



EDLD 6040: Advanced Applied Quantitative Methods (3 units)
CALIFORNIA STATE UNIVERSITY, BAKERSFIELD
Doctoral Program in Educational Leadership
Spring 2026
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Office hours: Monday & Tuesday 10 am – noon, Thursday, 1-2 pm; or by appointment

Office Location: Education Building 234

Class Meeting & Location: Saturdays 9:00 am - 3:00 pm; EDUC 128

Mission of the School of Social Sciences and Education

Mission

CSUB Educator Preparation Programs cultivate school, university, and community partnerships that prepare highly qualified education professionals, who work collaboratively to nurture an equitable and informed education community.

Vision

The CSUB Educator Preparation Programs will be the nexus of a network of ethical educational leaders who promote student growth and improve the quality of life in their communities.

Theme

“Expanding minds. Engaging hearts. Enhancing communities.”

Candidate Dispositions

Candidates preparing to work in schools as teachers or other professional school personnel know and demonstrate the content, pedagogical, and professional knowledge, skills, and dispositions necessary to help all students learn.

- **Professional Collaboration:** Candidates will participate in action-oriented collaboration that will enable them to learn from others and provide leadership in partnerships with all stakeholders.
- **Reflective Practitioner:** Candidates are reflective, life-long learners who apply problem solving and critical thinking strategies and the respectful appreciation of differing points of view.
- **Ethical Professional:** Candidates’ actions are based on accepted professional standards of conduct and reflect insight and awareness with respect to diverse perspectives, opinions, obligations and ethical responsibilities of the profession.
- **Student/Client Centered:** Candidates, throughout their programs, will prioritize the needs of the students/clients they serve by maintaining trusting relationships built upon caring, nurturing (respective) and meaningful interactions.
- **Professional Leader:** Candidates, throughout their programs, will be strong, determined, professional leaders with a clear instructional focus using effective communication skills and a willingness to take risks to ensure the advancement, safety, and welfare of all students in our communities.
- **Professional Competence:** Candidates will maintain high programmatic outcomes that reflect research-based practices, principles of learning differentiation, and standards-based instruction.

Course Description

This seminar course examines advanced research methodologies and data analysis techniques applicable to education and social science settings. Topics include experimental and quasi-experimental design, advanced statistical techniques, sampling distributions, nonparametric statistics, inference and hypothesis testing. Specific applications to the work of the education leader.

AI-Enriched Course Design

Traditionally, this course relies on statistical software such as **SPSS**, valued for its user-friendly interface and effectiveness in basic quantitative data analysis. However, SPSS has limitations in supporting the full spectrum of research methodologies—particularly advanced techniques involving both structured and unstructured data. To meet the demands of dissertation research, the course now integrates script-based computing using **R** and **RStudio**, enabling mixed-method empirical studies across experimental and quasi-experimental designs. At the same time, SPSS's point-and-click interface is retained to minimize typographical errors common in script-based computing. This dual-platform approach provides access to a broader and more advanced array of statistical methods, supported by R's robust ecosystem of open-source packages.

Beyond conventional scripting, today's educational leaders must also learn to generate and refine optimized R code using Artificial Intelligence (AI) tools rather than rely on rote memorization. Multiple AI platforms—including **Microsoft Copilot**, **ChatGPT**, and **DeepSeek**—are integrated to examine their credibility and guide doctoral students through essential research processes: *selecting appropriate methods, applying statistical analyses, interpreting results, and reporting findings*.

This AI-enhanced, dual-platform design equips students with advanced quantitative and mixed-method competencies, while emphasizing sound judgment about data size, measurement scales, and sampling distributions in parametric statistics. When datasets are too small to establish a sampling distribution, nonparametric approaches are employed to support valid inference and hypothesis testing.

Altogether, this comprehensive approach cultivates doctoral researchers who are not only **skilled producers** of high-quality empirical work but also **informed consumers** of research literature—well prepared for scholarly and leadership roles in education.

Required Learning Materials and Preparations

Pre-Course Software Installation

SPSS Downloading and Installation

- Visit <https://www.csub.edu/its/support/software-downloads.shtml>
- Follow instructions as well as any necessary files needed for installation and authorization.
- If you encounter issues, please call (661) 654-HELP or visit the helpdesk downstairs in the library.

AI Account Sign-up

Get an account to access ChatGPT, MicroSoft Copilot, and DeepSeek. No clue? Google or prompt AI – “How to access DeepSeek/ChatGPT/MicroSoft Copilot?”

Download R and R Studio (If needed, here is the [Video instruction](#))

Step 1: Install R

- Go to the R Project website: <https://cran.r-project.org/>
- Click on your operating system (Windows, macOS, or Linux).
- Download the base version and install it using the default settings.

Step 2: Install RStudio

- Visit: <https://posit.co/download/rstudio-desktop/>
- Choose the free **RStudio Desktop (Open Source)** version.

- Download and install.

Download Data

- <http://www.csub.edu/~jwang/hsbdemo.csv>
- <http://www.csub.edu/~jwang/hsbdemo.xlsx>
- <http://www.csub.edu/~jwang/wide1.csv>
- <http://www.csub.edu/~jwang/CSUB1.csv>
- <http://www.csub.edu/~jwang/TextAnalytics.csv>

Reference Materials¹

UCLA SPSS-Based Teaching Materials (Videos [1](#), [2](#), [3](#), [4](#), and [5](#))

Oxford University's R Package for Qualitative Inquiries ([Ref. Link](#))

Course Student Learning Outcomes

Students will demonstrate competence in:

1. **Method Selection (Q1: When to use each method?):** Choosing appropriate methods based on research questions and data characteristics.
2. **Hands-on Application (Q2: How to use the method?):** Applying SPSS, R/RStudio, and AI tools to analyze structured and unstructured data.
3. **Findings Interpretation (Q3: How to make meaningful interpretations?)** Interpreting and reporting results from quantitative, qualitative, and mixed-methods analyses.

