DOCUMENT RESUME

ED 106 350 TM 004 466

AUTHOR	Van Nelson, C.; Cossaart, Elaine R.
TITLE	Does the Instructor or the Course Make the Most Difference in Student Evaluation of Instruction?
PUB DATE	[Apr 75]
NOTE	19p.; Paper presented at the Annual Meeting of the American Educational Research Association (Washington, D.C., March 30-April 3, 1975) For a related document, see TM 004467
EDRS PRICE	MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS	Classes (Groups of Students); *College Majors; College Students; College Teachers; *Effective Teaching; Higher Education; *Participant Satisfaction; *Sampling; Statistical Analysis; Teacher Evaluation; *Teacher Rating
IDENTIFIERS	*Mathematical Sciences Instructor Evaluation Form

ABSTRACT

Data from a total of 6,726 evaluation forms collected over three terms supplied information concerning instructors and courses. Items on the evaluation forms were separated into five factors. The variance-covariance matrix of these factors for each class was compared with the combined variance-covariance matrix of the other classes taught by the instructor. It was also compared with the combined variance-covariance matrix of other sections of the same course taught by different instructors. In most cases, the variance-covariance matrix for a given class resembled the combined variance-covariance matrix of other classes taught by the instructor. (Author)

DOES THE INSTRUCTOR OR THE COURSE MAKE THE MOST DIFFERENCE IN STUDENT EVALUATION OF INSTRUCTION?

C. Van Nelson

Ball State University

Elaine R. Cossaart

Muncie Community Schools

While there does not seem to exist a clear-cut definition of good teaching, student evaluations are used to measure some aspect of the instructor's effectiveness. Some institutions, or departments in institutions, use student evaluation in promotion and tenure deliberations. While any evaluation of an instructor is an implied comparison with other instructors that the evaluator has experienced, a direct quantitative comparison among instructors would seem to be valid only if the evaluators are from the same population.

It is a distinct possibility, however, that the students who are evaluating instructors come from different populations. The Department of Mathematical Sciences at Ball State University serves mathematics and computer science majors and minors, elementary education majors, business majors, and students who need to take mathematics to fulfill a general studies requirement. It seems possible that a mathematics major would rate the effectiveness of an instructor teaching a mathematics course

differently than an elementary education major would rate the effectiveness of the instructor in a mathematics course for elementary education majors.

Instructors also complain that they have had a "bad" class. There is evidence to support the claim that an instructor using the same methods may get different ratings in different sections of the same course (Center for Improved Learning,1972).

To test for a consistent population, one can test for homogeneity of variance. If homogeneity of variance cannot be established and the sample sizes are different, a comparison of the means of one sample with another may not be valid.

Theoretical Framework

The researchers assisted in the development of an evaluation form where five components were identified (Nelson,1974). These five components were named Instructor Presentation, Interaction-Evaluation, Classroom Details, Student Motivation, and Course Information. A copy of the form used in the evaluation appears in Appendix A. The statements on the evaluation form were related to the components as follows:

Component	Statements
Instructor Presentation	1-10
Interaction-Evaluation	11-18
Classroom Details	19-24
Student Motivation	25-27
Course Information	28-32

Scoring of the evaluation form was done using the method of summated ratings with normal deviate weights (Nelson,1974). The use of normal deviate weights insures a multi-normal distribution.

Morrison(1967) suggests a generalization of Bartlett's test for homogeneity of variance with p variates. This procedure involves the calculation of M, where $M = (\sum_{i=1}^{k} n_i) \ln |S| - \sum_{i=1}^{k} n_i \ln |S_i|$, n_i is the number of observations in each of k samples, $|S|$ is the determinant of the covariance matrix when the samples are pooled, and $|S_i|$ is the determinant of the ith sample covariance matrix. Box(1949) has shown that the quantity MC^{-1} is approximately distributed as a chi-squared variate with degrees of freedom $\frac{1}{2}(k-1)\,p\,(p+1)$, where $C^{-1} = 1 - \frac{(2p^2 + 3p - 1)(k+1)}{6\,(p+1)\,k}\left(\sum_{i=1}^{k} \frac{1}{n_i} - \frac{1}{\sum_{i=1}^{k} n_i}\right)$.

