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ABSTRACT

This study illustrates how a factor analysis of a well-designed student-rating instrument can increase its utility. Factor analysis of a student-rating instrument was used to reveal constructs that would explain student attrition in science, mathematics, and engineering majors. The Instructional Development and Effectiveness Assessment (IDEA) instrument is used to rate college courses in science or mathematics at Kansas State University. It is used to gather students' reactions to instructors, personal progress, and courses, as well as students' attitudes, and to obtain an overall rating. Subjects for the factor analysis were 141 upperclass students (56.7 percent male). The factor analysis reveals constructs about which students in science and mathematics have expressed concern. Of seven identified factors, the first three, interpreted as instructor presentation skills, student perception of personal progress, and student-teacher interaction, are particularly important in distinguishing instructor presentation from the personal aspects of course takers. Three tables present analysis results. (Contains 23 references.) (SLD)

Factor Analysis of the IDEA Student Rating Instrument for Introductory College Science and Mathematics Courses

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Most students attend college to prepare for a career. Most have already chosen majors and have a good idea of what professional field they expect to enter. However, of the students who initially choose science, mathematics, or engineering majors, over 40 percent graduate with a major in a nonscience field (Tobias, 1990). Students switch from science, mathematics, and engineering majors at a much higher rate than from any other major. At a time when careers requiring science and technology expertise are increasing, this loss of talent to the field has become critical. Approaches to increasing student interest and persistence in preparation for science related careers have come from several fronts. Most solutions are aimed at restructuring curriculum and instruction in elementary and secondary schools. However necessary these changes may be, addressing the problem at the college level could more quickly show results. One approach is to assess college science and mathematics curriculum and instruction to discern problems which would deter students from their career goals. Confronting and resolving problems at the college level would have an almost immediate effect on the numbers of college graduates in science, mathematics, and engineering.

If college instruction is a contributor to the decline in the number of science, mathematics, and engineering majors, a direct approach to assessing the instruction is to ask the students. Colleges and universities often do this by using in-house or commercially prepared student rating forms. These rating forms commonly consist of a series of items regarding the instruction and instructor in a particular course. The student responses are usually on a Likert scale. Results are typically given as average scores on individual items with an overall rating average. These ratings are primarily used by instructors for self-improvement and by administrators as contributing information for promotion and tenure decisions. However useful the item average scores might to be to instructors and administrators, the student rating instrument could also render further valuable information. Factor analysis techniques executed on the item responses can often reveal underlying constructs within the rating instrument. Interpretable factors provide additional information not readily apparent from individual item averages. Factor scores are often more meaningful in evaluating instruction than average scores on individual items. In addition, factor analysis could reveal constructs which are important in influencing student persistence in a major and suggest more clearly avenues for improvement. Using a student rating instrument is a positive step in evaluating instruction and a factor analysis of the item responses could increase its utility in discerning how to help students persist in their career goals.

Few studies have focused on college instruction as a contributing factor to the decline in the number of science majors. Tobias (1990), conducted a study of freshman science courses to determine why the classes are considered so "hard" and why so many students are "turned off" by science. Subjects were enrolled in freshman chemistry or physics courses, attended classes, took examinations, received grades and completed the courses. The subjects were talented nonscience majors with the proper prerequisites for the freshman science courses. Data was accumulated from subject journals and interview sessions. The courses were reported to be interesting and the teaching adequate, however, the courses emphasized technique without explanation of how it came about and failed to connect content with the real world. The subjects complained of large impersonal lecture classes with a distinct lack of student enthusiasm. At the same time, the courses were intensely competitive.

