# College students' evaluation of effective teaching: Developing an instrument and assessing its psychometric properties

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**ABSTRACT**

Students' evaluations of teaching (SETs) are currently the most commonly used method for evaluating teaching effectiveness in higher education institutions. They aid in evaluating the quality of faculty teaching and provide useful information for administrators, faculty, and students. The majority of SET instruments were developed based on faculty and/or administrators' knowledge and experience but excludes students' input. The goals of this study were to develop a SET instrument using student samples from the United Arab Emirates University (UAEU), identify its dimensions, and assess its psychometric properties. Data collected from a total sample of 2367 students who were selected randomly and distributed in three different sub-samples. In the process of developing the SET instrument, two types of validity: content and construct, and two types of reliability: stability of the instrument over time and internal consistency were evaluated. A confirmatory factor analysis (CFA) was also used to cross-validate the developed instrument. The final version of the SET instrument consists of 29 items in five dimensions. These five dimensions are: Teachers' Knowledge and Organization (7 items), Clear Explanation (6 items), Grading and Evaluation (6 items), Teaching Methods (4 items), and Relationship with Students (6 items). The developed SET is neither short nor long and is not subject matter specific, so it can be used in different classrooms.

Keywords**:** students' evaluation of teaching, teaching effectiveness, learning, teaching evaluation, effective teaching, college students

## INTRODUCTION

Students' evaluations of teaching (SETs) are currently the most commonly used method for evaluating teaching effectiveness in higher education institutions. In fact, they receive more attention than do other measures of teaching such as peer evaluation, faculty self-reports or individual teaching portfolio (Comm & Manthaisel, 1998; Seldin, 1993). Moreover, SETs are often used by many institutions as the sole measure of teacher effectiveness (Washburn & Thornton, 1996; Wilson, 1998). They aid in evaluating the quality of faculty teaching and provide useful information for administrators, faculty, and students. The results obtained from SETs can be used for several administrative decisions such as tenure, promotion, merit pay, salary increase, teaching award, and contract renewal. This is the summative function or assessment of SETs. For faculty members, teaching evaluations provide useful feedback to improve their future teaching performance and facilitate growth (Rifkin, 1995). This is known as the formative function or assessment of SETs. Data generated by SETs can also be used to develop and improve courses. Finally, for students, results and information from evaluating faculty members assist in selecting future courses and instructors (Gary & Bergmann, 2003; Marsh & Roche, 1993). The use of SETs also gives students an important opportunity to effectively contribute to the teaching-learning process. According to a major literature review: "SETs are (1) multidimensional; (2) reliable and stable; (3) primary a function of the instructor who teaches the course rather than the course that is taught; and (4) relatively valid against a variety of indicators of effective teaching" (Marsh, 2001, *p*. 184).

SET instruments typically contain one or more Likert-type rating scales and some open-ended questions that allow students to write their comments or suggestions. However, the essential part that is usually used in making decisions is the rating scales. Reviewing many SET instruments indicates that these evaluation forms cover many characteristics of good or effective teaching, such as teaching methods, knowledge, organization, interaction with students, clarity, effective communication, grading, using technology, flexibility, enthusiasm, and valuable feedback (Marsh & Bailey, 1993). The characteristics of effective teaching also includes fairness of grades, rapport with students, personal characteristics, and preparation (Jackson, et.al., 1999), availability of instructor outside the classroom, workload, interesting presentations, clarifying difficult points (Gursoy & Umbreit, 2005), and others. However, there are some characteristics of effective teaching that are usually not included in SET instruments. These are mostly characteristics that cannot be observed by students in the classroom, such as course design, quality of readings, academic standards, and quality of assignments (Murray, 2005). In general, "The validity and usefulness of SET information depends upon the content and coverage of the items and the SET factors that they reflect" (Marsh, 2007, *p*. 321).