Together, these outcomes prepare students as **competent producers and critical consumers** of contemporary research in K-14 leadership. Access to curated R scripts enables students to customize dissertation projects with cutting-edge data analysis skills.

Content Alignment

This course is designed to introduce students to various research methods with user-friendly AI support for statistical and text analytic approaches pertinent to educational leadership. Each class meeting begins with a Q&A period to support assignment completion. Students will be able to identify various research methods, as well as the strengths and limitations of each method.

Schedule Overview

Part	Theme	Learning Activities	Assignments
1	Statistical reasoning and applied data analysis	Explore SPSS, R, and AI tools for analyzing different types of data; examine the rationale for statistical inference; replicate and interpret a chi-square (χ^2) analysis using a UCLA dataset; compare and evaluate outputs generated by SPSS and ChatGPT.	Install SPSS, R, and RStudio; access AI tools; complete Weekend 1 report.
2	Probabilistic inference and mean comparisons	Conduct one-sample, paired-sample, and independent-sample <i>t</i> tests in SPSS and compare results using AI tools to evaluate tool-specific strengths; interpret statistical significance in applied evaluation contexts.	Complete Weekend 2 report pertaining to different <i>t</i> test applications.

¹ All materials are chosen with no cost to CSUB students. This class follows an [NSF-endorsed model](#) for AI-enriched research method instruction. The latest development can be found in the [LASER curriculum](#) that has been adopted by many higher education institutions.

3	Multi-group comparisons and General Linear Model	Complete one-way and two-way ANOVA within the general linear model framework using SPSS, AI, and R; practice post hoc tests, ANCOVA correlation, and regression. AI tools are used to interpret outputs and support statistical reporting. Introduce IDB analyzer.	Conduct these parametric tests for Weekend 3 report completion
4	Restructuring data for multivariate analysis	Transpose, recode, and clean data for multivariate analysis; use CSUB's federal grant data (CSUB1 & wide1) to develop a codebook, restructure formats, and practice MANOVA; Align analytic choices with substantive questions and methodological options.	Practice CSUB1.csv and wide1.csv for Weekend4 report development
5	Effect size and model building	Review the needs for reporting practical significance; use SPSS, and AI to compute effect size; compare forward/backward/stepwise model building techniques; introduce dummy variables for regression.	Replicate results for Weekend 5 report construction
6	AI-assisted verification and result comparison	Replicate and verify statistical analyses using multiple AI tools (Microsoft Copilot and DeepSeek), building on methods learned in prior weekends; evaluate how different AI systems select statistical methods, conduct analyses, and report results.	Examine AI result credibility when developing Weekend 6 report
7	Text Analytics and Mixed-Methods Inquiry	Apply R-based text analytics to open-ended survey responses, integrating qualitative and quantitative data within a mixed-methods framework using NLP techniques (e.g., tokenization, n-grams, sentiment analysis, topic modeling, and TF-IDF with PCA).	Replicate results of text analytics for Weekend 7 reporting.
8	Non-parametric statistical methods	Learn distribution-free statistical inference in Binomial test, Wilcoxon signed-rank tests, sign tests, Mann-Whitney U test, and Kruskal-Wallis test; Use AI-generated R scripts to replicate SPSS results and validate findings.	Hands-on practice of each test for Weekend 9 reporting

*This syllabus serves as a guide to course procedures. The instructor reserves the right to adjust the pace according to student progress – It is what students learned (not how much the instructor covered) that accounts!

Grading and Evaluation

GRADING

Students are expected to accumulate and polish AI-enriched reports throughout the semester. The weights for these reports are:

- Report for Weekends 1, 2, 3, 4, 5, 7, and 8 – 15% each (90% total; **lowest score dropped**);
- Report in Weekend 6 (4/11/2026) – 10%. ²

Final Grade Scale (Total: 100 points):

A: 93–100 | A–: 90–92 | B+: 87–89 | B: 84–86 | B–: 81–83 | C+: 78–80 | C: 75–77 | C–: 72–74

Campus Resources:

- [Services for Students with Disabilities](#)
- To request academic accommodation due to a disability, please contact the Office of Services for Students with Disabilities (SSD) as soon as possible. Their office is located in SA 140, and they may be reached at 661-654-3360 (voice) or 661-654-6288 (TDD). If you have an accommodations letter from the SSD Office documenting that you have a disability, please present the letter to me during my office hours as soon as possible so we can discuss the specific accommodation that you might need in this class.

² The university expects the instructor to present three research projects at the 2026 annual meeting of the American Education Research Association in the weekend of 4/11. Since EDLD 6070 takes eight weekends, this class is essential in seven-weekend setting for the DPEL program to fill the Spring semester schedule across a total of 15 weeks.

- c. [Writing Resource Center](#): offers writing support to students from the first year to graduate in every discipline.
- d. [Library Research Help](#): Another great resource for research and ideas for your presentation.
- e. *Well-Being and Basic Needs*: During your CSUB career, you may experience challenges, including struggles with academics, finances, or your personal well-being. CSUB has a multitude of resources available to all students.
 - [Food Security](#)
 - [Emergency Housing Stability](#)
 - [Student Health Services](#)
 - [Counseling Center](#)
 - [Campus Advocate](#)