This approximation appears to be good if k and p do not each exceed 5. For other values of k and p, he suggests the quantity $\frac{M}{b}$ approaches the F distribution with f_1 and f_2 degrees of freedom, where $b = \frac{f_1}{1 - A_1 - \frac{f_1}{f_2}}$, $f_1 = \frac{1}{2}(k-1)\,p\,(p+1)$, $f_2 = \frac{f_1 + 2}{A_2 - A_1^2}$,

$A_1 = \frac{2p^2 + 3p - 1}{6\,(k-1)\,(p+1)}\left(\sum_{i=1}^{k} \frac{1}{n_i} - \frac{1}{\sum_{i=1}^{k} n_i}\right)$, and $A_2 = \frac{(p-1)(p+2)}{6(k-1)}\left(\sum_{i=1}^{k} \frac{1}{n_i^2} - \frac{1}{(\sum_{i=1}^{k} n_i)^2}\right)$

Using the statistical procedure described above, the hypothesis

$$\Sigma_1 = \Sigma_2 = \Sigma_3 = \cdots = \Sigma_k$$

where Σ_i represents the covariance matrix of the ith sample, of equal covariance matrices can be tested against the hypothesis

$$\Sigma_i \neq \Sigma_j$$

that at least two of the covariance matrices are different.

Procedure

The evaluation form was administered three times, Winter quarter 1972-73, Fall quarter 1973, and Spring quarter 1974, in the Department of Mathematical Sciences at Ball State University. The number of usable forms totaled 6726; 2445 Winter quarter 1972-73, 2486 Fall quarter 1973, and 1795 Spring quarter 1974. Normal deviate weights were computed for each quarter. Since these weights did not vary by more than .08, the Fall quarter 1973 weights were used in this study. All personnel teaching classes in the Department of Mathematical Sciences, from graduate assistant to full professor were required to administer these forms in their classes. The data selected for this report included undergraduate courses that had the most sections.

The courses selected were as follows:

Elementary education

Mathematics content: 201, 202, 203, 204, 209
Mathematics methods: 391

Mathematics majors and minors:

Analytic geometry: 113
Calculus: 170, 171, 172
Structures: 211

General Studies Mathematics: 100, 101

Business Mathematics: 131, 132

Table 1 lists the instructors, by code number, and the courses that were taught by these instructors.

Students did not know which instructors would be teaching a particular class, since instructors were assigned to classes after the students had completed registration. Students rarely

Table 1

Courses and Number of Sections taught by Instructors

Instructor	Course 201	202	203	204	209	391	113	170	171	172	211	320*	100	101	131	132
14	1	1	1						1		1					
17	2	1		1	1		2									
24	1		5	2	2	5										
28		2	1		1											
31				2	3	4										
32	1	1	7	1		5										
36							1	1		1						1
37		2												1		
45		3			1			1	1	1						
50				5		5										
53							1	1	1		1					
55	1	2			1			1		1					1	
63		3	2		1			2		1						
68	2			1	2			1					2	2		
71		1													1	
73		1	2									1				2
78				2												
81		1		2	6	6										
85	3	1						1	1							
88	1	2		6			2									
93	2	1											1			
95							2									
97**	1						1									

* Course 320 included to give complete data for instructor 73.
**Data incomplete for instructor 97

were allowed to change sections of a course after the quarter had begun. Although the assignments of students to classes may not have been random, students did not choose a class for the instructor. Most classes had between 15 and 30 students. The only large classes were two sections of course 131 which had 60 and 70 students, and two sections of course 132 which contained 51 and 58 students.

Covariance matrices were computed for each section of every course listed above, and then were pooled to give the covariance matrix for each course and for each instructor. The following hypotheses were then tested using the F distribution, and, where appropriate, the chi-squared distribution:

H_1: There are no differences in the covariance matrices of the five components of the evaluation form among different sections of the same course taught by different instructors.

H_2: There are no differences in covariance matrices of the five components of the evaluation form among different classes taught by the same instructor.

Results

The results for each course are presented in Table 2. Hypothesis H_1 is rejected in every case, and, in all but one case at the .01 level of significance. It is interesting to note that the chi-squared approximation agreed with the F approximation in every case.

The results for each instructor are presented in Table 3.

Table 2

Test for Differences Between Instructors

Course	Number of Sections	Total Number of students	χ^2	df	F	df
201	15	390			2.618**	210,82796
202	22	590			2.723**	315,107294
203	18	437			2.209**	255,53819
204	22	516			2.505**	315,101593
209	18	398			2.474**	255,76144
391	25	513			2.702**	360,94318
113	9	203			2.899**	120,28614
170	8	147			2.568**	105,20012
171	4	94	117.61**	45	2.685**	45,4660
172	4	73	95.39**	45	2.178**	45,6276
211	2	29	41.56**	15	2.755**	15,3352
100	3	66	47,41*	30	1.576*	30,8676
101	3	33	63.34**	30	2.086**	30,2486
131	2	130	39.37**	15	2.624**	15,64836
132	3	129	60.64**	30	2.017**	30,13672