Research has shown that teaching effectiveness is multidimensional (Marsh, 2001; Gage & Berliner, 1992; Huitt, 1995). Some indicators/components (e.g., communication skills, attitude toward the students, knowledge of the subject, organizational skills, enthusiasm, fairness, flexibility, and encouragement of students) are identified to be strongly related to teaching effectiveness (Kim, Damewood, & Hodge, 2000). Toland & Alyala (2005) identified three dimensions of teaching effectiveness namely, instructor delivery of course information, instructor-student interaction, and regulation of students' learning. Marsh & Roche (1997) identified nine dimensions: learning/value, enthusiasm, organizing, group interaction, relationship with students, extent of coverage, examination and grading, assignments, and workload/difficulty. Jackson et al. (1999) identified the following six factors: relationship with

students, course value, organization, grading, difficulty, and workload. Similarly, Gursoy & Umbreit (2005) identified four factors: learning, instruction, organization, and workload as effective teaching measures. Marks (2000) identified five dimensions: organization, workload, expected grades, teacher's concern, and learning. In the UAE, Badri, Abdulla, Kamali, & Dodeen (2006) identified five factors of teaching effectiveness: knowledge and performance in teaching, grading, overview of the course, requirements/efforts, and course outcomes.

Regardless of the number and construct of dimensions, it is clear that SETs assess distinguished components of effective teaching. However, there is no agreement on the nature and number of dimensions underlying students' perceptions of teaching effectiveness (Gursoy & Umbreit, 2005). Therefore, understanding the multidimensionality of effective teaching is essential when validating instruments and interpreting final ratings. Particularly, formative diagnostic feedback from SETs, which intends to improve teaching and learning, should reflect this multidimensionality (Marsh, 2007).

The majority of SET instruments were developed based on faculty and administrators' knowledge and experience, supplemented by review of previous research (Marsh, 2007), but excludes students' input (Ory & Ryan, 2001). For example, in the last 10 years, the United Arab Emirates University (UAEU) used three different SET instruments to evaluate teaching effectiveness of its faculty members. The three forms were developed by specialized ad hoc committees of administrators and faculty members based on their education, experience in teaching at the college level, and through reviewing similar SET instruments used by other universities. However, none of these instruments were validated or assessed by students before their use. In general, students are in a unique position to identify teaching effectiveness, teachers' performance, and teachers' characteristics that enhance learning. Another noteworthy observation here is that most research in effective teaching has used samples of U.S. students only (Vulcano, 2007). Researchers (e.g., L'Hommedieu, Menges & Brinko, 1990; Murray, Rushton, and Paunonen, 1990), recommend that one must always determine the validity and utility of the evaluative instrument at the local institution at which it is used. Hence, the goals of this study are to develop a SET instrument using student samples from UAEU, identify its dimensions, and assess its psychometric properties.

## METHODOLOGY

### Participants

Data of the study were collected from the students of UAE University. The University has an enrolment of approximately 13,000 students. A random sample (2367 students) participated in this study in three different sub-samples. A brief description of each sub-sample is presented in the Results section.

### Development Process

Developing the SET instrument was conducted in the following steps:

**1. Determining the Aspects of Effective Teaching**

The main aspects of effective teaching were identified through an extensive review of literature on teaching effectiveness and evaluation at the college level. These aspects included essential

characteristics of teacher performance, teacher qualities and behaviors, and classroom environments.

## 2. Assessing Validity

"Validity is an indication of how well an instrument actually measures what it is intended to measure, and helps to ensure that there are no logical errors in drawing conclusions from the data" (Dodeen, 2003, *p*. 7). When validating a SET instrument, it is recommended to collect evidences to support both the content and the construct validity (Marsh, 2007). Following this, evidences of both types of validity were assessed as follows:

a. Content-related validity: this is the degree to which the content of the items of the instrument reflects the content domain of interest. Generally, content-related validity is established if content experts review and agree that the instrument items are representing the aspects of the construct to be assessed. To assess content validity of the current instrument, a panel of faculty members from UAEU with similar educational background and experience were recruited to review the instrument.

b. Construct-related validity: this refers to the degree to which an instrument is measuring an intended hypothetical construct (Gay, 1996). It also involves "how well the scoring structure of the instrument corresponds to the construct domain" (Onwuegbuzie et al, 2007, p. 118). Statistically, construct-related validity can be assessed through the use of Exploratory Factor Analysis (EFA) procedure.

