



Placement Test and Prerequisite Validation

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Presentation Overview

1. **Important Resource Documents**
2. **Matriculation Assessment Requirements**
 - **Good aspects of placement test validation**
 - **Research that must be done**
 - **Most typical approaches for test qualification**
3. **Multiple Measures**
4. **Examples of Validation Studies**
5. **Prerequisite Validation Requirements**
 - **Overview of prerequisites**
 - **Most typical approaches for prerequisite validation**



Resource Documents

LOCAL RESEARCH OPTIONS

1. Assessment Validation Project: Local Research Options (1991)
Note: The appendix includes a very helpful section on statistical procedures
2. Matriculation Evaluation: Monographs on Designs from the Local Research Options Design Project (1992)
3. Matriculation Evaluation: Phase III Local Research Options (1992)

These Documents are Available from the RP website (www.rpgroup.org)

- Click on "Publications"
- Click on "Special Studies"
- Click on "Matriculation – Local Research Options"

3



Resource Documents

PREREQUISITES

1. Good Practices for the Implementation of Prerequisites (1997), CA Academic Senate
2. The Model District Policy for Prerequisites, Co requisites, and Advisories on Recommended Preparation (1993) CA Academic Senate

These Documents are Available from the Academic Senate website

(<http://www.academicssenate.cc.ca.us>)

- Click on "Index"
- Scroll to article (articles are listed in alpha order)

4



Resource Documents

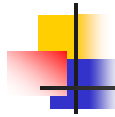
MATRICULATION AND ASSESMENT

1. Assessment Instrument Approval Status Summary (Handout)
2. Matriculation Regulations (see the Assessment Component)
3. Standards, Policies and Procedures for the Evaluation of Assessment Instruments Used in the California Community Colleges (4th Edition, Revised March, 2001)

These Documents are Available from the California Chancellor's Office website (<http://www.cccco.edu/>)

- Click on "About Us" – left side of page
- Click on "Divisions and Units" – right side of page
- Scroll down listings and click on "Student Services & Special Programs"
- Click on "Matriculation"
- Click on[Keep checking. No documents were posted yet on the redesigned web site, as of July 16, 2002]

5



Matriculation Standards: Assessment Component

- Administer assessment instruments to determine student competency in computational and language skills.
- Use assessment instruments approved by the Chancellor.
- Use assessment instruments only for the purpose for which they were developed or validated.
- Use multiple measures (other than two or more highly correlated instruments) for placement, required and appropriate referral, or subsequent evaluation.
- Use assessment instruments, methods or procedures in an advisory manner in the selection of academic courses and educational programs.
- At many colleges students can remove a "prerequisite block" by completing the approved placement test.

6



Assessment in Matriculation

- **Primary function of assessment: to “assist the student in making decisions about appropriate course level enrollment, major area of study, and vocational program choice.”**
- List of approved assessment instruments is published at least annually by the CCCCO. (See handout)
- A CO assessment advisory committee reviews the standards.
- The advisory committee reviews the applications by publishers and colleges to have their instruments placed on the approved list.

7

Page 5 of Standards



College Districts Shall Not Use:

- ...an instrument that is not on the approved list;
- ...an instrument in a manner or for a purpose other than which it was developed and validated;
- ...any single assessment by itself for placement, referral, evaluation (i.e, you need “multiple measures”);
- ...any assessment, method or procedure to exclude a student from admission to a community college.
- ...any assessment instrument to exclude a student from a course or program, except that districts may establish appropriate prerequisites.
- ...assessment to unlawfully discriminate against any person.

8



Matriculation Regulations Require

- Each college district to establish a program of institutional research for ongoing evaluation of its matriculation process to ensure compliance with the regulations.
- Part of the evaluation is to ensure that tests and procedures minimize cultural or linguistic bias and are used in an appropriate manner.
- Test publishers and colleges using “locally managed instruments” must renew approval every 6 years. They should collect renewal evidence sometime between 4th and 6th years, and submit renewal evidence during 5th year.
- Local college using second party instruments still must up-date their evidence on content-related validity, cut-score validity and disproportionate impact during the renewal period. This up-dated evidence must be kept on file for review during the matriculation on-site review.



