

A Criteria-Based Course and Instructor Evaluation System

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ABSTRACT

This paper describes a criteria-based course and instructor evaluation system that has been recently deployed by the School of Electrical Engineering at Purdue University. The various evaluation forms are described along with the criteria used to evaluate both lecture and lab oriented courses. The software used to analyze the scannable forms and the variety of report formats generated are also described.

INTRODUCTION

In the early 1970's, the School of Electrical & Computer Engineering (ECE) at Purdue University adopted a course & instructor evaluation system to be used in all courses (undergraduate and graduate, lecture and laboratory classes). The evaluation system adopted was based on a series of questions that students could respond to using a five-point scale, with answers ranging from "strongly agree" to "strongly disagree" (the Purdue Center for Instructional Services has compiled a large set of such questions — referred to as the CAFETERIA System — from which "customized" course & instructor evaluation forms can be constructed). For its course & instructor evaluation forms, ECE chose a set of ten questions (eleven for the "lab" version of the form); this same set of questions was used for over twenty years. The analysis performed was fairly straight-forward: the mean of each question was computed on a five-point scale (with "5" → "strongly agree" and "1" → "strongly disagree"), and from equally weighted arithmetic averages of several of these means, three composite scores were computed: (1) an "instructor" score, (2) a "course" score, and (3) a "facilities" score. Associated with each composite score was a "percentile". A sample of the CAFETERIA-style form used is illustrated in Figure 1, and a sample of the report output produced appears in Figure 2.

MOTIVATION FOR CHANGE

Despite the virtue of simplicity, there was a significant amount of frustration among the ECE faculty concerning the CAFETERIA-style evaluation system, and perhaps in particular the kinds of questions used. A classic example is the author's personal favorite: "My instructor explains difficult material clearly" (what this question is really gauging is the *student's ability* to understand difficult material, and is perhaps more accurately rephrased as, "I am able to clearly understand difficult material"). Another example is: "My instructor is among the best teachers I have ever known". What is the difference between (simply) "agreeing" with this statement (scoring it "4") and "strongly agreeing" with it (scoring it "5")? And, teacher *of what subject?* — no focus is provided as to the comparison group that should be considered in formulating the response.

There was also confusion concerning how the composite scores were generated, i.e., which questions were used to calculate the "course" score, the "instructor" score, and the "facilities" score, as well as how the

questions were "weighted". But perhaps the greatest frustration was trying to understand the associated "percentile" scores — not only was the comparison base ill defined (all courses — including sophomore-level courses with 300 students, senior-level labs with 10 students, and graduate-level course with 5 students — were lumped into a *single* comparison base), but also wide swings in percentile scores appeared to result from very small differences in the composite score (e.g., a ± 0.01 difference between Professor A's "instructor" score and Professor B's "instructor" score could manifest as a 10 to 20 point difference in percentile scores). Clearly, the atmosphere was ripe for change!

A CRITERIA-BASED EVALUATION SYSTEM

In search for a viable alternative, the author began experimenting with a *criteria-based* course & instructor evaluation system in 1991. The underlying motivation was to develop an instrument that could provide useful feedback towards improving courses as well as instructional technique. Another motivation was to provide students with an "evaluation scale" they readily understood: the "A-B-C-D-F" grading scale. To clearly delineate the "course" and "instructor" criteria, as well as to help focus students' responses through the use of subsidiary questions, were additional factors motivating the design. Last, but certainly not least, was the motivation to clearly show how each calculation was performed, and to illustrate — in a graphical fashion — how a given course "stacked up" against other courses in its comparison group (and to clearly define the constituents of each comparison group).

A key challenge in the design of the new course & instructor evaluation instrument was not only the choice of criteria (such as "text", "exams", etc.), but also the choice (and *wording*) of appropriate subsidiary questions to help focus students' responses (e.g., "did the text help you learn the material" and "did the exams reflect your knowledge of the course material", etc.). The latter proved to be one of the more difficult aspects of the entire project.

