Course Circumstances and Teaching Methods Related to Student Ratings

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Student ratings of instruction (SRI) have been used to provide feedback to instructors about their teaching and the course since the 1920s (Murray, 2005). However, SRIs have faced considerable opposition, primarily because some instruments are not well constructed and ratings results are often overemphasized and underutilized (Benton & Cashin, 2014). Ratings are overemphasized when they serve as the primary or only measure of teaching effectiveness. They are underutilized when faculty and administrators fail to use the feedback to improve teaching.

Nonetheless, most institutions of higher education have some system for collecting student ratings from classes on a regular basis. SRIs remain in use because they are a practical means of assessing student perceptions of teaching and the course. Further, they are the most reliable source of evidence about teaching effectiveness because they represent the observations by multiple raters across multiple occasions (Marsh, 2007). Moreover, SRIs are primarily a function of who teaches a course rather than the course that is taught, are correlated with other measures of teaching effectiveness, are relatively unaffected by potential biases, and can be useful for improving teaching especially when combined with consultation (Benton & Cashin, 2014; Marsh, 2007; Knol, 2013).

Changes in higher education have made SRIs all the more relevant in today's competitive environment. Accreditation and government regulations have elevated the importance of assessment and accountability. Reliance on tuition as a source of funding has made student retention essential for institutional survival. Ratings offer a reliable means of gathering indirect evidence of student learning and formative feedback about teaching effectiveness.

However, other changes are affecting the way student ratings are collected. The most obvious are the growth of adjunct or part-time faculty, the increase in courses offered entirely or

partially online, widespread faculty and student access to mobile devices, and automated response systems (ARS). Reliance on part-time faculty presents challenges to consistently measuring student progress on learning outcomes without substantial communication and coordination with full-time faculty and administrators. Online courses require technological support for delivery, analysis, and reporting of online ratings forms. Mobile devices make shorter forms more desirable. Automated response systems enable frequent assessment with immediate feedback while the course is occurring rather than waiting until the end of the semester. Institutions need a student ratings instrument that is responsive to such changes. They need an instrument that offers the possibility for quick, reliable, valid, immediate, and helpful feedback and that is of value to both full- and part-time faculty whether they teach online or face-to-face.

The purpose of this paper is to describe some of the work that has gone into the development of such an instrument—IDEA's *Teaching Essentials*. The 12-item survey measures student overall impressions of the instructor and the course, observations of seven essential teaching methods, and three extraneous student characteristics that can influence ratings. We present, in this paper, validity evidence to support its use for both formative and summative decision making when combined with other information sources. Moreover, we investigate the extent to which instructors' perceptions of certain course circumstances are related with student perceptions of the teacher and the course. Such information could help administrators identify potential areas to improve to facilitate teaching and learning.

Teaching Methods

Researchers have consistently found that student ratings are multidimensional, that they reflect different aspects of teaching effectiveness. The number of factors identified varies from as few as five (Braskamp & Ory, 1994; Centra, 1993) to as many as 28 (Feldman, 2007), depending

on the instrument and number of items. The consistent finding of multidimensionality indicates ratings convey more than just a single construct.

Across multiple factor-analytic studies (Braskamp & Ory, 1994; Feldman, 1989; Hativa, Barak, & Simhi, 2001; Marsh, 1987; Murray, 1987), four broad teacher behaviors are most highly correlated with ratings of teaching effectiveness: organization, clarity, enthusiasm/expressiveness, and rapport/interactions (as summarized in Hativa, 2013). *Organization* concerns how the course is structured and managed (e.g., making it clear how each topic fits into the course and scheduling course work to keep students up-to-date). *Clarity* in explanations of course content has been shown to enhance student learning and may be the single most important teaching quality (Wabash National Study of Liberal Arts Education, year). *Enthusiasm/expression* involves stimulating and inspiring students. Finally, *rapport/interactions* refer to instructor helpfulness and interest in individual student learning. In this study, we sought to identify which of IDEA's 20 teaching methods are most important for explaining variance in student ratings of the teacher and the course. We hypothesized that the best model would include elements of organization, clarity, enthusiasm/expression, and rapport/interactions.