Why Placement Test Validation is a Good Thing

- Is a good starting place for campus research
- Provides an opportunity for the researcher to work and build trust with faculty and staff
- Work in this area has identified and improved poor placement practices
- The CCC system is much more sophisticated regarding assessment and placement practices
- Placement test validation has led to many other important issues (e.g., grade variation, course articulation)

10

Individual Responsibilities in Placement Test Validation

- **Matriculation coordinator**
 - Facilitates process (schedules planning meetings, etc.)
 - Monitors the project
 - Prepares and submits application for approval to CO
 - Organizes and archives all assessment research
- **Faculty – Dept. chair, discipline experts**
 - Faculty select the candidate test
 - Complete the content validity forms
 - Distribute test, data gathering sheets to classes
 - Work with the researcher to set test cuts
 - Review preliminary and final research reports
 - Given options from the researcher, faculty decide how to integrate multiple measures into the placement decisions
- **Researcher**
 - Is the assessment expert, knows the assessment standards
 - Prepares the research report. Plays an advisory role in setting test cut and integrating multiple measures
 - Prepares binders containing all documents produced by the study
- **Administration – Dean, VP SS, President**
 - Are kept informed; Dean and VP sometimes attend planning meetings¹

Opportunities to win points in this kind of research...

- Remember that faculty are the discipline experts and, as a researcher, you are serving them.
- Doing good work in this area and working well with faculty and staff will develop respect for the research function (and you).
- Put your research reports into binders. This will help staff find reports for future reference, and the OPR team visit.
- Offer to facilitate development of a home grown placement test.

12

Types of Tests

- Second party tests on Chancellor's Office Approved list
- Locally managed second party tests (A commercial instrument not on the approved list)
- Locally developed tests
- Objective versus performance assessments

13

| Criteria | Second Party Objective Test | Locally Managed Objective Test | Second Party Performance Test | Locally Managed Performance Test |
|--------------------------------|---------------------------------------|---|---------------------------------------|--|
| Content Validity | Test Manual & Faculty Review | Faculty Review | Test Manual & Faculty Review | Narrative |
| Criterion Validity | Test Manual | Local Study | Test Manual | Local Study |
| Consequential Validity | Local Study | Local Study | Local Study | Local Study |
| Adequacy of Test Cut | Local Study (judgmental or empirical) | Local Study (judgmental or empirical) | Local Study (judgmental or empirical) | Local Study (judgmental or empirical) |
| Reliability | Test Manual | Equivalent forms, test retest, or estimation formula, SEM | Test Manual | Cross reader reliability, Cross prompt reliability |
| Test Bias | Test Manual | Local Study | Test Manual | Local Study |
| Disproportionate Impact | Local Study | Local Study | Local Study | Local Study |

14



Placement test approval application form to be sent to Chancellor's Office

- Handout
- Completed form and supporting research documents are sent to John Poggio (U. of Kansas).
- John Poggio and Doug Glasnapp review and issue preliminary report.
- Assessment Advisory Group meet with Poggio and Glasnapp to render final decision.

15



Second Party Tests – Primary Responsibility of the Test Developer

- A. Content-Validity
- B. Criterion-Related or Consequential-Related Validity
- C. Test Bias Review (cultural and linguistic review)
- D. Reliability
- E. Testing Special Groups

16



Second Party Tests - Responsibility of the Colleges

- A. **Content validity**
- B. **Criterion validity*** (* if set cut scores using an empirical approach)
- C. **Consequential validity***
- D. **Evidence on Test Bias**
- E. **Evidence to support adequacy of cut score(s)**
 - Judgmental approach
 - Empirical approach
 - Criterion-related evidence
 - Consequential-related evidence
- F. **Reliability and errors of measurement**
- G. **Disproportionate impact (every 3 years)**

17




Second Party Test – Typical Steps

- **Meet and plan the studies**
- **Do content review**
- **Administer candidate test, information form (demographics and possible multiple measures) to students**
- **Have instructors rate student ability**
- **Prepare summary tables from content analysis data**
- **Prepare tables comparing test scores to instructor ratings**
- **Conduct disproportionate impact analysis**
- **Meet with faculty to review data: possible test cuts, how to incorporate multiple measures, disproportionate impact results**
- **Organize all reports, cover letters, meeting notes, place into binder**


18

Objectively Scored Test *Developed* or *Managed* by a College

- 
- A. **Content validity**
 - B. **Criterion validity** (if empirical approach used to set cut scores)
 - C. **Evidence addressing test bias**
 - D. **Evidence to support adequacy of the cut scores**
 - A. **Judgmental approach**
 - B. **Empirical approach**
 - A. **Criterion** (test has not, as yet, been used for placement)
 - B. **Consequential** (test has been used for placement)
 - E. **Reliability and standard errors of measurement**
 - A. **Test-retest**
 - B. **Parallel forms**
 - C. **One of the common procedures** (e.g., Kuder-Richardson, Coefficient Alpha)
 - F. **Disproportionate impact**