After three successful independent trials, the author presented the preliminary results obtained using the criteria-based evaluation strategy to the ECE Curriculum Committee in 1993. After "much discussion" (what faculty do best) and some minor modifications, the system was adopted for use in all ECE courses, effective Fall 1994. The "lecture course/lecture instructor" evaluation form adopted appears in Figure 3 (the "lab course/lab instructor" evaluation form is similar in form, but uses different criteria). Note that a provision has been provided for each instructor to specify up to two additional "course" related questions and up to two additional "instructor" related questions. Also, note the inclusion of "cross/reality check" (or, "overall assessment") questions for both the course (#13) and the instructor (#8). A place is also provided on the form for students to include written comments.

Because of the large volume of forms utilized each semester, a scannable version of each (double-sided) form had to be designed. The scannable versions of these forms were designed and printed by NCS Corporation, the manufacturer of the scanner used by Purdue's Center for Instructional Services.

ANALYSIS SOFTWARE

The software needed to analyze the results obtained and produce reports for both faculty and ECE School administrators can best be described by examining the various report formats. Referring to the sample faculty report, illustrated in Figure 4, note that the first page simply contains a tabulation of all the raw data along with calculations of the *Criteria Grade Averages* (or, CGAs, based on a "A = 4.0" scale). Means for both the course and the instructor are also calculated, based on equally-weighted averages of CGAs 1-12 and 1-7 for the course and instructor, respectively. Note that question 13 on the course evaluation and question 8 on the instructor evaluation provide a "cross/reality check" between the course/instructor means computed —

empirically, we have found the respective pairs to be fairly close, which is encouraging. The second page of the report contains graphs of the course and instructor CGAs vs. the average CGAs for the comparison group (currently, there are three "hard-coded" comparison groups: undergraduate lecture courses, graduate lecture courses, and (all) lab courses). "Straight-line" plots representing the equally-weighted mean of the course/instructor CGAs are superimposed on these plots. From these plots, an individual instructor can quickly ascertain the strengths/weakness of his/her course or instructional technique, relative to peers in the comparison group.

For the ECE Curriculum Committee — which is privy only to the "course" portion of the evaluation (traditionally, the "instructor" portion has been private) — a single-page report for each course is generated. This report contains the tabulation along with the plot for the course evaluation. Appended to the end of the report are summary plots for each comparison group; each display the "CGA curve" for that group along with the *range* of each CGA.

FUTURE WORK

One of the current limitations of the analysis software is the "hard coding" of the three comparison groups (undergraduate lecture, graduate lecture, all labs). A future goal is to design a new "header form" for each course (i.e., the form that provides the course number, instructor name, enrollment, etc., for the set of evaluation forms which follow) that includes the capability to *specify* additional comparison groups (e.g., sophomore/junior "core" courses, senior electives, etc.). Another goal, now that we have amassed data from several semesters, is to devise a way to graphically illustrate "history" information — different ways to condense and display this data will have to be explored. A final challenge we have been charged with is to determine how the data should be summarized for "public posting" (as well as *where* and *how* it should be posted).

SUMMARY

The new criteria-based course & instructor evaluation system described in this paper has successfully been used for three semesters (and one summer session) at Purdue's School of Electrical and Computer Engineering. Student reaction to its use has been generally favorable, and a number of faculty have commented that the results obtained "make sense" to them. A study detailing faculty/student reaction to the system will be described in a forthcoming paper.

ACKNOWLEDGEMENTS

The author would like to thank Robert F. Pierret for his efforts, as the ECE Curriculum Committee Chairman, in bringing this project to fruition — without his help, we would surely still be guessing what it means to "explain difficult material clearly".

BIOGRAPHY

DAVID G. MEYER is currently an Associate Professor at the School of Electrical & Computer Engineering, Purdue University, West Lafayette, Indiana, specializing in multimedia educational delivery systems, advanced architecture microprocessors, parallel processing computer systems, and electro-acoustics.