* Significant at .05 level

** Significant at .01 level

Table 3

Test for Differences Between Classes

Instructor	Number of Classes	Total Number of students	χ^2	df	F	df
14	5	154	138.11**	60	2.181**	60,1245
17	7	181			1.882**	90,88038
24	15	371			3.339**	210,79502
28	4	101	107.07**	45	2.372**	45,15789
31	9	177			1.742**	120,32696
32	15	319			1.682**	210,36649
36	4	76	108.53**	45	2.342**	45,1771
37	3	54	45.55*	30	1.695*	30,721
45	7	154			1.670**	90,19644
50	10	225			2.078**	135,42150
53	4	77	88.16**	45	1.947**	45,8321
55	7	217			1.953**	90,15882
63	9	190			2.438**	120,30152
68	10	205			1.464*	135,26139
71	2	92	20.78	15	1.384	15,17626
73	6	192			2.201**	75,16996
78	2	51	15.54	15	1.122	15,9664
81	15	359			2.679**	210,75199
85	6	110	113.81**	75	1.505*	75,10069
93	4	97	105.44**	45	2.337**	45,17743
95	2	46	24.41	15	1.621	15,4406

* Significant at .05 level

** Significant at .01 level

In the 22 cases where data was available, the hypothesis H_2 was rejected 19 times at the .05 level of significance, and 16 of these times at the .01 level of significance. In only one case did the chi-squared approximation differ from the F approximation; this case was therefore considered significant only at the .05 level. In three cases, the hypothesis H_2 could not be rejected.

Conclusions

It is interesting to note that hypothesis H_1, the assumption of equal covariance matrices for each section of a course, could be rejected at least at the .05 level of significance in each case. At the same time, H_2, the assumption of equal covariance matrices for each class taught by an instructor could be rejected in 19 out of 22 cases. In the cases where H_2 could not be rejected, data could only be reported for two classes for the instructor. In cases 78 and 95, the instructors had taught two sections of the same class, while in case 71, the instructor had taught two different courses.

In cases 24, 31, 32, 50, and 81, the instructors are restricted to the elementary education majors. Even so, the results reported for these instructors indicate unequal covariance matrices. These instructors are the only personnel of the department with an elementary teaching licence and thus qualified to teach the elementary methods course, math 391. However, the results indicate unequal covariance matrices for this course.

At least in this study, the classes seemed to make the difference in the covariance matrices. Students generally seemed to give favorable ratings to an instructor; the average rating across items for all 6726 students was 1.01, which coincides with the "Agree" category. It is possible that the differences in the covariance matrices between classed were caused by a small percentage of students that rate the instructor in the "Disagree" or "Strongly Disagree" category on several statements.

There is also the possibility that the evaluation form used was not suited to comparing differences among classes. The researchers would like to see a similar study done using another evaluation form.

Student evaluation of instruction is only one measure of instructor effectiveness. The results presented indicate that the means for classes may be difficult to compare. If the results of a student evaluation are to be used for comparison of personnel, the results should be substantiated by another means of evaluating the instructor such as class visitation.

References

Box, G. E. P. A General Distribution Theory for a Class of Likelihood Criteria, Biometrika, 36, (1949) pp. 317-346.

Center for Improved Learning, Faculty and Course Evaluation 1971-1972, Student Association, Student Services, Inc., Ball State University, Muncie, Indiana,(1972) pp. 34-35.

Morrison, Donald F. Multivariate Statistical Methods. New York: McGraw-Hill Book Company,(1967) pp.152-153.

Nelson, C. Van, Cossaart, Elaine R. The Adaptation of the Method of Summated Ratings Using Normal Deviate Weights to a Form for Student Evaluation of Instruction. Paper presented at the AERA 1974 convention, Chicago, Ill.

Appendix A

INSTRUCTIONS

Please follow the instructions below carefully. This will help us in processing these forms. It is requested that you do NOT sign your name.

1. Be sure that you are using a No. 2 pencil.

2. On the Evaluation Form, record the course number, section number, and instructor code number for the class in which you are enrolled.

3. On the Evaluation Form, circle the number corresponding to your reason for taking the course.

4. In the upper right hand corner of the machine form you will find a section titled, "Identification Number." In the top three squares, record the course number. Now darken one number in each of the top three rows corresponding to the digits that you recorded for the course number.

5. Do the same for the section number, instructor code number and the number for your reason for taking the class. Use two digits to record your section number. For example, if you are in section 2, record this as 02.