Course Circumstances

Researchers have examined possible bias caused by certain student, course, and instructor characteristics. In general, SRIs are either unrelated or weakly related to most characteristics considered irrelevant to teaching effectiveness. SRIs are unrelated to student age, gender, level, grade point average, and personality. They correlate with neither the time of day the course is taught nor the time during the term they are administered. Moreover, they are only weakly correlated with instructor age, gender, race, personal characteristics, and teaching experience

(see Benton & Cashin, 2014, for a review). Such findings are evidence for the divergent validity of student ratings.

In the current study, we examined the extent to which instructors perceive several course circumstances influence student learning. Course circumstances refer to managerial, instructor, and student characteristics relevant to the teaching/learning process. Managerial characteristics include adequacy of physical facilities, support for technical and instructional issues, and instructor control over course-management decisions. Managerial circumstances indicate the extent to which the institution or department provides instructors resources and autonomy to improve their teaching. Instructors receiving less-than-ideal support would be constrained and thus the teaching quality could suffer. Also, those who consider themselves being granted inadequate control over course management decisions might not be able to adapt to needs of students with different backgrounds, and student learning could be negatively influenced.

Instructor characteristics include motivation to teach the course, previous experience teaching the course, and substantial changes made in the course. There is some evidence that certain instructor characteristics are related to ratings. For example, instructors' interest in teaching is positively related with the time they are willing to devote to teaching (Blackburn, Lawrence, Bieber, & Trautvetter, 1991). The preference for teaching may result in more positive student learning outcomes.

Student characteristics include preparation, enthusiasm, and effort to learn. Some student characteristics, notably motivation and typical work habits, also influence ratings. When students have an interest in the subject matter and have good work habits, instructors are more likely to receive higher ratings (Hoyt & Lee, 2002; Marsh & Dunkin, 1997).

Instructors were asked whether they believed each of the following managerial,

instructor, and student characteristics had a positive, negative, or neither a positive nor negative impact on learning: physical facilities and/or equipment; technical/instructional support; previous experience teaching the course; substantial changes in the course; desire to teach the course; control over course management decisions; and students' level of preparation, enthusiasm, and effort. We hypothesized that instructors who perceive a positive impact of such circumstances would receive higher overall ratings of the teacher and the course than those who perceive a negative impact.

Methods

Instrumentation

The IDEA Student Ratings of Instruction (SRI) system has been available nationally since 1975 and is comprised of two forms: The *Faculty Information Form* and the *Student Rating Form*[1].

Faculty Information Form. Instructors complete the *Faculty Information Form* (FIF) for each course evaluated in the system. They are asked to indicate whether managerial, instructor, and student circumstances had a positive, negative, or neutral impact on students' learning. The response options are *Had a positive impact on learning*, *Neither a positive nor a negative impact, Had a negative impact on learning,* and *Can't judge*.

Student Rating Form. The IDEA *Student Rating of Instruction Form* is a 47-item instrument. Students indicate how frequently their instructor used each of 20 teaching methods, by responding 1 (*Hardly Ever*), 2 (*Occasionally*), 3 (*Sometimes*), 4 (*Frequently*), or 5 (*Almost Always*). In Table 1, the 20 teaching methods are organized into five teaching styles based on factor analysis (Hoyt & Lee, 2002). Additional questions concern course characteristics, student

[1] Samples of the faculty and student forms can be found at http://ideaedu.org/services/student-ratings/sample-forms-student-ratings-instruction.

characteristics, and overall summary measures of the course and the instructor. The summary measures read, *Overall, I rate this instructor an excellent teacher* and *Overall, I rate this course as excellent*. The scale ranges from 1 = *Definitely False* to 5 = *Definitely True*.