INSTRUCTOR AND COURSE APPRAISAL / LECTURE PORTION OF LAB/LECTURE COURSE

Please read each statement carefully, then select one of these five alternatives:
Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), Strongly Disagree (SD)

1. Overall, this course is among the best I have ever taken.	SA	A	U	D	SD
2. I am generally pleased with the text(s) required for this course.	SA	A	U	D	SD
3. The size of this class is appropriate to course objectives.	SA	A	U	D	SD
4. My background is sufficient to enable me to use the course material.	SA	A	U	D	SD
5. Complexity and length of course assignments are reasonable.	SA	A	U	D	SD
6. Exams cover a reasonable amount of material.	SA	A	U	D	SD
7. Overall, this instructor is among the best teachers I have known.	SA	A	U	D	SD
8. Outside help is readily available.	SA	A	U	D	SD
9. My instructor explains difficult material clearly.	SA	A	U	D	SD
10. My instructor is well prepared for class.	SA	A	U	D	SD
11. _____	SA	A	U	D	SD
12. _____	SA	A	U	D	SD

Place written comments in space below:

Figure 1. CAFETERIA-style lecture course & instructor evaluations used previously.

COURSE	362	+-----+			CLASS	MAJOR		
DIVISION	01	SUMMARY			-----	-----		
SECTION	00	Instructor	MEAN	PT	Freshman	0	EE	25
NO. STUDENTS	35	3.9	39		Sophomore	2	ME	0
INSTRUCTOR	Prof. X	Course	3.8	61	Junior	23	CEE	0
SEMESTER	Summer 94	Facilities	3.5	28	Senior	10	MSE	10
					Graduate	0	AAE	0
					Other	0	IE	0
				+-----+			Other	0

	SA	A	U	D	SD	MEAN	%ILE
	(5)	(4)	(3)	(2)	(1)		
1. Overall, this course is among the best I have ever taken.	14	10	8	1	2	3.9	56
2. I am generally pleased with the text(s) required for this course.	6	16	5	6	2	3.5	38
3. The size of this class is appropriate to course objectives.	8	24	3	0	0	4.1	44
4. My background is sufficient to enable me to use course material.	11	18	3	3	0	4.1	56
5. Complexity and length of course assignments are reasonable.	5	20	6	3	1	3.7	13
6. Exams cover a reasonable amount of material.	8	18	7	1	1	3.9	13
7. Overall, this instructor is among the best teachers I have known.	9	14	9	1	2	3.8	56
8. Outside help is readily available.	6	15	9	3	2	3.6	38
9. My instructor explains difficult material clearly.	7	19	5	2	2	3.8	39
10. My instructor is well prepared for class.	10	22	2	0	1	4.1	50

Figure 2. Sample report generated for CAFETERIA-style evaluations used previously.

Part A: Course Evaluation

Major	
<input type="checkbox"/> EE	<input type="checkbox"/> AAE
<input type="checkbox"/> CmpE	<input type="checkbox"/> IE
<input type="checkbox"/> ME	<input type="checkbox"/> CS
<input type="checkbox"/> MSE	<input type="checkbox"/> Other

Class	
<input type="checkbox"/> Fr	<input type="checkbox"/> Sr
<input type="checkbox"/> So	<input type="checkbox"/> Gr
<input type="checkbox"/> Jr	<input type="checkbox"/> Other

Expected Grade	
<input type="checkbox"/> A	<input type="checkbox"/> D
<input type="checkbox"/> B	<input type="checkbox"/> F
<input type="checkbox"/> C	<input type="checkbox"/> ?

Avg Out-of-Class Hrs/Wk Devoted to This Course	
<input type="checkbox"/> 1-2	<input type="checkbox"/> 7-9
<input type="checkbox"/> 3-4	<input type="checkbox"/> 10-12
<input type="checkbox"/> 5-6	<input type="checkbox"/> > 12

Grade each criterion, listed below, based on the following scale (use **N/A** to indicate *not applicable*):

A	B	C	D	F
<i>excellent</i>	<i>good / above average</i>	<i>average</i>	<i>marginal / below average</i>	<i>poor</i>

