OUR MANDATE

The Centre for Research in Applied Measurement and Evaluation (CRAME) is a research-intensive centre in the Department of Educational Psychology in the Faculty of Education at the University of Alberta. The central purpose of CRAME is to conduct and promote high-quality research in the areas of educational measurement and cognitive psychology in order to make assessment an integral part of learning and instruction.

THE FACULTY

Dr. W. Todd Rogers, Professor & Director (PhD, University of Colorado at Boulder, 1971)  
Research Interests: Educational measurement and evaluation; program evaluation; research design and applied statistical methods. Email: todd.rogers@ualberta.ca

Dr. Mark J. Gierl, Associate Professor (PhD, University of Illinois at Urbana-Champaign, 1996). Research Interests: Educational and psychological measurement, focusing on differential item and bundle functioning; cognitively diagnostic assessment; unidimensional and multidimensional item response theory; test translation and adaptation. Email: mark.gierl@ualberta.ca

Dr. Jacqueline P. Leighton, Assistant Professor (PhD, University of Alberta, 1999).  
Research Interests: Educational assessment and evaluation, in particular the assessment of cognitive processes involved in reasoning and problem-solving, the development of high-level thinking tasks, construct validation, and statistics. Email: jacqueline.leighton@ualberta.ca

STUDENT FUNDING

CRAME provides financial support for its graduate students, whenever possible. Funding opportunities include research assistantships, teaching assistantships, and consulting internships. Students are also encouraged to apply for university and provincial scholarships as well as national scholarships through the Social Sciences and Humanities Research Council of Canada.

EMPLOYMENT OPPORTUNITIES

CRAME graduates have many employment opportunities. Our graduates are employed at both private and public institutions throughout the world. Moreover, all of our graduates, to-date, have found employment in the area of educational measurement and evaluation. Our graduates are employed as professors and research associates in publicly funded universities and government testing agencies (e.g., Queen's University in Kingston, Ontario; Student Evaluation Branch, Alberta Learning in Edmonton, Alberta; University of Tanzania; Student Evaluation, Government of South Africa). Our graduates are also employed at privately funded testing companies (e.g., CTB/McGraw-Hill in Monterey, California; Educational Testing Service in Princeton, New Jersey). These employment opportunities tend to be available for students at the M.Ed. (Master of Education) and Ph.D. (Doctor of Philosophy) levels, although a Ph.D. is now required for some positions.
OUR PROGRAMS

Students interested in pursuing a Master of Education (M.Ed.) degree in Measurement, Evaluation, and Cognition must complete EDPY 500 (Introduction to Statistics) or equivalent as a pre-requisite and a minimum of seven three-credit courses, including the following five: EDPY 501 (Introduction to Research Methods), 505 (Advanced Univariate Statistics), 507 (Test Theory), 508 (Item Response Theory), and 510 (Learning and Cognition). (CRAME courses are described on the following pages.) In addition, student must complete at least two three-credit courses related to their area of specialization and a thesis.

Students interested in pursuing a Doctor of Philosophy (Ph.D.) degree in Measurement, Evaluation, and Cognition must complete a minimum of seven three-credit courses including the following three: EDPY 605 (Multivariate Statistics), 608 (Doctoral Seminar in Educational Measurement), and 610 (Doctoral Seminar in Cognition and Learning). The remaining four three-credit courses are determined by the student's interests. Normally, coursework is completed by the end of Year 2. Following the completion of coursework, the student must pass an Oral Candidacy Examination and then the student must write and defend a dissertation.

CRAME COURSE SUMMARY

- EDPY 500 Introduction to Data Analysis in Educational Research
- EDPY 505 Advanced Univariate Statistics in Educational Research
- EDPY 507 Test Theory
- EDPY 508 Item Response Theory
- EDPY 605 Multivariate Statistical Methods in Educational Research
- EDPY 608 Doctoral Seminar in Educational Measurement
- EDPY 615 Program Evaluation
- EDPY 697 Special Seminars including:
  1. Generalizability Theory
  2. Factor Analysis
  3. Test Score Equating
  4. Construction and Analysis of Attitude Scales and Interest Inventories
  5. The Cognitive Analysis and Construction of Achievement Tests
  6. Standard Setting and Norming
  7. Multidimensional Item Response Theory
CRAINE COURSE DESCRIPTIONS

- **EDPY 500 Introduction to Data Analysis in Educational Research**

This course serves as the first step in the graduate-level statistics sequence in our Faculty—EDPY 505 (Advanced Univariate Statistics in Educational Research) and EDPY 605 (Multivariate Statistical Methods in Educational Research) follow. The purpose of this course is to present students with an introduction to descriptive and inferential univariate statistics commonly used in social science research. In this course, three different aspects of statistical reasoning will be emphasized: (1.) computational formulas and assumptions, (2.) computer applications, and (3.) appropriate uses of univariate statistics in educational research. A thorough understanding of the topics covered in this course will prepare students for more advanced graduate work in educational statistics.