## 3. Assessing Reliability

Reliability of an instrument means the extent to which "the results could be replicated if the same individuals were tested again under similar circumstances" (Crocker & Algina, 1986, p.105). Two types of reliability were assessed: stability overtime and internal consistency:

a. Stability Overtime – an indicator of how much the instrument is presenting similar results overtime. A random sample of 242 students participated in this analysis. The instrument was administered twice within three weeks. The correlation between students' answers on the two administration times was used to assess the instrument stability.

b. Internal Reliability: The internal reliability of the SET instrument was assessed using Cronbach's alpha. The minimum recommended level is 0.70 (Nunnally & Bernstein, 1994).

## 4. Cross-Validating the SET Instrument

After identifying the nature and the number of underlying dimensions that structure the developed SET instrument, a Confirmatory Factor Analysis (CFA) was employed to cross-validate the factor structure. A total of 1081 students participated in this analysis.

On evaluating the results of the CFA, several fit statistics were used. Chi-square tests the fit between the sample covariance matrix and the matrix implied by the model. A large and statistically significant chi-square value indicates poor fit (Hu & Bentler, 1995; Oliver, Jose, & Brough, 2006). As chi-square is sensitive to the sample size, it is

usually recommended to utilize other fit statistics that are insensitive to sample size, such as the comparative fit index (CFI), the goodness-of-fit index (GFI), and the non-normed fit index (NNFI) (Byrne, 2001).

## RESULTS

Prior to the statistical analyses, all variables in the collected data set were screened for outliers or extreme values. No outliers or extreme values were identified. The data sets were also screened for missing values. Most of the variables had very few missing cases which did not affect the results. Participants with many missing data were deleted.

### Developing the Initial Version of the SET Instrument

Through extensive review of literature on teaching effectiveness, and students' evaluation at the college level, and by reviewing related research on educational measurement, 42 different aspects of effective teaching were identified. These aspects consist of characteristics of teacher's performance, teacher qualities and behaviors, and classroom environments. The list included knowledge, planning, organization, interaction with students, clarity, teaching methods, effective communication, grading, using technology, enthusiasm, flexibility, and others. It is necessary to note that these attributes are just characteristics or teaching techniques that are usually correlated with teaching effectiveness because effective teaching itself is a construct, and there is no measure that for effective teaching (Marsh, 2007). The list was reviewed several times and many modifications were made. By the end of this step, an initial version of the SET instrument was developed.

### Assessing Content-Related Validity

A group of 15 faculty members from UAEU, with different backgrounds and long teaching experience at the university level, was recruited to review the content-related validity of the present instrument. The review process included item content, wording, clarity, appropriateness to university students, relationships with other items, and all related issues that may improve the items or the instrument as a whole. All ambiguous items were either removed or rewritten. All notes, comments, and suggestions produced by the reviewers were carefully collected, analyzed, and considered. This resulted in changing, deleting, modifying or adding a few items to the developed instrument. By the end of this step, a revised version of the instrument was prepared. This version consisted of only 38 items. The importance or value of each of these items were assessed from students' perspective. A 5-point Likert scale ranged from Not At All Important (1) to Extremely Important (5) was applied on these items.

### Assessing Construct-Related Validity

Exploratory Factor Analysis (EFA) procedure was used to assess the construct-related validity. The goal of this analysis was to identify the number and nature of the components or dimensions that underline the present SET instrument. A total of 1060 students responded to the 38 items that constitute the developed SET instrument. Table 1 (Appendix) describes the demographics of the participating students. The student sample represented the actual percentages of males and females, as well as, the eight colleges in the UAE University. The

sample also included students from all educational levels with different GPA records that ranged from very low to very high.