Validity and reliability evidence for the IDEA SRI system is found in several sources (Benton, Li, Brown, Guo, & Sullivan, 2015; Hoyt & Perera, 2000; Hoyt & Lee, 2002). Reliability is high at both the class and instructor levels. No meaningfully practical differences are found between online and paper surveys (Benton, Webster, Gross, & Pallett, 2010a; and between online and face-to-face courses (Benton, Webster, Gross, & Pallett, 2010b). In addition to paper forms, four survey delivery methods are available online: survey links available through a Blackboard® Building Block, e-mail, the course website, or a combination of all three. Students are restricted to one submission, and response rates average approximately 78%.

Data Source

We analyzed archived data from IDEA Student Ratings of Instruction collected in 490,333 college and university classes from over 300 institutions in all regions of the continental U.S. during the years 2002-2011. Approximately 28% of institutions were master's level, 22% bachelors, 14% doctoral, 15% associate, and 22% other. Data included ratings collected via online and paper formats, and in online and face-to-face settings. Average ratings and inter-correlations among items are highly similar when collected in either format or either setting (Benton, Webster, Gross, & Pallett, 2010a; 2010b).

Results

In statistical tests with a large sample, even trivial effects can be statistically significant. Given the sample size of nearly one-half million classes, we report eta-squared values, Cohen's *d*, and standardized regression coefficients considered to be of practically meaningful magnitude.

Cohen (1988) considered effect sizes (*d*) approximating .20 as small, .50 as medium, and .80 as large.

Which Perceived Course Circumstances are Related to Overall Summary Measures?

We converted students' ratings on the two overall summary measures to T scores and then formed subgroups based on instructors' perceived impact (i.e., *positive impact, neither positive nor negative impact, negative impact)* of various course circumstances on learning, as was done in Hoyt and Lee (2002). Table 2 presents means, standard deviations, and Cohen's *d* values. All one-way ANOVAs were significant at the $p < .001$ level. Given the extremely large sample sizes, we set an a-priori eta-square (η^2) $\geq .02$ as a meaningful effect.

Managerial circumstances. Instructor perceptions of the impact of physical facilities, control over course management decisions, and technical/instructional support had little impact on overall ratings of the course and the teacher, as all eta-squared values were lower than .02. However, perceived control over course management decisions had a small-to-medium effect. Instructors who believed such control had a positive impact on learning received higher ratings of the course ($d = .57$) and the teacher ($d = .37$) than those perceiving a negative impact.

Instructor circumstances. Instructor circumstances also had little impact on overall ratings (all $\eta^2 \leq .02$). Nonetheless, instructors who believed previous experience teaching the course had a positive impact were rated higher than those who believed it had a negative impact on both rating of the excellence of the course ($d = .52$) and the teacher ($d = .45$). Similarly, when instructors believed their desire to teach the course positively affected student learning, ratings of the course ($d = .50$) and teacher ($d = .38$) were higher.

Student circumstances. In general, differences in instructor perceptions of student circumstances had the greatest "impact" on student ratings of the course ($\eta^2 > .02$). A large effect

was found for teacher perceptions of student enthusiasm on ratings of the course (η^2 = .07, d = .87). Medium effects were observed for student effort to learn (η^2 = .04, d = .67) and student background and preparation (η^2 = .03, d = .50).

Two student circumstances had moderate effects on overall ratings of teacher excellence. Instructors who perceived positive effects from student enthusiasm (η^2 = .03, d = .58) and student effort (η^2 = .03, d = .50) received higher ratings. Weaker effects were found for student preparation (η^2 = .02, d = .35).

Which Teaching Methods are Most Strongly Related to Overall Summary Measures?

