Slavin, Chapter 2). Quasi-Experimental Designs. (Slavin, Chapter 3).

Week 3 – Other Non-Experimental Designs: Time Series (Slavin, Chapter 4), Correlational Designs (Slavin, Chapter 5), and Survey Research (Slavin, Chapter 6).

*Hotgraves, T. (2004). Social desirability and self-reports: Testing models of socially desirable responding. *Personality and Social Psychology Bulletin*, 30, 161-172.

Preliminary Bibliography for Proposal Due

Week 4 – Qualitative Research (Slavin, Chapters 7, 8, & 9).

*Ercikan, K. Roth, W. M. (2006). What good is polarizing research into qualitative and quantitative? *Educational Researcher*, 35, 14-23.

Draft Hypotheses for Proposal Due

Week 5 – Review, Discussion, & **Mid-term Exam**.

Week 6 – Threats to Validity (Slavin, Chapter 10).

*Gosling, S.D., Vazire, S., Srivastava, S., & John, O.P. (2004). Should we trust web-based studies? *American Psychologist*, 59, 93-104.

Week 7 – Measurement/Psychometrics (Slavin, Chapter 11).

*American Psychological Association. FAQ/Finding information about psychological tests. www.apa.org/science/faq-findtests.html

Week 8 – Planning and Implementing the Study (Slavin, Chapter 12).

*Wampold, B.E. (2006). Designing a Research Study. In F. T. L. Leong & J.T. Austin (EDS.), *The psychology research handbook* (p.93-103). Thousand Oaks, CA: Sage.

Draft of Methods Section for Proposal Due

Week 9 – Descriptive Statistics, Basic Inferential Statistics (Slavin, Chapter 13) (Gerber & Finn, Chapters 2-4).

*Smith, P.C., Budzeika, K.A., Edwards, N.A., Johnson, S.M., & Barse, L.N. (1986). Guidelines for clean data: Detection of common mistakes. *Journal of Applied Psychology*, 71, 457-460.

Week 10 – Basic Inferential Statistics, cont. Matching Design, Measures, and Hypotheses to Statistical Analyses (Slavin, Chapter 14) (Gerber & Finn, Chapters 10-12).

*Wilkinson, L., & Statistical Task Force on Statistical Inference (1999). Statistical methods in psychology journals: Guidelines and explanations. *American Psychologist*, 54, 594-604.

Draft of Statistical Analysis Plan Due by End of the Class Period
Week 11 – **Final Exam**

Final Draft of Research Proposal Due.