Hewitt and Seymour (1991, 1992; Seymour, 1992a, 1992b) in ethnographic studies interviewed college students who were described as "switchers," those who started college initially majoring in science but switched to another major, and "non-switchers" those who persisted in science. Results suggest that the two groups were not greatly different. Both groups mentioned changing interests, conceptual difficulties, inadequate high school preparation, etc. as concerns. However, most often mentioned by all the students was the poor teaching and unapproachability of the faculty in sciences. In fact, poor teaching and remoteness of the faculty was the number one complaint of the non-switchers but only the number seven complaint for the switchers. Both groups experienced difficulties with instruction, but one group persisted and the other switched majors.

Schlipak (1988) interviewed female and male physics and engineering students and faculty at Harvard University to discern differences from other fields in an ethnological study. Interviews with college physics and engineering students and faculty revealed five themes. The science/engineering community was united by language that excluded nonscientists. The male dominated faculty were perceived as strong authority figures who were brilliant, elitist, and disinterested in undergraduates. Poor advising and lack of support from faculty were usual, but women students voiced particular dissatisfaction. Separation of the science community from other fields was seen by men students as a decision to be autonomous, but by women students as isolation. Women students, but not men, expressed concerns about the intense competition.

In a series of reports, Light (1990; 1992) explored teaching and learning in many fields at Harvard University. Information about undergraduates and the physical sciences was generated from questionnaires. The data revealed several perceptions. First, contrary to most expectations, students expressed a strong interest in taking courses in physical science; students were not frustrated by faculty emphasis on research in these areas, but hoped to participate; freshmen expressed confidence about taking science and seniors expressed regrets for not taking more science; students perceived a high workload in science classes; students perceived more grade competition in science classes. The sample size was modest and the students were superior Harvard undergraduates.

Even though the sample sizes in the preceding studies were small, the results point out recurring themes in science classes. College instruction in science, mathematics, and engineering courses is often distinct from instruction in other fields. This suggests that science and mathematics curriculum and instruction may be instrumental in deterring some students from their career goals. Assessing science and mathematics instruction by using student ratings may provide some answers. Augmenting rating questionnaires with factor analysis could communicate elements of instruction in a way that may be directly addressed. In the present study students at a public urban university in the South were asked to rate their first college course in science or mathematics using the IDEA[1] (Instructional Development and Effectiveness Assessment) rating items. All students were juniors or seniors who had been initially or were currently science, mathematics or engineering majors. The courses rated included introductory biology, chemistry, geology, physics, computer science, or nonremedial mathematics for mathematics engineering majors. A factor analysis utilizing principal components techniques was used to discern underlying interpretable factors.

Methods and Materials

The IDEA

The IDEA student rating of instruction questionnaire is part of a faculty evaluation system developed at Kansas State University by Donald P. Hoyt and expanded by William P. Cashin. The IDEA had been used in over 90,000 classes in 300 institutions by 1988 (Cashin, 1988). Its long history and extensive use provide a broad database supporting reliability and validity. The current IDEA is

[1]Available from the Center for Faculty Evaluation and Development, Kansas State University, Manhattan, KA 66502-1604

the 1988 edition.

The IDEA Survey form for student reactions to instruction and courses is divided into six information sections and one identification section. For this study only the 45 items of the first five sections were considered.

1. <u>The Instructor</u> includes twenty statements describing the instructor's teaching. Responses to the items are by a five-point Likert scale ranging from (1) hardly ever, (2) occasionally, (3) sometimes, (4) frequently, and (5) almost always.

2. <u>Progress</u> includes ten objectives in a college course. Responses reflect the progress in this course compared with other college courses. For each stated objective, students use Likert scale responses to the question, "In this course my progress was: (1) Low (lowest 10 percent of courses I have taken), (2) Low Average (next 20 percent of courses I have taken), (3) Average (middle 40 percent of courses), (4) High Average (next 20 percent of courses I have taken), and (5) High (highest 10 percent of courses I have taken)."

3. <u>The Course</u> includes four items about assignments, subject matter and work-load as compared with other courses. Likert scale responses are: (1) much less than most courses, (2) less than most, (3) about average, (4) more than most, and (5) much more than most.