COURSE EVALUATION CRITERIA	A	B	C	D	F	N/A
1. Content of Course (e.g.: <i>Do you consider the knowledge and skills taught in this course valuable components of your engineering education?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Organization of Course (e.g.: <i>Was the lecture material logically organized and well-paced? Did it follow the course outline?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Administration of Course (e.g.: <i>Were course policies and procedures clearly delineated in the materials provided to you on the first day of class, and subsequently followed?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Outside Help (e.g.: <i>Were help resources — T.A., grader, reserve books, help sessions, etc. — available as necessary for you to successfully complete this course?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Background Provided by Prerequisites (e.g.: <i>How well did this course build on the background provided by the specified prerequisites? Were you sufficiently prepared?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Course Text (e.g.: <i>Did it help you learn the material? Did it correspond well to the course syllabus? Was it accurate? Was it readable? Did it contain sufficient examples?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Supplemental Course Notes (e.g.: <i>Did the supplemental notes help you learn the course material? Did they complement the material in the course text?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Homework Assignments (e.g.: <i>Did they help you learn the course material? Could they be completed in a reasonable amount of time?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Exams (e.g.: <i>Did they reflect your knowledge of the course material? Could they be completed in the allotted time? Were they designed so you could display what you knew?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Quizzes (e.g.: <i>Did they help you learn the course material? Did they help prepare you for the exams? Could they be completed in the allotted time?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Projects (e.g.: <i>Did they help reinforce your overall understanding of the course material and help tie things together? Could they be completed in the allotted time?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Lab Experiments (e.g.: <i>Were they well coordinated with the lecture material? Did they help you learn the course material? Could they be completed in the allotted time?</i>)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Overall Assessment of Course (In reflecting on all the criteria listed above, how would you rate this course?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 3(a). New criteria-based lecture evaluation form — course side.

Part B: Instructor Evaluation

Grade each criterion, listed below, based on the following scale (use **N/O** to indicate *no opinion*):

A	B	C	D	F
<i>excellent</i>	<i>good / above average</i>	<i>average</i>	<i>marginal / below average</i>	<i>poor</i>

INSTRUCTOR EVALUATION CRITERIA	A	B	C	D	F	N/O
1. Preparation for Lecture (e.g.: Did your instructor exhibit sufficient knowledge of the subject matter? Was your instructor well-prepared for each class?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Clarity of Presentation (e.g.: Did your instructor present the lecture material in an organized fashion, and clearly explain or illustrate key points?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. General Instructional Technique (e.g.: How would you rate the instructor's overall ability to present information and promote learning?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Availability Outside of Class (e.g.: Was the instructor available outside of class a sufficient amount of time each week? Was outside consultation encouraged?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Rapport with Students (e.g.: Did the instructor actively involve students in the learning process? Did the instructor encourage classroom participation?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Effectiveness in Answering Questions (e.g.: Did the instructor ensure that students' questions were answered satisfactorily? Did the instructor encourage questions?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Effort Put Forth in Teaching Class (e.g.: How would you rate the overall amount of time and effort put forth by the instructor in teaching this class?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Overall Assessment of Instructor (In reflecting on all the criteria listed above, how would you rate this instructor?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part C: Course & Instructor Comments

Figure 3(b). New criteria-based lecture evaluation form — instructor side.

Course & Instructor Evaluation Data for: EE362 Division 01 Section 00

Semester: Summer 1995 Instructor: Prof. X

Number of student evaluation forms processed for this report: 47 (Enrollment: 49)

MAJOR									
EE	CmpE	ME	MSE	AAE	IE	CS	Other	N/R	Err
29	15	0	0	0	0	0	0	1	2

EXPECTED GRADE								
A	B	C	D	F	?	N/R	Err	GPA
21	19	4	0	0	1	1	1	3.39

CLASS							
Fr	So	Jr	Sr	Gr	Other	N/R	Err
0	2	40	4	0	0	1	0

AVG. OUT-OF-CLASS HOURS/WEEK							
1-2	3-4	5-6	7-9	10-12	>12	N/R	Err
0	1	0	5	1	38	1	1

COURSE EVALUATION: ("N/R" indicates no response, "Err" indicates error in scanning data)