**PREREQUISITE:** Consent of the Instructor; also note that EDPY 500 or equivalent must be completed prior to beginning a graduate program in CRAME

- **EDPY 505 Advanced Univariate Statistics in Educational Research**

This course serves as the next step in the graduate-level statistics sequence after EDPY 500: Introduction to Data Analysis in Educational Research. The purpose of this course is to present students with advanced univariate procedures. The majority of the semester will be spent on regression and analysis of variance models. Three different aspects of statistical reasoning will be examined, namely (1.) computational formulas and assumptions, (2.) computer applications, and (3.) appropriate uses of univariate statistics in social science research.

**PREREQUISITE:** EDPY 500 or Equivalent and Consent of Instructor

- **EDPY 507 Test Theory**

EDPY 507, Test Theory, is a graduate course intended for people who are using and/or constructing educational and psychological tests and/or interpreting test scores. The course is divided into two main parts. In Part A, the classical test score model for reliability and dependability is examined critically for both norm-referenced and criterion-referenced score interpretations. Modern measurement models, which arose principally because of deficiencies in the classical model, are introduced. In Part B, the concept of validity is critically examined. The tripartite model of validity is contrasted with the unified view of validity. Techniques for collecting validity evidence are introduced. Practical illustrations are presented so that those most interested in applying measurement, such as researchers, school personnel, and medical and mental health professionals will find the course a useful reference source. Following completion of the course, students should be able to understand the appropriate uses and limitations of common measures of test reliability and what constitutes allowable validity evidence. They should be able to judge published tests using the most recent revision of the Standards for Educational and Psychological Testing and the Principles for Fair Student Assessment Practices for Education in Canada. Lastly, they should have knowledge about controversies in measurement and some of the more recent developments in measurement.

**PREREQUISITE:** EDPY 500 or Equivalent and Consent of Instructor
• EDPY 508 Item Response Theory

This course focuses primarily on item response theory (IRT). In the first few classes, however, we will review classical test theory before moving into modern test theory. This course will provide a foundation for IRT by focusing on how this theory can be used to understand examinees, items, and their interactions. We will examine different IRT models, focusing on assumptions, representations, and applications. Some class time will be spent in the CRAME lab so we can use IRT software such as BILOG, MULTILOG, and TESTFACT. A thorough understanding of IRT will prepare students for theoretical and applied research in educational measurement and psychometrics since this approach represents our modern test theory.

PREREQUISITE: EDPY 507 or Equivalent and Consent of Instructor

• EDPY 605 Multivariate Statistical Methods in Educational Research

Multivariate Statistical Methods in Educational Research is a graduate course in statistical methods in educational and social science research that parallels EDPY 505. The difference between the two courses is that in EDPY 505, one dependent variable was considered. In EDPY 605, more than one dependent variable will be considered. During this course, central concepts of multivariate analysis of variance and covariance using concrete examples will be developed.

PREREQUISITE: EDPY 505 or Equivalent and Consent of Instructor

• EDPY 608 Doctoral Seminar in Educational Measurement

The topics in this course will vary each year. Please check with the instructor.

PREREQUISITE: EDPY 507 or Equivalent and Consent of Instructor

• EDPY 615 Program Evaluation

This is a course on the theoretical and practical issues in program evaluation. It is an attempt to counter the belief that program evaluation is simply applied research methodology. We will examine some of the history, achievements, and debates in program evaluation. Students will also be expected to develop a detailed, personal view on contemporary evaluation theory. Students are expected to have a background in research design (e.g., EDPY 501) and in one substantive methods area such as educational measurement (e.g., EDPY 507), experimental design and analysis (e.g., EDPY 505 or PSYCH 530), or qualitative research (e.g., EDPY 503).

