



## Latent Factors Underlying Items on the Instructional Assessment System (IAS)

Daniel Gemoll, Senior Statistician

From fall semester 2006 through spring semester 2008 Marquette University used Form X of the University of Washington's (Office of Educational Assessment) Instructional Assessment System (IAS). This form includes 4 generic items utilizing six-point response scales plus 23 aspect-focused items using seven-point scales. Of these 23 items, 11 cover various course/instructor characteristics like content, organization and fair assignment of grades, 7 items ask about perceived course progress, and 5 items ask about expected grades, level of challenge, and effort. Form X also includes 4 single-choice items asking specifically about perceived effort, expected grade, and relationship of course to major. Administrations in spring 2007 and fall 2007 involved 2,571 classes and 62,309 student response records.

Response data from the 27 course/instructor evaluation rating items were analyzed. Specifically, factor analyses were conducted to identify patterns of communality in correlations between all the items. These patterns are displayed as loadings on one or more foci of variance called **latent factors**. Each factor accounts for a portion or percentage of the total variance found in all the response data. These factor loadings indicate how much each individual item relates to each specific factor. Thus a good statistical solution is said to be one that contains items and factors that account for a majority of the total variance, and that are reasonably interpretable.

Analyses identified three factors in the IAS response data each of which accounted for 5% or more of the total variance. The first factor accounted for 51.0% of the total variance while the second and third factors accounted for 10.8%, and 6.1% of the total variance, respectively.

**Combined the three factors accounted for slightly more than two-thirds (67.9%) of the total variance in the data.** Slightly over half the items, including the 4 generic items, loaded on the first factor and are best interpreted as a general course/instructor factor. The 8 items that loaded on the second factor indicated it is best interpreted in terms of the impact of the course on the student. The relatively small third factor consisted of 4 items that asked about effort, intellectual challenge, and involvement.

### Loadings of Items on Latent Factors extracted from IAS data

| <b>Item</b>   | <b>Factor 1</b> | <b>Factor 2</b> | <b>Factor 3</b> |
|---|-----------------|-----------------|-----------------|
| The instructor successfully rephrased explanations to clear up confusion.                             | 0.79            | 0.30            | 0.05            |
| The instructor gave very clear explanations.  | 0.78            | 0.33            | 0.04            |
| The instructor's effectiveness in teaching the subject matter was:                                    | 0.77            | 0.38            | 0.12            |
| The instructor's contribution to the course was:  | 0.76            | 0.35            | 0.16            |
| Students were aware of what was expected of them.   | 0.75            | 0.27            | 0.05            |
| Evaluation of student performance was related to important course goals.                              | 0.74            | 0.31            | 0.08            |
| Grades were assigned fairly.  | 0.69            | 0.27            | 0.00            |
| Class sessions were well organized.   | 0.69            | 0.23            | 0.14            |
| Extra help was readily available.   | 0.67            | 0.21            | 0.11            |
| The course as a whole was:  | 0.67            | 0.49            | 0.18            |
| Meaningful feedback on tests and other work was provided.   | 0.66            | 0.27            | 0.07            |
| Class sessions were interesting and engaging.   | 0.66            | 0.42            | 0.17            |
| The course content was:   | 0.58            | 0.49            | 0.20            |
| Assigned readings and other out-of-class work were valuable.  | 0.55            | 0.31            | 0.22            |
| Student participation was encouraged.   | 0.53            | 0.26            | 0.07            |
| Describe your progress: Understanding written material in this field.                                 | 0.36            | 0.78            | 0.15            |
| Describe your progress: Understanding and solving problems in this field.                             | 0.36            | 0.77            | 0.18            |
| Describe your progress: Developing an appreciation for the field in which this course resides.        | 0.41            | 0.75            | 0.19            |
| Describe your progress: General intellectual development.   | 0.42            | 0.73            | 0.28            |
| Describe your progress: Learning the conceptual and factual knowledge of this course.                 | 0.44            | 0.73            | 0.22            |
| Describe your progress: Applying course material to real world issues or to other disciplines.        | 0.35            | 0.72            | 0.14            |
| Describe your progress: Developing an ability to express yourself in writing or orally in this field. | 0.34            | 0.72            | 0.13            |
| Relative to other courses: do you expect your grade in this course to be:                             | 0.20            | 0.40            | 0.03            |
| Relative to other courses: The amount of effort to succeed in this course was:                        | 0.05            | 0.06            | 0.92            |
| Relative to other courses: The amount of effort you put into this course was:                         | 0.09            | 0.16            | 0.91            |
| Relative to other courses: The intellectual challenge presented was:                                  | 0.18            | 0.17            | 0.77            |
| Relative to other courses: Your involvement in this course (assignments, attending, etc.) was:        | 0.09            | 0.22            | 0.75            |
| Percent of total variance accounted for by factors  | 51.0%           | 10.8%           | 6.1%            |