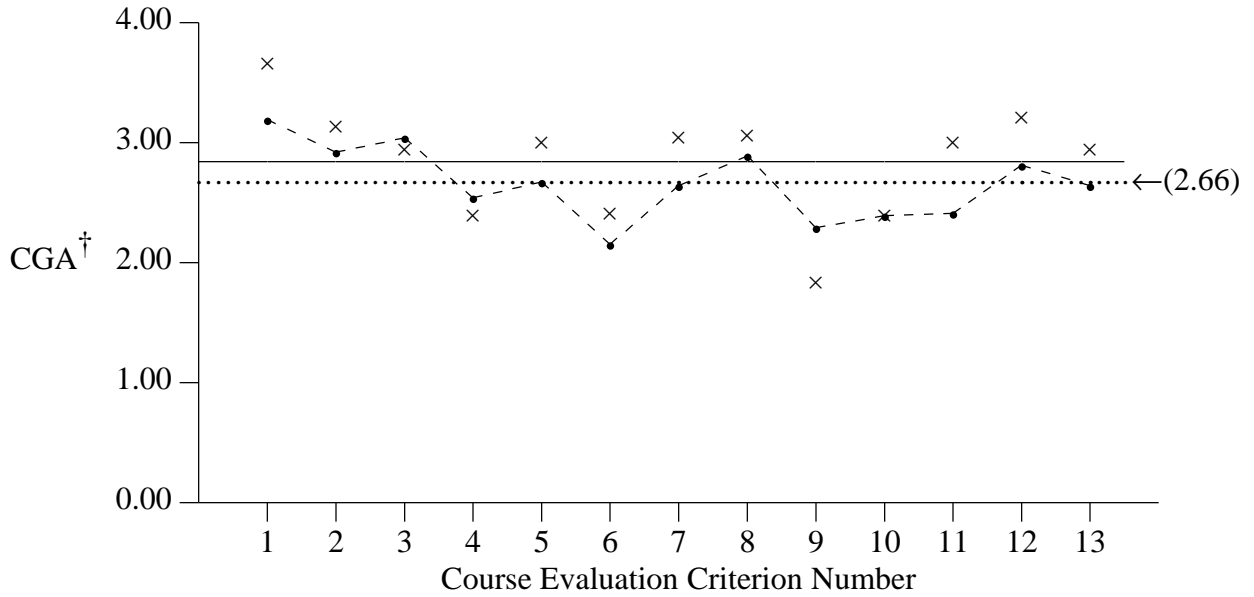
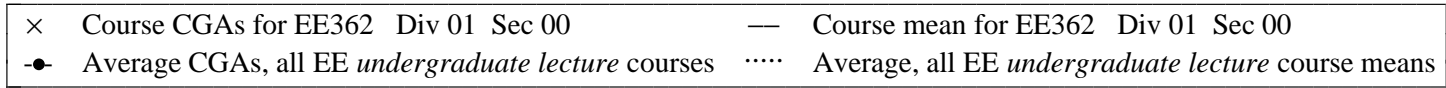
Course Evaluation Criteria	A	B	C	D	F	N/A	N/R	Err	CGA†
1. Content of Course	32	14	1	0	0	0	0	0	3.66
2. Organization of Course	18	19	8	2	0	0	0	0	3.13
3. Administration of Course	14	21	8	3	1	0	0	0	2.94
4. Outside Help	8	18	8	8	4	0	1	0	2.39
5. Background Provided by Prerequisites	15	20	9	3	0	0	0	0	3.00
6. Course Text	10	10	12	5	4	6	0	0	2.41
7. Supplemental Course Notes	18	13	12	2	0	2	0	0	3.04
8. Homework Assignments	13	24	10	0	0	0	0	0	3.06
9. Exams	5	3	21	15	3	0	0	0	1.83
10. Quizzes	4	19	16	5	2	0	1	0	2.39
11. Projects	13	24	7	3	0	0	0	0	3.00
12. Lab Experiments	19	21	5	2	0	0	0	0	3.21
13. Overall Assessment of Course	9	28	8	2	0	0	0	0	2.94
14. Overall effectiveness of technology-delivered course format.	8	22	9	4	3	0	1	0	2.61
15. (No instructor-supplied Question #2 was specified)	0	0	0	0	0	0	47	0	0.00
COURSE MEAN (based on total of criteria 1 – 12)	169	206	117	48	14	8	2	0	2.84

INSTRUCTOR EVALUATION:

Instructor Evaluation Criteria	A	B	C	D	F	N/O	N/R	Err	CGA†
1. Preparation for Lecture	22	16	4	1	0	4	0	0	3.37
2. Clarity of Presentation	17	20	6	3	0	1	0	0	3.11
3. General Instructional Technique	12	17	14	4	0	0	0	0	2.79
4. Availability Outside of Class	5	6	15	8	13	0	0	0	1.62
5. Rapport with Students	8	16	9	8	2	4	0	0	2.47
6. Effectiveness in Answering Questions	17	13	11	6	0	0	0	0	2.87
7. Effort Put Forth in Teaching Class	8	14	8	12	5	0	0	0	2.17
8. Overall Assessment of Instructor	9	17	13	8	0	0	0	0	2.57
9. Effectiveness of instructor in video presentation format.	9	18	11	7	2	0	0	0	2.53
10. (No instructor-supplied Question #2 was specified)	0	0	0	0	0	0	47	0	0.00
INSTRUCTOR MEAN (based on total of criteria 1 – 7)	89	102	67	42	20	9	0	0	2.62

Figure 4(a). Sample report generated for new criteria-based evaluation form — first page.

Course Evaluation Summary for: EE362 Division 01 Section 00 Semester: Summer 1995



Instructor Evaluation Summary for: Prof. X Semester: Summer 1995

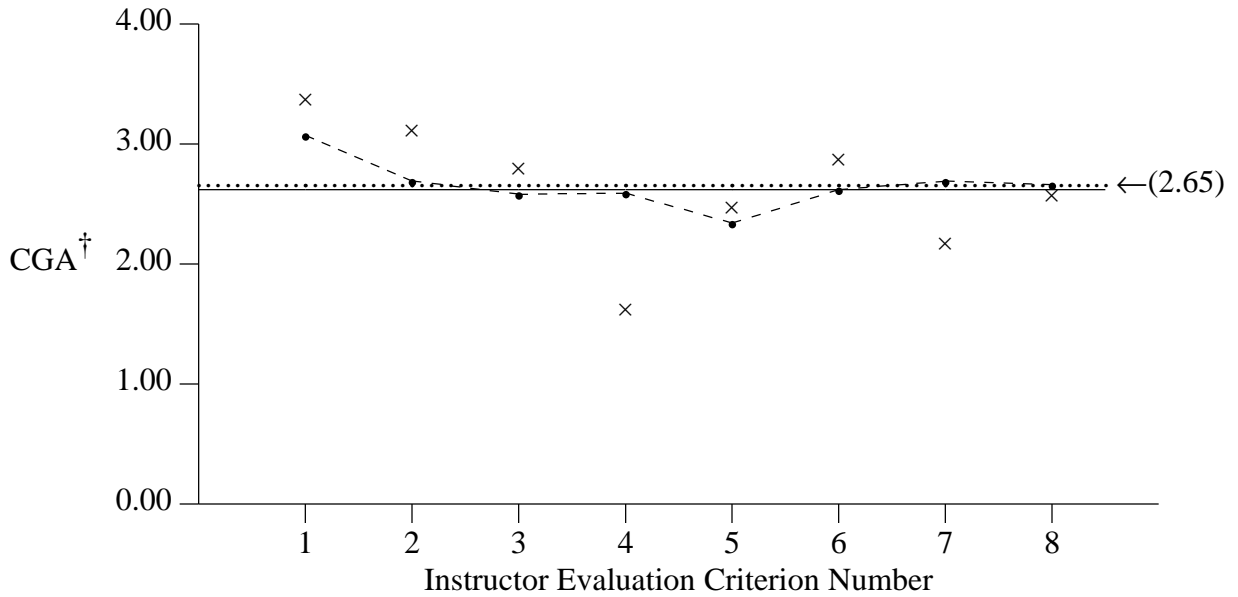
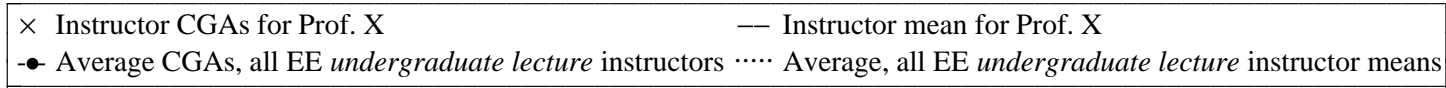


Figure 4(b). Sample report generated for new criteria-based evaluation form — second page.