We employed Bayesian Model Averaging (BMA) to provide estimated probabilities that the frequency of each of the 20 teaching methods was associated with student ratings of the teacher and the course. BMA is an ensemble technique that tests multiple models to obtain better predictive performance than that obtained with a single model (Hoeting, Madigan, Raftery, & Volinsky, 1999). Schwartz Bayesian Criterion (SBC) is used for model selection among the finite set of models (2 to the kth power, where k denotes the number of explanatory variables). The SBC introduces a penalty term for increasing the number of predictors. We selected the best 100 models, based on the SBC criterion. Only classes where the instructor rated the learning objective as relevant were included in the analysis. Modeling was conducted on subsamples of classes based on enrollments: small (10-14 students), medium (15-34 students), large (35-49 students), and very large (50 or more students). We performed separate analyses on ratings of the instructor and the course.

Table 3 presents estimated regression parameters and R^2 values for the full models. Table 4 summarizes the results of the BMA analyses. Seven teaching methods were significantly related to either one or both of the two summary measures. For student ratings of the overall

excellence of the course, the adopted model included five significant teaching methods that together explained approximately 74% of the variance in the criterion variable: *introduced stimulating ideas about the subject* (β = .21), *explained course material clearly and concisely* (β = .12), *demonstrated the importance and significance of the subject matter* (β = .09), *inspired students to set and achieve goals which really challenged them* (β = .08), and *made it clear how each topic fit into the course* (β = .05).

For student ratings of overall teacher excellence, the adopted model included four significant teaching methods that together explained approximately 86% of the variance in the criterion variable: *explained course material clearly and concisely* (β = .26), *displayed a personal interest in students and their learning* (β = .15), *introduced stimulating ideas about the subject* (β = .10), and *found ways to help students answer their own questions* (β = .08).

We also conducted BMA within groupings of small (10-14 students), medium (15-34 students), large (35-49 students), and very large (50 or more students) class sizes. The findings generally replicated those for the entire database, which provides evidence of the generalization of the teaching methods across class size.

Discussion

Instructors who believe certain course circumstances had a positive influence on student learning tend to receive higher overall ratings. Specifically, instructor perceptions of whether students' enthusiasm, effort, and preparation positively affected learning had the strongest relationship with ratings of the teacher and the course. The perceived impact of student enthusiasm is strongly related to ratings of the course and moderately related to ratings of the instructor. One explanation is that students' affective reactions are connected to their learning. Students who are bored or unenthused about what they are studying are more likely to process

new information at a surface level and to employ ineffective learning strategies, such as rehearsal (Efklides, 2011: Pekrun, 2006). Consequently, students' levels of enthusiasm can affect their motivation, which is related to overall impressions of the instructor and the course (Benton, Li, Brown, Guo, & Sullivan, 2015). Alternatively, instructors' perceptions of student enthusiasm may have influenced their teaching performance and/or attitude, which could then have influenced students' overall ratings.

Faculty perceptions of students' efforts to learn are moderately related to ratings. Overall impressions of the instructor and the course were higher when instructors perceived student effort as having a positive rather than negative impact on learning. Student effort to learn is tied to motivation. Students tend to be more motivated to learn something if they value it and have some expectancy of success (Wigfield & Eccles, 2000). It is important for instructors to explain the value of the subject matter for students' future education or job/life skills. Also, instructors can raise the expectancy of student success by communicating high expectations and providing support for high achievement (Svinicki & McKeachie, 2011).

Overall ratings are also higher when the instructor reports students' level of preparation for taking the course was a positive factor. Student background and preparation are important for learning new information because prior knowledge assists in constructing meaning. The most important individual student characteristic in predicting future learning is prior knowledge (Svinicki & McKeachie, 2011). Across all academic areas students use what they know about a topic to construct meaning and thereby read, think, and write more effectively. Having rich domain-specific knowledge helps students remember new information better than they would otherwise (Alexander, Kulikowich, & Schulze, 1994). For new information to be memorable, students must connect it with relevant knowledge already stored in long-term memory. To

provide a meaningful context for learning, instructors can assess students' prior domain knowledge and then fill in any missing gaps.