19

Validity – Multiple choice tests

- 
- **Content** (Design 14, Exemplars page 1)
 - Do prerequisite skills match the skills tested?
 - Faculty complete a matrix.
 - ***Criterion** (Design 10, Exemplars page 12)
 - Use when candidate test has not yet been used to place students into classes.
 - Correlation between test scores and a criterion variable.
 - Criterion can be exam scores, instructor ratings, grades, etc.
 - Different designs can be used: mean difference or correlational designs.
 - Criterion is an r of at least +0.35
 - ***Consequential** (Design 15, Exemplars page 15)
 - Use when the test has already been used to place students.
 - After first two weeks of a course, students and/or instructors are asked to evaluate the appropriateness of their placement into the course.
 - Standard is at least 75% judgment of proper placement.
- * Criterion or consequential validity needed ONLY if an empirical approach has been used to establish the test cut!*

Performance Tests

Additional Considerations

■ **Validity** (Exemplars pages 10-11)– Narrative on the process used to develop prompts; the actual prompts; scoring guidelines; how scorers are trained and anchored; examples of the scoring rubrics; describe how scoring and placement process “fits” the actual course content.

■ **Reliability**

- Interrater reliability (See design 18, exemplars page 46, 49)
 - Coefficients > .70,
 - Percent agreement 90%, where agreement is within 1 point on a 6-point scale.
- Cross-prompt (equivalent-forms) reliability (See design 17)
 - Coefficients of .75 or higher


21

Fairness

- **Test Bias** – (See exemplars, page 29)
 - Diverse panel who reflect college’s student population reviews test items, prompts for bias, insensitivity, and offensiveness.
- **Disproportionate Impact** – (See design options 12, 13, exemplars - page 39)
 - Must do a study every three years.
 - Impact must not exceed EEOC guidelines.
 - Impact must be addressed by an explanatory narrative, and a plan to both monitor the situation and, if necessary, take corrective action.


22

Reliability – Multiple Choice Tests (see Exemplars, page 45)

- 
- **Test-retest**
 - **Parallel forms**
 - N of at least 50 students, time period of at least 2 weeks
 - Need coefficient of at least .75
 - **Internal consistency estimates**
 - E.g, Coefficient Alpha (Using SPSS: Analyze—>Scale—> Reliability analysis—>Alpha)
 - **Performance assessments**
 - **reliability** coefficients > .70. If percent agreement measure is used, there should be at least 90% agreement between scores, where “agreement” is within 1 point on a 6-point scale (See design option 18).
 - **Cross-prompt reliability** coefficients of .75 or higher (See design option 17).

23

Reliability



Placement tests that rely on cut scores for placement (i.e, objective tests) require:

1. A coefficient of reliability, and
2. Calculation of the Standard Error of Estimate (SEM)
 - To be provided for intervals across the score scale or at likely cut points.
 - See Exemplars, page 47)

Both measures are a way of assessing a test's reliability

24



Setting the Test Cut

- Judgmental approach (See exemplars)

- Empirical approach
 - **Criterion-related** (See design option #11)
 - Those who score above cut should have a greater expectancy of success in the course than those who score below the cut.
 - "Success" can be based upon grades, instructor ratings, midterm scores, etc.
 - **Consequential-related** (See design option #15, and exemplars)

25



Setting the Test Cut, Criterion-Related Approach (See design option #11)

| | Below Test Cut | Above Test Cut | <i>Proposed cut score of 21</i> |
|-----------------------------------|-----------------------|----------------------------|---|
| Success (A, B, C, CR) | 16.2% | 42.9% | 59.0% (Base Rate for Success) |
| Non-Success (D,F,NCr,W) | 27.1% | 13.8% | 41.0% (Base Rate for Nonsuccess) |
| | 43.3% | 56.7% (Selection Ratio) | <i>27.1% + 42.9% = 70% placed correctly</i> |


26



Qualification Criteria for Direct Performance Assessments – Second Party

- A. Content validity (narrative)
- B. Criterion or consequential validity (either)
 - Criterion validity when test has not as yet been used to place students
 - Consequential validity when test has been used to place students

27



Modifications for Qualifying or Using Computerized Tests

Content validity - Publisher must supply paper copies of sample test items. College must conduct an item-by-item review.

Cut score validity - Several teachers take CPT, each as if were a marginal student (for each course) – produces professionally derived cuts.

Criterion or Consequential validity evidence - Coefficient of .35 or higher for criterion validity. Coefficients corrected for restriction of range are acceptable.