4. <u>Self-rating</u> includes four items about the student's own attitudes and behaviors in the course. The Likert scale responses are: (1) definitely false, (2) more false than true, (3) in between, (4) more true than false, and (5) definitely false.

5. <u>Overall rating</u> includes seven statements about the course, the instructor, and the student's learning. Likert scale responses are: (1) definitely false, (2) more false than true, (3) in between, (4) more true than false, (5) definitely true.

Reliability is involved with consistency. Reliability can be affected by the number of raters. Cashin, in a draft technical report on the IDEA system (1992), reported the following average item reliabilities: .69 for 10 raters; .83 for 20 raters; and .91 for 40 raters. These reliabilites are typical of well designed student rating forms.

Stability is involved with the agreement of a student's rating repeated over time. Marsh & Overall (1979) and Overall & Marsh (1980) in a longitudinal study compared student ratings at the end of a course with ratings of the course one to several years later using the same students. The average correlation was .83. This stability is particularly cogent to the present study in that it establishes that seniors or even graduate students rating courses taken up to several years before will not have changed their responses to a great degree.

Generalizability is involved with how well the ratings reflect an instructor's effectiveness overall and not just for a particular course during a particular term. Marsh (1982) studied data from 1,364 courses dividing them into four categories: same instructor, same course; same instructor, different course; different instructor, same course; different instructor, different course. The items were separated into those concerned specifically with the instructor and those considered background. In correlating the instructor ratings for the four groups, "same course, same instructor" had a correlation of .71. For "same instructor, different course," the correlation was .52. For "different instructor, same course," the correlation was .14, and for "different instructor, different course," the correlation was .06. These data suggest that the generalizability of student rating items is tied to the instructor more than to the course. The background items, such as the student's reason for taking the course and the workload of the course, were found to be more highly correlated with the course rather than the instructor. For the same course these items had higher correlations, regardless of instructor. These data suggest that student ratings are generalizable for instructors and for courses.

Validity is concerned with items measuring what they are designed to measure. If the criterion for measuring instructor effectiveness is student learning, achievement should be greater with effective than with ineffective instructors. Cohen (1981, 1986) in a meta-analysis reviewed validity studies using student grades on an independently derived examination as a measure of student learning. The students were enrolled in the same courses using the same text and syllabus, but with different instructors. The examinations for the course were identical but constructed by a third party. The correlations of actual student grades on the examinations with student ratings of the instructor ranged on the various items from .22 to .50. Cashin (1988) suggests that unlike reliability, validity correlations above .70 are very useful but rare when studying complex phenomena. Student ratings with validity correlations between .00 and .19, even when statistically significant are not usually practical to use, however, those above .20 are generally useful. Cashin submits that students rate instructors higher in classes where they learn more, however, one must realize that other factors such as student preparation, motivation, etc. not related to the instructor, also enter into the equation.

Cashin (1988, 1992) reviewed sources of bias in student ratings. Instructor characteristics reviewed included age, sex, experience, personality, and research productivity. These factors generally show little or no relationship to student ratings. However, faculty rank was often found to have an affect. The IDEA system reports a correlation with academic rank (including graduate teaching assistants) of .10. Style of presentation including expressiveness and enthusiasm often affects students ratings. Cashin (1988) suggests that style and enthusiasm are related to an instructor's effectiveness and should not be considered a source of bias.

Cashin (1988) reviewed student characteristics relative to student ratings and reported student characteristics found not to be related, included the student's age, sex, level (freshman, sophomore, etc), GPA, and personality. A student variable which was related to ratings included reasons for taking the course. The IDEA system uses a motivation item "I had a strong desire to take this course" which has an average correlation of .37 with the other items on the questionnaire to account for this factor. In the present study all subjects were incipient science majors.

Expected grades are known to influence student ratings. Using IDEA data Howard and Maxwell (1980; 1982) suggest that students who are motivated and learn more, earn higher grades, therefore suggesting student ratings are valid.