Perceptions of how managerial decisions affected learning had a relatively weaker effect on ratings of the teacher and the course. With the increase in online courses and accreditation requirements, managerial decisions are sometimes not solely in the hands of the instructor. Some teach courses they did not create; others create courses they'll never teach (Creasman, 2012). Decisions about learning objectives, assignments, and assessments can then end up being collaborative decisions, as in curriculum committees overseeing several sections of the same course. This is especially true if accreditation and program review requirements mandate certain student-learning outcomes be emphasized and assessed.

Instructor characteristics related to student ratings include previous experience teaching the course and desire to teach. Instructors who have taught a course previously are better prepared because they have already set goals and objectives, selected textbooks, written a syllabus and lesson plans, prepared technology, created student activities, and decided on teaching methods. Students are more engaged with the content we want them to learn when they sense their instructor shares a passion for the subject matter (Berkeley Center for Teaching and Learning; Smith, 2011). Such intensity can be expressed through the instructor's enthusiasm, own research, personal experiences, ideas, and feelings. Teacher enthusiasm is, in turn, positively correlated with college students' behavioral, cognitive, and emotional engagement, intrinsic goal orientation, and academic self-efficacy (Zhang, 2014).

The causal direction of the relationship between course circumstances and ratings is unknown. Instructors who have previous experience teaching the course, who have a stronger desire to teach a course, and who view students as enthusiastic, prepared, and hard working may

actually do a better job of preparing for and teaching the course. In that sense, then, the higher ratings reflect better preparation and instruction. Alternatively, when students are unenthusiastic to learn, under-prepared, and have poor work habits, instructors may have less desire to teach and consequently do a poorer job. In either case, the ratings reflect what students perceive as poorer teaching.

A second major finding from the study is that teaching methods related to organization, clarity, enthusiasm/expression, and rapport/interactions are predictive of overall student ratings of course and instructor excellence (see Table 5). Organization has its greatest influence on overall ratings of the course. Clarity influences ratings of both the course and the teacher. Enthusiasm/expression is shown in multiple teacher behaviors. By introducing stimulating ideas about the topic, instructors seem to influence overall impressions of the course and the teacher. But, inspiring students and demonstrating the importance of the subject matter affect only ratings of the course. Finally, rapport/interactions influence student ratings of the teacher. Displaying a personal interest in students and helping them to answer their own questions creates favorable impressions in students' views of the instructor.

Implications

The current findings offer supporting evidence for the validity of IDEA's *Teaching Essentials*. Consistent with previous findings (Hoyt & Lee, 2002), faculty perceptions of instructor and managerial circumstances have little impact on ratings of the teacher and the course. This is consistent with previous findings that course circumstances and instructor differences are either unrelated or only weakly related to student ratings (Benton & Cashin, 2014). On the other hand, instructor perceptions of student characteristics are related to student ratings. When instructors believe student enthusiasm, effort, and background preparation affects

learning positively student, their overall ratings tend to be higher. Accordingly, such student characteristics will be used to adjust ratings on the two overall summary ratings (Benton & Li, 2015).

Based on the findings, we develop a succinct instrument that aims to provide instructors with student feedback on the seven fundamental teaching methods, which are prerequisites for effective teaching and learning. For each course evaluated, instructors receive a report offering suggestions on teaching based on their students' responses to *Teaching Essentials.* Recommendations on actions are made based on two factors: the comparison in average score on the teaching method between the instructor's course and other courses with similar class size and comparable level of student motivation, as well as the proportions of students who report the frequency of the teaching method to be "frequently" or "almost always."

As its name suggests, *Teaching Essentials* measure the extent to which instructors practice the four broad categories of teaching behaviors, which are theoretically and empirically related with student learning. Moreover, those teaching methods represent general pedagogical strategies that are applicable to courses of various disciplines, formats, settings, and sizes. The versatile characteristic of *Teaching Essentials* makes it beneficial for full- and part-time faculty, online and face-to-face courses, and end-of-course and periodic feedback.