PREREQUISITE: Consent of Instructor
• EDPY 697 Special Seminars including:

1. Generalizability Theory

Generalizability Theory is a graduate course intended for people who are using and/or constructing educational and psychological tests and interpreting test scores. In contrast to the classical test score model where there is one amorphous error term, Generalizability Theory allows the consideration of multiple sources of error. G theory enables the decision maker to determine how many occasions, test forms, and raters are needed for a norm-referenced score interpretation and for a criterion-referenced score interpretation. In this course, we will develop the central concepts of Generalizability Theory, using concrete examples for both interpretation systems.

PREREQUISITE: EDPY 505 and EDPY 507 or Equivalent and Consent of Instructor

2. Factor Analysis

The purpose of this course is to become knowledgeable about the various models and procedures generally considered as part of common factor analysis. It is also intended to help students gain experience in the execution of factor analysis using available computer programs and the interpretation of the results of these analyses. Attention will be given to the two principal steps in factor analysis, namely factor extraction and factor rotation/transformation. Emphasis will be placed on criteria for distinguishing a superior solution from an inferior solution.

PREREQUISITE: EDPY 505 and EDPY 507 or Equivalent and Consent of Instructor

3. Test Score Equating

Equating is a statistical process that is used to adjust scores on two or more test forms, designed and validated as measures of the same construct or domain of behavior, so that the scores on the forms can be used interchangeably. That is, given two or more "parallel" forms, equating involves transforming the system of units of one or more forms to the system of units of the remaining form so that the scores, after the transformation, are equivalent or interchangeable. Equating is necessary because it is not possible to construct multiple forms of a test that are strictly parallel. It is used to “fine-tune” the testing process. In this course, we will study both theoretical and applied issues related to equating educational and psychological tests using classical test theory and IRT approaches.

PREREQUISITE: EDPY 507 and EDPY 508 or Equivalent and Consent of Instructor

4. Construction and Analysis of Attitude Scales and Interest Inventories

The measurement of attitudes and survey methods are two commonly found processes in educational research. The goals of schooling call for the development of attitudes. Market analysis of products and procedures often involves assessing attitudes. Surveys abound not only in education, but also in process and product evaluations and, of course, in the world of politics. The purposes of this course are to develop capability in (a) the construction of attitude scales and survey questionnaires and (b) the analysis of the data obtained from these two types of instruments. This course goes together, as part of a series, with EDPY 697 - The Cognitive Analysis and Construction of Achievement Tests.

PREREQUISITE: EDPY 507 or Equivalent and Consent of Instructor
5. The Cognitive Analysis and Construction of Achievement Tests

This course will give students a general introduction to the "cognitive characteristics" of educational achievement tests by (a) drawing on both seminal and current cognitive research in reasoning and problem solving, and (b) applying this research to the analysis of test items so as to evaluate the degree to which the items measure what they are referenced to measure. In addition, students will examine how to construct items that measure specific cognitive skills and make the most of findings in cognitive psychology. Students will be expected to learn the major theories and findings in reasoning and problem solving, and be able to understand, challenge, and evaluate these findings against the assumptions and research advanced in the educational measurement literature. This course goes together, as part of a series, with EDPY 697 - The Construction and Analysis of Attitude Scales and Interest Inventories.

PREREQUISITE: EDPY 507 or Equivalent and Consent of Instructor

6. Standard Setting and Norming

Standard setting and norming is a graduate course intended for people who are using and/or constructing educational and psychological tests and/or interpreting test scores. The course is divided into two parts. In Part A, the development of norms for norm-referenced score interpretations is discussed and examined. In Part B, the development of standards for criterion-referenced score interpretation is discussed and examined. Following completion of the course, students should be able to understand the appropriate uses and limitations of norms and standards.

PREREQUISITE: EDPY 507 or Equivalent and Consent of Department

7. Multidimensional Item Response Theory

This course focuses primarily on multidimensional item response theory (MIRT). We begin, however, by reviewing basic concepts in unidimensional IRT before drawing parallels in MIRT. We will also examine some of the history in MIRT, work with MIRT software, and apply MIRT concepts to test development and differential item functioning analyses. More generally, this course will provide students with a foundation in MIRT by focusing on how this theory can be used to understand examinees, items, and their interactions in a more sophisticated and realistic manner compared to the unidimensional framework. A thorough understanding of MIRT will prepare students for theoretical and applied research in educational measurement and psychometrics.

PREREQUISITE: EDPY 508 and EDPY 697 Factor Analysis or Equivalent and Consent of Instructor

FOR MORE INFORMATION CONTACT DR. W. TODD ROGERS OR VISIT THE CRAME WEBSITE AT http://www.education.ualberta.ca/educ/psych/crame/