Course and administrative variables reviewed and reported to have little or no effect were class size, time of day, and time during term the survey was taken (Cashin, 1988). In a later study comparative data from four class sizes from less than 15 students to more than 100 showed a modest correlation with student ratings (Cashin, 1992). Level of course and academic field have been reported in some studies to affect student ratings. The IDEA system correlates on average .07 with course level. The present study used only introductory courses for rating.

Student ratings in 44 academic fields have been reported for IDEA items. In general, humanities and arts type courses are rated highest, followed by social science type courses, then math-science type courses. Cashin & Clegg (1987) found that differences in ten academic fields accounted for 12 percent or more of the variance for half of the IDEA items. For a third of the items, differences in academic field accounted for 20 percent of the item variance. The IDEA has published tables of means for 44 academic fields on three global items (Cashin, Noma, & Hanna, 1987). By consulting the tables, comparisons can be made for ratings in each field. The reason for variation by academic field is unclear but users of student ratings are cautioned about comparing student ratings for courses in different fields. In the present study this difference is at a minimum since all courses evaluated are introductory science and mathematics courses.

Work load and difficulty have been found to be positively correlated with student ratings (Marsh, 1984). Average correlations of overall rating with specific IDEA items are .14 for "amount of reading," .17 for "amount of assignments," .22 for "difficulty of subject matter," and .29 for "worked harder in this course than on most courses I have taken." Cashin (1988) suggests that these results support the validity of student ratings rather than bias.

The Subjects

The subjects for the survey were upperclassmen in a public urban university in the South. The questionnaires were given to students in classes where possible and took approximately ten minutes. Instructors cooperated in allowing class time for the survey. Other subjects not easily accessible in classes were contacted and surveyed at meetings set up in an empty classroom. All subjects were volunteers and confidentiality was observed. The students were asked to respond to the IDEA standard form rating the instruction in their first college science course (in the case of mathematics or engineering majors, their first nonremedial mathematics course). The sciences included biology, chemistry, earth science, physics, engineering, computer sciences and mathematics.

Analysis of Data

The statistics were generated using SPSS-X statistical software package.

Results

Description of the Sample

The sample of 141 students was 56.7 percent male. The average age was 25 years (SD=4.64, range 19-42). The sample was 71.6 percent white, 9.2 percent black, 6.4 percent hispanic, 9.9 percent Asian, 0.7 percent American Indian, and 2.1 percent other groups. Natural science majors (biology, chemistry, earth science, and physics) made up 69.6 percent of the sample, computer science majors 12.7 percent, and engineering/mathematics majors 17.7 percent. For the course evaluated, the average grade the students reported was 2.70 with a median of 3.00 on a 4 point scale.

Table 1 presents the means and standard deviations for each of the 45 IDEA items.

[Insert Table 1 about here.]

Statistical Analysis of Data

Sampling adequacy using the Kaiser-Meyer-Olkin (KMO) statistic (Kaiser, 1978). Small values indicate that the correlations between pairs of variables cannot be explained by other variables, therefore, a factor analysis would be inappropriate. A sampling adequacy of .93 indicated that the data consisting of the IDEA items were appropriate for factor analysis.

The Bartlett test for sphericity was used to test the hypothesis that the correlation matrix was an identity matrix, i.e., that there were no factors. The test of sphericity was X^2=4391.28 with statistical significance of $p < .001$ indicating that factors were present in the correlation matrix.

A factor analysis utilizing principal components extraction was performed on the 45 IDEA items. The factors were chosen based on the eigenvalues greater-than-one and "scree" tests. These criteria yielded eight factors accounting for 67.2 percent of the variance. A varimax rotation enhanced interpretability of the factors. The rotated factor structure is presented in Table 2.

[Insert Table 2 about here.]

The items associated with the eight factors and variance accounted for prior to rotation are presented in Table 3. The items presented in Table 3 are those with structure coefficients greater than absolute .45.