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Table 1

Teaching Method Subscale Styles on the IDEA Student Ratings Diagnostic Form

I. Stimulating Student Interest
4. Demonstrated the importance and significance of the subject matter
8. Stimulated students to intellectual effort beyond that required by most courses
13. Introduced stimulating ideas about the subject
15. Inspired students to set and achieve goals which really challenged them
II. Fostering Student Collaboration
5. Formed "teams" or "discussion groups" to facilitate learning
16. Asked students to share ideas and experiences with others whose backgrounds and viewpoints differ from their own
18. Asked students to help each other understand ideas or concepts
III. Establishing Rapport
1.Displayed a personal interest in students and their learning
2. Found ways to help students answer their own questions
7. Explained the reasons for criticisms of students' academic performance
20. Encourage student-faculty interactions outside of class (office visits, phone calls, e-mail, etc.)
IV. Encouraging Student Involvement
9. Encouraged students to use multiple resources (e.g. data banks, library holdings, outside experts) to improve understanding
11. Related course material to real life situations
14. Involved students' in "hands-on" projects such as research, case studies, or "real-life" activities
19. Gave projects, tests, or assignments that required original or creative thinking
V. Structuring Classroom Experience
3. Scheduled course work (class activities, test, and projects) in ways which encouraged students' to stay up-to-date in their work
6. Made it clear how each topic fit into the course
10. Explained course material clearly and concisely
12. Gave tests, projects, etc. that covered the most important points of the course
17. Provided timely and frequent feedback on tests, reports, projects, etc. to help students improve

Table 2

Means and Standard Deviations (in parentheses) by Perceived Impact of Course Circumstances on Learning

Circumstance/Expected Impact	Excellent Teacher	Cohen' *d*	Excellent Course	Cohen's *D*
Physical facilities and or/equipment				
Positive (*n* = 187,028)	51.7 (9.2)		52.5 (9.5)	
In between (*n* = 147,747)	51.2 (9.2)		51.4 (9.6)	
Negative (*n* = 57,654)	50.5 (9.7)	.13	50.9 (10.1)	.17
Previous experience in teaching this course				
Positive (*n* = 325,740)	51.8 (8.9)		52.4 (9.3)	
In between (*n* = 42,538)	49.6 (10.2)		50.1 (10.3)	
Negative (*n* = 7,756)	47.8 (9.6)	.45	47.5 (11.3)	.52
Substantial changes in teaching approach, course assignments, content, etc.				
Positive (*n* = 112,611)	51.5 (9.3)		52.2 (9.7)	
In between (*n* = 204,900)	51.7 (9.0)		52.2 (9.4)	
Negative (*n* = 17,347)	49.6 (10.2)	.20	50.0 (10.5)	.22
Desire to teach this course				
Positive (*n* = 346,670)	51.7 (9.1)		52.3 (9.4)	
In between (*n* = 53,657)	49.1 (10.1)		49.1 (10.1)	
Negative (*n* = 3,380)	48.2 (10.7)	.38	47.6 (11.0)	.50
Control over course management decisions (objectives, texts, exams, etc.)				
Positive (*n* = 290,437)	51.9 (9.0)		52.6 (9.3)	
In between (*n* = 92,039)	50.2 (9.8)		50.4 (10.0)	
Negative (*n* = 11,037)	48.5 (10.8)	.37	47.3 (11.1)	.57
Students' level of preparation for taking the course				
Positive (*n* = 124,335)	52.2 (9.0)		53.3 (9.3)	
In between (*n* = 169,856)	51.9 (8.8)		52.5 (9.3)	
Negative (*n* = 84,385)	48.9 (10.1)	.35	48.5 (10.2)	.50
Students' level of enthusiasm for the course				
Positive (*n* = 203,987)	52.8 (8.6)		54.1 (8.9)	
In between (*n* = 122,263)	50.8 (9.2)		51.1 (9.3)	
Negative (*n* = 56,111)	47.6 (10.4)	.58	46.1 (10.3)	.87
Students' level of effort to learn				
Positive (*n* = 224,234)	52.4 (8.9)		53.4 (9.2)	
In between (*n* = 109,517)	51.1 (9.1)		51.3 (9.4)	
Negative (*n* = 51,647)	47.8 (10.4)	.50	47.1 (10.2)	.67
Technical/instructional support				
Positive (*n* = 129,456)	51.3 (9.4)		52.0 (9.7)	
In between (*n* = 200,830)	51.6 (9.1)		51.9 (9.6)	
Negative (*n* = 26,971)	50.6 (9.8)	.07		.07