## **Latent Factors Underlying Items on the Marquette Online Course Evaluation System (MOCES)**

Daniel Gemoll, Senior Statistician

The Marquette Online Course Evaluation System (MOCES) measure was administered in April 2008 to students enrolled in undergraduate classes in Biological Sciences, Civil and Environmental Engineering, Journalism, and Theology classes. The instrument contained 15 quantitative course/instructor items having six-point response scales. The study involved 68 course titles, 124 sections, and 2,904 students.

Response data from the 15 course/instructor items were analyzed. Specifically, factor analyses were conducted to identify patterns of communality in correlations between all the items. These patterns are displayed as loadings on one or more foci of variance called **latent factors**. Each factor accounts for a portion or percentage of the total variance found in all the response data. These factor loadings indicate how much each individual item relates to each specific factor. Thus a good statistical solution is said to be one that contains items and factors that account for a majority of the total variance, and that are reasonably interpretable.

Analyses identified two factors within the MOCES response data each of which accounted for 5% or more of the total variance. The first factor accounted for 61.7% of the total variance while the second, much smaller, factor accounted for only 6.3% of total variance. **Combined, the two factors accounted for more than two-thirds (68.0%) of the total variance.** A majority of the items loaded appreciably on the first factor hence that factor seems best interpreted as a **general course/instructor factor**. The six items that loaded appreciably on the second factor suggest it is best interpreted in terms of the **impact of the course on the student**.

**Loadings of Items on Latent Factors extracted from MOCES data**

| <b>Item</b>  | <b>Factor 1</b> | <b>Factor 2</b> |
|--|-----------------|-----------------|
| How effective was this instructor in this class?                                     | 0.80            | 0.44            |
| How was the instructor's contribution to this class?                                 | 0.80            | 0.41            |
| This instructor provided explanations that reduced confusion.                        | 0.76            | 0.41            |
| Expectations of students were presented clearly.                                     | 0.69            | 0.37            |
| The instructor was interesting.  | 0.68            | 0.43            |
| This instructor was well organized.  | 0.67            | 0.36            |
| Evaluations of course work were consistent with class learning objectives.           | 0.61            | 0.44            |
| Assistance and/or extra help were available outside of class time.                   | 0.58            | 0.30            |
| This instructor encouraged student participation.                                    | 0.50            | 0.31            |
| How was the content of this class?   | 0.52            | 0.65            |
| How was this class as a whole?   | 0.61            | 0.64            |
| This class positively impacted my problem solving abilities in this subject.         | 0.35            | 0.81            |
| This class positively impacted my comprehension of written material in this subject. | 0.43            | 0.73            |
| This class positively impacted my ability to communicate orally and/or in writing.   | 0.34            | 0.67            |
| This class was intellectually challenging.   | 0.35            | 0.53            |
|  |                 |                 |
| Percent of total variance accounted for by factors                                   | 61.7%           | 6.3%            |