To determine the appropriateness of factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett test of sphericity were examined. The KMO measure of sampling adequacy yielded an acceptable level of .972, while the Bartlett test of sphericity produced a chi-square value of 26848.160 with 666 degrees of freedom, which was statistically significant ($p < .001$). Thus, the set of the items together met the requirements for factor analysis. "To ensure that each factor identified by EFA has only one dimension and each attribute loads only on one factor, attributes that have factor loadings of lower than .40, and attributes on more than one factor with a loading score of equal to or greater than .40 were eliminated" (Gursoy & Umbreit, 2005, *P.* 96). This procedure resulted in the elimination of 9 items. Through factor analysis with Varimax rotation, five factors were identified (see figure 1 Appendix), explaining 64.50% of the variance . The five factors were: Teachers' Knowledge and Organization (7 items), Clear Explanation (6 items), Grading and Evaluation (6 items), Teaching Methods (4 items), and Relationship with Students (6 items). The identified factors were graphed by a scree plot (below). The plot determined the magnitude of the eigenvalues of each factor in descending order. Five factors were clearly identified before the plot starts to level off.

By the end of this step, a validated form of the SET instrument was developed, which had 29 items in five factors. The five factors, the items of each factor, and the loadings of items on their corresponding factor are summarized in Table 2 (Appendix)

**Assessing Reliability**

Assessing the reliability of the present SET instrument included assessing stability overtime and internal consistency. A random sample of 242 students (193 females and 49 males) was used in assessing sstability over time. The SET instrument was conducted on the participating students twice within three weeks. The correlation of students' responses on the two applications times was calculated as a measure of stability over time. The correlation coefficient was .65, and it was statistically significant ($p<.001$).

Cronbach's alpha was used to assess the internal reliability of the developed version of the SET instrument (29 items). The minimum recommended level of internal reliability is .70 (Nunnally & Bernstein, 1994). The value of Cronbach's alpha was .96, which indicated that the instrument is internally reliable. Internal reliability was also calculated for each of the five components or factors and alpha values were as follows: Teachers' Knowledge and Organization $\alpha = .91$, Clear Explanation $\alpha = .89$, Grading and Evaluation $\alpha = .80$, Teaching Methods $\alpha = .84$, and Relationship with Students $\alpha = .67$. The reliability analysis indicated that the SET form is stable overtime, and it is internally reliable.

**Confirmatory Factor Analysis (CFA):**

A confirmatory factor analysis (CFA) was conducted to determine the plausibility of the five factor structure for the developed SET instrument. The five factors and their items were: Teachers' Knowledge and Organization (7 items: 2, 3, 4, 5, 6, 7, and 9), Clear Explanation (6 items: 10, 11, 12, 13, 14, and 15), Grading and

Evaluation (6 items: 16, 17, 18, 19, 20, and 21), Teaching Methods (4 items: 23, 24, 26, and 27), and Relationship with Students (6 items: 31, 34, 35, 36, 37, and 38).

Data used for the CFA was the responses of a random sample of students (n = 1081). Table 3 (Appendix)summarizes the demographic information of these participants. Clearly, the actual percentages of males and females, as well as, the 8 colleges in the University were well represented in this sample. The sample also included students from all educational levels with different GPA records that ranged from very low to very high.

The three fit statistics used in this analysis were the comparative fit index (CFI), the goodness-of-fit index (GFI), and the non-normed fit index (NNFI). Index values of .90 or higher indicate a good fit for these three measures. Also, a residual estimate that is usually recommended is the root mean square error of approximation (RMSEA). A value of less than .10 for RMSEA is considered adequate (Bentler & Bonnett, 1980). The results of the fit indexes were: CFI = .914, GFI = .864, NNFI = .905, while the residual estimates were RMSEA = .063. As all fit indexes were above the cut-off point, (expect GFI which is very close) this was considered an adequate fit.

**The final SET Instrument Version**

The analysis and the development steps above resulted in producing a final version of the SET instrument (see Table 4 (Appendix )). This version consisted of 29 items in five dimensions. Items were given new numbers from 1 to 29, and a 5-point Likert scale was used on these items which ranged from very poor (1) to very good (5).

## DISCUSSION

Students' evaluations play a significant role in the evaluation of teaching effectiveness at the university level worldwide. The goals of this study were to develop a SET instrument using samples of students from UAEU, identify its dimensions, and assess its psychometric properties. As emphasized by Marsh (2007), SET instruments should be developed using a theory in teaching, or an empirical technique such as factor analysis, or a systematic method to ensure content-related validity. Inadequately developed instruments fail to provide a comprehensive, multidimension evaluation, especially for diagnostic purpose. Important components of effective teaching could be missing from SETs. The empirical technique was used in the development of the present SET instrument.