Table 3

Bayesian Model Averaging on Overall Summary Measures by Class Size

Excellence of teacher Class Size = Small

Model Size	R^2	TM1	TM2	TM3	TM4	TM5	TM6	TM7	TM8	TM9	TM10	TM11	TM12	TM13	TM14	TM15	TM16	TM17	TM18	TM19	TM20
Full	.83	.14	.08		.02	-.01			.03	-.03	.24	-.01		.10	-.01	.03	-.04	.02			.01
3 vars	.82	.19									.29			.10							
4 vars	.82	.15	.09								.27			.07							
5 vars	.82	.15	.10								.26			.11			-.06				
6 vars	.82	.15	.09								.25			.11			-.06	.03			
7 vars	.83	.15	.08						.05	-.03	.26			.10			-.05				
8 vars	.83	.15	.08						.04	-.03	.25			.10			-.05	.02			

Excellence of teacher Class Size = Medium

Model Size	R^2	TM1	TM2	TM3	TM4	TM5	TM6	TM7	TM8	TM9	TM10	TM11	TM12	TM13	TM14	TM15	TM16	TM17	TM18	TM19	TM20
Full	.87	.16	.08	.01	.01	.00			.02	-.02	.26	-.01		.10	-.01		-.05	.02	-.01	.02	
3 vars	.86	.19									.31			.08							
4 vars	.87	.20									.30			.13			-.06				
5 vars	.87	.16	.09								.28			.11			-.07				
6 vars	.87	.16	.08								.27			.11			-.07	.02			
7 vars	.87	.16	.09								.26			.11	-.02		-.06	.02			
8 vars	.87	.16	.08								.26			.11	-.02		-.07	.02		.02	

Excellence of teacher Class Size = Large

Model Size	R^2	TM1	TM2	TM3	TM4	TM5	TM6	TM7	TM8	TM9	TM10	TM11	TM12	TM13	TM14	TM15	TM16	TM17	TM18	TM19	TM20
Full	.90	.13	.10					-.02	.02	-.02	.28	-.01	.02	.11			-.06	.02			
3 vars	.89	.14	.10								.35										
4 vars	.90	.19									.32			.13			-.07				
5 vars	.90	.13	.11								.30			.11			-.08				
6 vars	.90	.13	.10								.28		.03	.11			-.07				
7 vars	.90	.13	.11							-.02	.28		.03	.11			-.06				
8 vars	.90	.13	.10							-.02	.28		.02	.11			-.06	.01			

Excellence of teacher Class Size = Very Large

Model Size	R^2	TM1	TM2	TM3	TM4	TM5	TM6	TM7	TM8	TM9	TM10	TM11	TM12	TM13	TM14	TM15	TM16	TM17	TM18	TM19	TM20
Full	.94	.12	.10		.04		-.06		.02	-.02	.32	-.02		.12			-.06	.02			
3 vars	.93	.16							.06		.38										
4 vars	.93	.18									.33			.12			-.06				
5 vars	.93	.13	.11								.31			.11			-.07				
6 vars	.93	.12	.10								.30			.10			-.07	.02			
7 vars	.94	.13	.10				-.05				.32			.13			-.07	.02			
8 vars	.94	.12	.11							-.02	.30	-.03		.12			-.06	.02			