[Insert Table 3 about here.]

Conclusions

Interpretation of the Statistics

Factor analysis is a way of parsimoniously describing data by recognizing relationships among variables (Gorsuch, 1974). Factor analysis serves to reduce the number of variables while preserving the maximum amount of variance. Interpretation of the factors also helps to identify underlying constructs of the instrument. The correlations among the student responses on the IDEA items rating their introductory science courses can be used to generalize separate factors, each describing distinct facets of the course experience and each factor uncorrelated with other factors. The interpretation of the factors is a generalization of the items which are most closely associated with the factor.

The IDEA was designed using a series of factor analyses as a tool to describe the separate aspects of the course experience. The instrument is divided into sections reflecting the authors' interpretation of six factors (Hoyt & Cashin, 1977). Items 1-20 were related to the skill of the instructor, items 21-30 were related to the progress of the student, 31-34 were the structure of the course, 35-38 were related to the attitude of the student, and items 40-46 were for the overall rating.

A factor analysis of the accumulated data from the IDEA student rating instrument was completed in 1992 at KSU. In a personal communication W. E. Cashin (1992) reported obtaining seven factors by principal components extraction using a varimax rotation. The seven factors explained 76.2 percent of the total variance. Cashin's analysis utilized class means of all undergraduate classes from all different subject areas from the KSU database consisting of many hundreds of classes of 30 students or more from colleges and universities nationwide. Factor I (items 2, 3, 4, 5, 7, 8, 9, 10, 13, 14, 15, 16, 17, 18, 20, 21, 34, 37, 38, 40, 42, 44, 45, 46), was interpreted as instructor skill; Factor II (items 11, 26, 27, 28, 29, 30, 41) was interpreted as creative expression; Factor III (items 21, 22, 23, 24, 25) was interpreted as cognitive skills; Factor IV (items 6, 12, 19, 31) was interpreted as examinations; Factor V (items 32, 33, 35) was interpreted as difficulty/effort; Factor VI (36 and 43) was interpreted as motivation to take the course; and Factor VII (item 1 and an item on the size of the class) was interpreted as discussion. These factors and associated items are comparable to those obtained in the present study. The factors for the present study are presented in Table 3.

In the present study Factor I was interpreted as "instructor presentation skills." The factor was most highly saturated with items regarding instructor enthusiasm, expressiveness, interesting presentations, clarity, summarizing material, intellectual stimulation, and overall rating of the instructor. Some example items on Factor I are, "The instructor explained the course material clearly, and explanations were to the point." and "The instructor made presentations which were dry and dull."

Factor II dealt with the student's "perception of personal progress in learning and development" from the course. The items most highly correlated with this factor asked the student to compare this course with other college courses on the basis of learning facts, principles, applications, skills, how professionals utilize this knowledge, developing creativity, self-discipline, understanding, positive attitudes and total learning. This factor was interpreted as the student's perception of personal accomplishment, learning, and competence in cognitive areas gained from taking the course. The focus of the items was on the personal experience of the course rather than on the instructor. Example items on this factor are the student's rating of progress on, "learning to apply course material to improve rational thinking, problem-solving and decision making" and "developing skill in expressing myself orally or in writing."

Factor III dealt with teacher-student interactions which helped the student develop creatively and intellectually. The associated items concerned how the instructor helped the students answer their own questions, encouraged self-expression, promoted discussion and encouraged thinking. Example items for this factor are, "The instructor encouraged students to express themselves freely and openly" and "The instructor promoted teacher-student discussion (as opposed to mere responses to questions)." This factor was interpreted as "creative and intellectual development."

Factor IV involved the quality of the course examinations and projects. The associated items questioned the clarity of questions, amount of memorization, detail, and import of materials on examinations and assignments. An example item on this factor is "The instructor gave examination questions which were unreasonably detailed (picky)." This factor was interpreted as the "nature of examinations."