The process of developing a SET instrument included several steps and psychometrical procedures. Developing the items of the scale was firstly dependent on an extensive review of the related literature on teaching effectiveness at the university level. Then, a group of experienced faculty members with background in education, measurement and evaluation, or educational psychology, reviewed the items of the developed instrument. Next, several validation procedures that included content and construct validity were used. Similarly, the instrument reliability was assessed through several procedures and by using several student samples' responses. CFA was used to cross-validate the final version of the instrument using a new random sample of students.

The final version of the developed SET instrument consists of 29 items in five dimensions. These five dimensions are: Teachers' Knowledge and Organization (7 items), Clear Explanation (6 items), Grading and Evaluation (6 items), Teaching Methods (4 items), and

Relationship with Students (6 items). This result corresponds to the related literature, which clearly indicates that students' evaluation of effective teaching is multidimensional (Gurosy & Umbreit, 2005; Jackson et al.,1999; Marks, 2000; & Marsh, 2007). Several dimensions of teaching evaluation have been identified by researchers. For example, Toland & Alyala (2005) identified three dimensions: instructor delivery of course information, instructor-student interaction, and regulation of students' learning. Gurosy and Umbreit (2005) found four components that significantly influence students' perceptions of effective teaching: learning, organization, instruction, and workload. Five components: organization, difficulty, grading, instructor concern, and learning were identified in Mark's (2000) study. Jackson et al. (1999) listed six factors: relationship with students, course value, organization, grading, difficulty, and workload. By comparing the results of this study with the literature, it could be observed that the five dimensions of effective teaching identified in this study are similar to dimensions identified by other studies. In particular, organization, grading, and relationship with students seem to be the most common dimensions in most SET instruments.

The final version of the developed SET instrument consists of 29 items, which is neither short nor long, and is easy to use. It is important to observe that the developed SET instrument is not subject matter specific, so it can be used in different classrooms. Additional research is needed, however, to replicate and refine the instrument and its utility in assessing teaching effectiveness using different samples of university students.

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## APPENDIX

Table 1
Students' demographic profile- exploratory factor analysis sample

| | | Number | Percentage | | | Number | Percentage |
|---|---|---|---|---|---|---|---|
| Gender | Males | 202 | 19.1 | College | Humanities | 406 | 38.4 |
| | Females | 858 | 80.9 | | Sciences | 92 | 8.7 |
| Year | First | 31 | 3.0 | | Education | 86 | 8.1 |
| | Second | 144 | 13.9 | | Business | 120 | 11.4 |
| | Third | 402 | 38.9 | | Engineering | 101 | 9.6 |
| | Fourth | 323 | 31.3 | | Law | 128 | 12.1 |
| | Graduate | 133 | 12.9 | | Agriculture | 69 | 6.5 |
| GPA | 3.50-4.00 | 143 | 13.8 | | IT | 54 | 5.5 |
| | 3.00-3.49 | 259 | 24.9 | | | | |
| | 2.50-2.99 | 355 | 34.2 | | | | |
| | 2.00-2.49 | 247 | 23.8 | | | | |
| | < 2 | 35 | 3.4 | | | | |

Table 2
Exploratory factor analysis of students' evaluation of effective teaching

| | | Factor loadings |
|---|---|---|
| Factor 1: Knowledge and Organization (7 items) | | |
| Item 2 | The instructor is well-prepared in his/her course | .608 |
| Item 3 | The instructor is informative when responding to students' questions | .622 |
| Item 4 | The instructor states goals and objectives clearly | .601 |
| Item 5 | Lectures are well organized | .725 |
| Item 6 | Effective use of class time | .787 |
| Item 7 | The class time is carefully planned | .739 |
| Item 9 | Effective classroom management | .559 |
| Factor 2: Clear Explanation (6 items) | | |
| Item 10 | Assignments, projects, activities,..etc are clear | .442 |
| Item 11 | Examples are used to simplify difficult points | .653 |
| Item 12 | Clear presentations of course materials | .745 |
| Item 13 | Clear explanations of concepts and principles | .750 |
| Item 14 | Emphasizing difficult points and facts | .599 |