Reliability - Test-retest, or equivalent forms, N=50 or more, 2 weeks between testings, coefficient of .75 or higher

Movement from qualified paper and pencil test to a computer version of test – qualification is not automatic; need a coefficient of .80 or higher between paper and computer versions of the test

28

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| Reliability | Test Manual | Equivalent forms, test retest, or estimation formula, SEM | Test Manual | Cross reader reliability, Cross prompt reliability |
| Test Bias | Test Manual | Local Study | Test Manual | Local Study |
| Disproportionate Impact | Local Study | Local Study | Local Study | Local Study |

29

Multiple Measures

- Title 5 - 55521(c) "Use multiple measures (other than two or more highly correlated instruments) for placement, required and appropriate referral, or subsequent evaluation."
- Design 22 – "Identifying and Incorporating Multiple Measures for Placement"
- "Multiple Criteria for Placement," in the Appendix of Assessment Validation Project Local Research Options (1991)

30



Incorporating Multiple Measures for Placement

- See Matriculation Evaluation : Phase III Local Research Options (1992)
 - Research Design Option 22 – “Identifying and Incorporating Multiple Measures for Placement”

31



Multiple Measures

- Assessment for course placement, evaluation of skills, and/or referral to special services MUST be comprised of more than one measure.
- Additional measures should not correlate closely with the test scores.
- No empirical validity studies are needed for multiple measures, but such studies make good sense. Use same designs as used to validate placement instruments.

32



Multiple Measures

- Avoid politically sensitive variables (ethnicity, age, gender).
- Use background variables related to academic performance.
- Variables that can easily be collected.
 - High school GPA
 - Years since last class
 - Hours of work planned during term
 - Self-assessment of reading, math, writing ability

33



Ways to Combine Multiple Measures

- **Non-Compensatory Cut Scores**
 - For example: Students are placed into Math 100 if they score 25 or higher on the math test AND have a high school GPA of C or above.
 - Researcher should prepare placement tables showing the number of successful placements for the decision rule adopted.

34



Ways to Combine Multiple Measures

- **Compensatory Cut Scores**

| | High School GPA | | | | |
|------------|-----------------|-----|-----|-----|-----|
| Math Score | A | B | C | D | F |
| 32-39 | In | In | In | Out | Out |
| 29-31 | In | In | Out | Out | Out |
| 21-28 | In | Out | Out | Out | Out |
| 14-20 | In | Out | Out | Out | Out |

35



Ways to Combine Multiple Measures

- **Multiple Regression and Logistics Regression**

- These statistical procedures generate a prediction formula having beta weights for each of the candidate predictor variables. Only significant predictors variables should be used in the final formula.
- Y' (predicted grade) = $.05 + .153 \times \text{essay} + .229 \times \text{objective test} + .113 \times \text{high school GPA}$
- Logistics regression is similar, but predicts success and non-success in the course.

36



Locally Developed Test - A Case Study (see handout)

- Planning and Review Meetings
- Content Review
- Test Cut
- Fairness, Bias
- Reliability
- Disproportionate Impact

37



Validating Course Prerequisites

- See Matriculation Evaluation : Phase III
Local Research Options (1992)
 - Research Design Option 23 – “Validating
Course Prerequisites”
 - Good Practices for the Implementation of
Prerequisites (1997), CA Academic Senate

38



Prerequisites...

- ...help insure that students have the necessary abilities and background to succeed in a course.
- ...can help boost student retention and success rates, maximizing use of resources.
- A relationship must be demonstrated between a course and its prerequisite before the prerequisite can be implemented.

39



Prerequisites

- Matriculation Regulations require...
 - "Prerequisite for a course shall be clearly related to course content and must be validated as being necessary for success in such course." (58106,c,2)
 - "...the validation procedure must ensure that a student who has not met the prerequisite is highly unlikely to obtain a satisfactory grade in the course" (58106,e)

40



Prerequisites

- CONTENT ANALYSIS – faculty judge whether mastery of one course is appropriate and necessary for success in another course. Faculty agree on common list of expectations for entering students. (Design 14)

41



Prerequisites

- STATISTICAL VALIDITY – empirical data evaluates the potential benefit and impact of the proposed prerequisite.

| Completed English 1A | Nonsuccess in Phil 7 | Success in Phil 7 |
|----------------------|--------------------------------|-----------------------------|
| Yes | 20% | 30% |
| No | 30% | 20% |

Base Rate=50%, Correct Predictions = 60%
Chi Sq = 4.0, $p < .05$

42



Prerequisites

- Faculty, via the Academic Senate and curriculum committee should have a documented procedure for validating prerequisites.
- The document should define “success” – is it 2 to 1 success to non-success, some statistic (e.g. $r = .35$ or higher) or what?
- The criterion for success can be course grades, midterm grades, instructor ratings of student readiness, etc.


43



Considerations: Prerequisite Validation

- Statistical significance may not mean practical significance.
- Instructors may vary in terms of grading criteria, standards, expectations.
- Not all prerequisites need to be empirically validated.
- Students must be provided other means of removing a prerequisite block:
 - Transcript from another institution
 - Alternate evidence to be judged by faculty
 - Placement test (and associated multiple measures)

44



More thoughts on prerequisites

- The research office could help by identifying courses that have low rates of success.
- Data may not support faculty claim that a prerequisite is necessary.
- Prerequisite enforcement can lead to cancelled classes.

45



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46