Factor V evaluated the student's "interest in taking the course." This factor was interpreted as motivation. The associated items were again concerned with the course not the instructor. An example item is "I had a strong desire to take this course."

Factor VI was concerned with the difficulty and effort involved with the course. The associated items were about the amount of non-reading assignments, difficulty, and how hard the student worked compared to other courses. This factor was interpreted as "course rigor." An example item is "I worked harder on this course than on most courses I have taken."

Only one item, involving the instructor's explanation of criticisms of students answers, was highly correlated with Factor VII. This item may be more related to a course involving considerable free discussion, such as a literature course or a social science course, rather than an introductory science course.

Only one item, which was concerned with the amount of reading required, was highly correlated with Factor VIII. Although the reading in introductory science courses is often intense, requiring reading for details and concepts, the reading assignments are usually not as extensive as in literature or social science courses. Factor VII and Factor VIII are not considered as reliable since each factor was strongly associated with only one item.

The factor analyses from the KSU data base and the present study rendered similar factors. The slight differences could be due to sample size and make-up. The rating units for Cashin's factor analysis were class averages, while for the present study the unit was the individual student. The Cashin sample included all courses from many different schools. The present sample included only science/mathematics/engineering courses. In spite of these differences in samples, the factors were remarkably similar, suggesting that the factors are stable.

Discussion

The importance of these factors particularly the first three is that they distinguish instructor presentation from the personal aspect of the student taking the course. In the work cited (Light, 1990, 1992; Hewitt & Seymour, 1991, 1992; Seymour, 1992a, 1992b; Shlipak, 1988; Tobias, 1990) instruction as defined as the presentation of content was not seen as a problem for most students. The personal feelings of intense competition, isolation, and personal development were most often pointed out as problems in science classes.

In the factor analysis of the IDEA, Factor I was the presentation skills of the instructor and accounted for most of the total variation. However, most items in the IDEA were directed to this aspect of instruction, as are most student rating questionnaires. Presentation is the aspect of teaching which instructors put much energy into such as preparing lectures and audio-visuals, choosing of texts, etc. It is an important part of teaching because it is necessary to present content in a coherent way. In addition, presentation is the aspect of teaching most readily judged by peers, students, and administrators. However, student ratings should not dwell on the "good show" to the exclusion of other facets of instruction which may be more important for student persistence.

The personal feelings of competence and learning students gain from a course would appear to have a more profound impact on student persistence in science and mathematics. Factor II included fewer items, but it holds the promise of explaining why students stay in a major. The items were geared to the student's feeling about himself/herself in the course, his/her progress, learning, skills, creativity. Factor III also dealt more personally with the student and interaction with the instructor. Factor III indicates a student's feeling of belonging in a field by being able to interact with others creatively and intellectually. Factors II and III more clearly indicate where the effort should go in improving science and mathematics instruction in order to increase the number of graduates in science, mathematics, and engineering.

The IDEA is a well designed student rating instrument with several aspects of instruction included in the items. This is important in an overall assessment of a course and an instructor. All too often in-house rating instruments focus only on presentation excluding other more important aspects. A well designed student rating instrument with many aspects of learning and teaching would be more helpful in achieving departmental goals.

<u>Summary</u>

This study illustrates how a factor analysis of a well designed student rating instrument can increase its utility. The present study was an effort to utilize a factor analysis of a student rating instrument to reveal constructs which would explain student attrition in science, mathematics, and engineering majors. The factor analysis of the IDEA rating instrument did reveal constructs about which students in science and mathematics have expressed concern. Further longitudinal studies using student ratings of science and mathematics courses coupled with information on student persistence could validate the interpretation and the importance of the factors in explaining attrition of science, mathematics, and engineering majors.