| | | |
|---|---|---|
| Item 15 | Examination questions are clear | .598 |
| Factor 3: Grading and Evaluation (6 items) | | |
| Item 16 | Examination cover content emphasized by the instructor | .480 |
| Item 17 | Grading criteria are clear | .542 |
| Item 18 | Offers useful feedback on assignments, projects, activities,… | .684 |
| Item 19 | Offers useful feedback on tests | .712 |
| Item 20 | His/her grading policy is fair | .633 |
| Item 21 | Uses variety of assessment methods | .533 |
| Factor 4: Teaching Methods (4 items) | | |
| Item 23 | Uses teaching aids and technology effectively | .617 |
| Item 24 | Presents course materials at an appropriately paced sequence | .537 |
| Item 26 | Encourages students to seek knowledge from multiple resources | .705 |
| Item 27 | Motivates students to learn | .627 |
| Factor 5: Interaction with Students (6 items) | | |
| Item 31 | Cares for students' learning | .560 |
| Item 34 | Treats students with respect | .702 |
| Item 35 | Accepts different viewpoints presented by students | .716 |
| Item 36 | Available outside the classroom for assisting students | .584 |
| Item 37 | Treats all students fairly | .721 |
| Item 38 | Flexible/open-minded when dealing with students | .708 |

Table 3
Students' demographic profile - confirmatory factor analysis sample

| | | Number | Percentage | | | Number | Percentage |
|---|---|---|---|---|---|---|---|
| Gender | Males | 210 | 19.4 | College | Humanities | 417 | 38.6 |
| | Females | 871 | 80.6 | | Sciences | 85 | 7.9 |
| Year | First | 30 | 2.8 | | Education | 100 | 9.3 |
| | Second | 165 | 15.3 | | Business | 117 | 10.8 |
| | Third | 396 | 36.6 | | Engineering | 112 | 10.4 |
| | Fourth | 324 | 30.0 | | Law | 104 | 9.6 |
| | Graduate | 146 | 13.5 | | Agriculture | 71 | 6.6 |
| GPA | 3.50-4.00 | 151 | 14.0 | | IT | 67 | 6.2 |
| | 3:00-3:49 | 273 | 25.3 | | | | |
| | 2:50-2.99 | 371 | 34.3 | | | | |
| | 2:00- 2:49 | 227 | 21.0 | | | | |
| | < 2 | 35 | 3.2 | | | | |

Table 4
Students' evaluation of teaching instrument

| | | Very Poor | Poor | Moderate | Good | Very Good |
|---|---|---|---|---|---|---|

| | |
|---|---|
| Knowledge and Organization | |
| 1 | The instructor is well-prepared in his/her course |
| 2 | The instructor is informative when responding to students' questions |
| 3 | The instructor states goals and objectives clearly |
| 4 | Lectures are well organized |
| 5 | Effective use of class time |
| 6 | The class time is carefully planned |
| 7 | Effective classroom management |
| Clear Explanation | |
| 8 | Assignments, projects, activities,..etc are clear |
| 9 | Examples are used to simplify difficult points |
| 10 | Clear presentations of course materials |
| 11 | Clear explanations of concepts and principles |
| 12 | Emphasizing difficult points and facts |
| 13 | Examination questions are clear |
| Grading and Evaluation | |
| 14 | Examination cover content emphasized by the instructor |
| 15 | Grading criteria are clear |
| 16 | Offers useful feedback on assignments, projects, activities,… |
| 17 | Offers useful feedback on tests |
| 18 | His/her grading policy is fair |
| 19 | Uses variety of assessment methods |
| Teaching Methods | |
| 20 | Uses teaching aids and technology effectively |
| 21 | Presents course materials at an appropriately paced sequence |
| 22 | Encourages students to seek knowledge from multiple resources |
| 23 | Motivates students to learn |
| Interaction with Students | |
| 24 | Cares for students' learning |
| 25 | Treats students with respect |
| 26 | Accepts different viewpoints presented by students |
| 27 | Available outside the classroom for assisting students |
| 28 | Treats all students fairly |
| 29 | Flexible/open-minded when dealing with student |