Excellence of course. Class Size = Small

Model Size	R^2	TM1	TM2	TM3	TM4	TM5	TM6	TM7	TM8	TM9	TM10	TM11	TM12	TM13	TM14	TM15	TM16	TM17	TM18	TM19	TM20
Full	.70	.02		.02	.07	-.03	.04	.02	.02	-.06	.13			.19	.03	.08	-.03		.02	.02	-.02
3 vars	.69										.20			.22		.10					
4 vars	.69				.10						.16			.18		.08					
5 vars	.70				.10					-.06	.16			.19		.11					
6 vars	.70				.10					-.05	.16			.21		.12	-.03				
7 vars	.70				.08		.04			-.05	.14			.20		.12	-.03				
8 vars	.70				.08		.04			-.06	.14			.19		.11	-.04			.03	

Excellence of course. Class Size = Medium

Model Size	R^2	TM1	TM2	TM3	TM4	TM5	TM6	TM7	TM8	TM9	TM10	TM11	TM12	TM13	TM14	TM15	TM16	TM17	TM18	TM19	TM20
Full	.74	.01		.01	.09	-.04	.06		.01	-.06	.11	-.02	.01	.22	.04	.08	-.03	.01	.03	.02	-.02
3 vars	.73				.13						.15			.24							
4 vars	.73				.12						.15			.20		.07					
5 vars	.74				.12					-.06	.15			.21		.10					
6 vars	.74				.11					-.05	.14			.23		.11	-.04				
7 vars	.74				.09		.05			-.05	.12			.22		.11	-.04				
8 vars	.74				.09		.05			-.06	.13			.22	.02	.10	-.04				

Excellence of course. Class Size = Large

Model Size	R^2	TM1	TM2	TM3	TM4	TM5	TM6	TM7	TM8	TM9	TM10	TM11	TM12	TM13	TM14	TM15	TM16	TM17	TM18	TM19	TM20
Full	.78				.07	-.03	.04		.04	-.02	.13	-.02		.21	.02	.05		.01	.02		
3 vars	.77								.09		.19			.26							
4 vars	.77				.09						.16			.21		.08					
5 vars	.78				.08				.05		.16			.21		.05					
6 vars	.78				.08	-.01			.04		.15			.21		.06					
7 vars	.78				.08	-.01			.04		.14			.21		.06		.02			
8 vars	.78				.06	-.02	.04		.04		.13			.20		.06		.02			

Excellence of course. Class Size = Very Large

Model Size	R^2	TM1	TM2	TM3	TM4	TM5	TM6	TM7	TM8	TM9	TM10	TM11	TM12	TM13	TM14	TM15	TM16	TM17	TM18	TM19	TM20
Full	.80		-.07		.09	-.05			.04	-.03	.12			.25	.03	.11		.02	.06	-.03	
3 vars	.79										.15			.29		.11					
4 vars	.79										.14			.31		.15				-.06	
5 vars	.79				.10	-.04					.11			.24		.13					
6 vars	.80				.09						.09			.26		.13		.03		-.05	
7 vars	.80				.09	-.02					.09			.26		.14		.03		-.04	
8 vars	.80		-.06		.11	-.05				-.03	.12			.24		.14			.06		

Table 4

Teaching Methods Related to Overall Summary Measures

	Overall Summary Measure	
Teaching Methods	Excellence of Course	Excellence of Instructor
Organization	Made clear how each topic fit	
Clarity	Explained material clearly and concisely	Explained material clearly and concisely
Enthusiasm/expression	Introduced stimulating ideas Inspired students Demonstrated subject importance	Introduced stimulating ideas
Rapport/interactions		Displayed personal interest Helped students answer own questions