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Table 1

Means and Standard Deviations of IDEA Student Rating Items

Variable	n	Mean	SD	Variable	n	Mean	SD
IDEA 1	141	2.58	1.25	IDEA 24	141	2.82	1.20
IDEA 2	141	2.86	1.20	IDEA 25	141	2.70	1.22
IDEA 3	141	2.60	1.31	IDEA 26	141	2.58	1.24
IDEA 4	141	3.75	1.28	IDEA 27	141	3.06	1.23
IDEA 5	141	2.80	1.21	IDEA 28	141	2.71	1.19
IDEA 6	141	2.40	1.30	IDEA 29	141	2.21	1.15
IDEA 7	141	3.10	1.36	IDEA 30	141	2.79	1.26
IDEA 8	141	3.62	1.16	IDEA 31	141	3.13	.96
IDEA 9	141	2.72	1.34	IDEA 32	141	3.22	1.03
IDEA 10	141	3.42	1.16	IDEA 33	141	3.41	1.01
IDEA 11	141	2.61	1.20	IDEA 34	141	3.38	.89
IDEA 12	141	2.27	1.07	IDEA 35	141	3.14	1.32
IDEA 13	141	2.90	1.27	IDEA 36	141	3.69	1.30
IDEA 14	141	3.16	1.16	IDEA 37	141	3.11	1.54
IDEA 15	141	2.96	1.42	IDEA 38	141	3.20	1.45
IDEA 16	141	3.68	1.19	IDEA 39	Omit		
IDEA 17	141	3.48	1.28	IDEA 40	141	4.00	1.01
IDEA 18	141	2.89	1.40	IDEA 41	141	2.66	1.33
IDEA 19	141	2.54	1.18	IDEA 42	141	2.64	1.20
IDEA 20	141	2.89	1.32	IDEA 43	141	3.60	1.28
IDEA 21	141	3.22	1.17	IDEA 44	141	3.47	1.42
IDEA 22	141	3.27	1.12	IDEA 45	141	3.57	1.14
IDEA 23	141	2.91	1.13	IDEA 46	141	3.48	1.39

Table 2

Sorted Factor Loadings of the IDEA Items after Varimax Rotation

Item	Factors							
	I	II	III	IV	V	VI	VII	VIII
Idea 8	.70185	.21776	.18602	.14714	.14223	.06934	.18905	.21323
Idea 17	.69612	.28621	.15338	.33475	.12352	-.01417	-.00304	.05758
Idea 7	.69319	.21832	.23182	.08815	-.09973	-.23884	.02441	-.02893
Idea 20	.67768	.39458	.29982	.15002	.04455	-.05062	.07062	-.03645
Idea 4	.67343	.15286	.30033	-.00295	.22741	.10379	.07220	.12518
Idea 18	.65557	.29022	.16033	.08519	.10436	-.02945	.06184	-.06186
Idea 16	.63703	.14739	.04571	.29025	-.00900	-.03168	.07618	.41448
Idea 14	.62998	.43386	.21929	.23228	.03029	-.05629	-.13440	.05383
Idea 44	.62828	.36788	.39452	.26858	.06833	-.02534	.09025	-.12166
Idea 9	-.61684	-.29232	-.36779	-.30307	-.03134	.12321	-.17773	.07030
Idea 15	.60269	.45979	.14067	.06475	.08628	.20356	-.07101	-.15043
Idea 10	.58547	.35086	.11729	.13326	.14794	-.02505	.07498	.33064
Idea 37	.56610	.36607	.39374	.27118	.14965	.03236	.12650	-.12661
Idea 24	.26879	.75756	.16301	.03521	.08183	.11912	-.06522	.19234
Idea 21	.42750	.73376	.04484	.11452	-.02194	.01715	-.09269	-.07708
Idea 23	.21310	.70207	.25678	.07739	-.00773	.06085	-.08865	-.00748

Table 2

Sorted Factor Loadings of the IDEA Items after Varimax Rotation

Item	Factors							
	I	II	III	IV	V	VI	VII	VIII
IDEA 29	-.01073	.69952	.27631	.08918	.10904	.08658	.23072	.15889
IDEA 30	.18854	.68601	.10175	.12435	.18079	-.10380	.31212	-.02976
IDEA 26	.22601	.66610	.46600	-.04488	.11364	.14106	.09307	.19607
IDEA 27	.33590	.64119	.20074	.03684	.05579	-.01025	-.10393	.12869
IDEA 22	.32688	.64043	.14739	.13519	.06028	.13034	-.17477	-.27367
IDEA 28	.34009	.64007	.22540	.03011	.00253	-.05068	.18682	.00018
IDEA 25	.36827	.59593	.22009	-.06649	.12966	.01425	.08761	.10219
IDEA 46	.50514	.59243	.13955	.19918	.19779	.10870	.02513	-.18436
IDEA 38	.49752	.53993	.29044	.20544	.30845	.04249	.00237	-.10485
IDEA 45	.35144	.48516	.15733	.37787	.38591	.06698	.00306	-.15629
IDEA 34	.31594	.48372	.03167	.39817	.16904	.03320	.01242	-.02097
IDEA 1	.17335	.21551	.75793	.02713	-.02725	-.04769	.12041	.00402
IDEA 3	.36351	.30431	.66267	.18105	-.07728	.14511	-.09750	.03361
IDEA 13	.43149	.22607	.58956	.09988	-.01473	-.02451	-.12745	-.02919
IDEA 2	.45368	.33541	.56790	.03453	-.01105	-.08197	-.22385	.05086
IDEA 41	.16423	.33557	.55320	.14716	.24851	.17827	-.02952	.13599

Table 2

Sorted Factor Loadings of the IDEA Items after Varimax Rotation

Item	Factors							
	I	II	III	IV	V	VI	VII	VIII
IDEA 5	.44991	.36240	.51135	.21405	.02399	-.04629	.01600	-.02159
IDEA 42	.22978	.18459	.45738	.32387	.11867	-.07941	.39958	.05465
IDEA 19	-.17643	.01980	-.08368	-.79790	.10942	.01440	-.00233	.01974
IDEA 12	-.34434	-.00657	-.30142	-.61169	-.04624	-.03503	.19944	-.03971
IDEA 40	.41631	.17713	.05378	.60457	.13513	.06963	-.03976	.03368
IDEA 6	.01569	-.30349	-.03962	-.47530	.25381	.17279	.15236	-.29564
IDEA 36	.12526	.10665	.14195	.00198	.83939	-.03236	-.13961	-.08225
IDEA 43	.12731	.20180	-.12855	-.06968	.80451	.08426	-.14548	.11963
IDEA 32	-.18001	.12531	-.05275	.19404	.03469	.79229	-.09314	.03717
IDEA 33	.01755	-.06536	.06917	-.16825	-.20380	.78484	.22255	.09210
IDEA 35	.11750	.35240	.21611	-.09813	.09862	.54872	.08819	-.30857
IDEA 31	.19167	.06033	-.08931	-.23752	-.02023	.19787	.64705	-.08821
Idea 11	.22318	.08172	.43017	.03806	.03911	.11975	-.27366	.48996

Table 3

Factor Analysis of Student Rating Items from the IDEA (1-46)

Factor	Items (Varimax Rotation)	Prerotation Eigenvalue	% of Variance
Factor I	2,4,7,8,9,10,14,15,16,17, 18,20,37,38,44,46	18.3943	40.9
Factor II	15,21,22,23,24,25,26,27, 28,29,30,34,38,45,46	2.7996	6.2
Factor III	1,2,3,5,13,26,41,42	2.1112	4.7
Factor IV	6,12,19,40	1.7491	3.9
Factor V	36,43	1.5848	3.5
Factor VI	32,33,35	1.4431	3.2
Factor VII	31	1.1532	2.6
Factor VIII	11	1.0066	2.2

Note. Items considered salient to a factor were those with structure coefficients greater than absolute .45.