6. Circle your response to each statement on the Evaluation Form, then Record your response in the LEFT column of the machine form. The number in parentheses beside each statement in the Evaluation Form shows where you are to record the answer on the machine form. For example, statement 2 on the Evaluation Form is recorded as 5 in the first column of the machine form.

7. When you have responded to all items and have made any comments that you wish to make, place your Evaluation Form face down in the appropriate pile in the front of the room and the corresponding machine form face down in the other pile.

MATHEMATICAL SCIENCES INSTRUCTOR EVALUATION FORM

Classification:

Course number:

Section number:

Instructor Code number:

My reason for taking this course is that

0. it is a requirement on a major or minor in a mathematical science.
1. it is a requirement on a major or minor other than one in a mathematical science.
2. it is an elective on a major or minor in a mathematical science.
3. it is an elective other than a major or minor in a mathematical science.
4. a reason other than above.

Circle one of the following categories for each statement below, then darken the appropriate square on the machine form. The code is:

a.	Strongly Agree	SA
b.	Agree	A
c.	Neutral	N
d.	Disagree	D
e.	Strongly Disagree	SD

Instructor Presentation

(1)	1.	The course content was presented in a coherent manner, with major points emphasized, and relationships made clear.	SA	A	N	D	SD
(5)	2.	The instructor seemed well-prepared for the lectures, discussions, or other activities.	SA	A	N	D	SD
(9)	3.	The instructor provided enough examples and illustrations to clarify the material for me.	SA	A	N	D	SD

(13)	4. The instructor seemed enthusiastic about teaching.	SA	A	N	D	SD
(17)	5. The instructor seemed to have a thorough knowledge of the subject.	SA	A	N	D	SD
(21)	6. The instructor had a sufficient vocabulary, used appropriate language, correct grammar, and expressed his ideas clearly.	SA	A	N	D	SD
(25)	7. The instructor spent a minimum amount of class time on information unrelated to the course content.	SA	A	N	D	SD
(29)	8. The instructor's presentations made class attendance worthwhile.	SA	A	N	D	SD
(33)	9. The instructor's pacing of the course material was satisfactory.	SA	A	N	D	SD
(37)	10. The method of instruction was adequate; I see no need for an appreciable change in the instructor's method.	SA	A	N	D	SD
(41)	11. The instructor gave a sufficient number of appropriate assignments based on or related to the material covered.	SA	A	N	D	SD
(45)	12. Tests or other evaluative measures were appropriate to the course.	SA	A	N	D	SD
(49)	13. The instructor encouraged questions in class.	SA	A	N	D	SD
(53)	14. The instructor's answers to questions were usually adequate.	SA	A	N	D	SD
(57)	15. The instructor tried to establish conditions conducive to learning.	SA	A	N	D	SD
(61)	16. The instructor maintained office hours and/or provided adequate opportunity for individual help.	SA	A	N	D	SD
(65)	17. The instructor had sufficient evidence, in terms of written work, projects, or tests, to evaluate my performance.	SA	A	N	D	SD
(69)	18. The instructor's grading system seemed fair to me.	SA	A	N	D	SD

(73) 19.	I was able to read what was written on the chalkboard.	SA	A	N	D	SD
(77) 20.	I was able to hear the instructor without difficulty.	SA	A	N	D	SD
(81) 21.	The instructor dressed appropriately for class.	SA	A	N	D	SD
(85) 22.	The instructor was well-groomed.	SA	A	N	D	SD
(89) 23.	The instructor had a pleasant speaking voice.	SA	A	N	D	SD
(93) 24.	The instructor did not have distracting mannerisms.	SA	A	N	D	SD

Motivation

(97) 25.	I made an honest effort to learn in this course.	SA	A	N	D	SD
(101) 26.	I felt intellectually challenged by this course.	SA	A	N	D	SD
(105) 27.	I was motivated to spend time, or at least try to spend time, preparing for the course.	SA	A	N	D	SD

Course information

(109) 28.	I felt that the textbook and/or the other materials were adequate for the course.	SA	A	N	D	SD
(113) 29.	I felt that the description of the course in the catalog was adequate. (Please mark N if you have not read the course description in the catalog.)	SA	A	N	D	SD
(117) 30.	I learned as much as I expected to learn from the course.	SA	A	N	D	SD
(121) 31.	The prerequisites for the course were adequate for me.	SA	A	N	D	SD
(125) 32.	I felt the content of the course, exclusive of instruction, was worthwhile to me.	SA	A	N	D	SD

(129) 33. Year at Ball State University

A. Freshman

B. Sophomore

C. Junior

D. Senior

E. Graduate

(133) 34. My overall grade average at Ball State University is about

A. 1.0

B. 2.0

C. 3.0

D. 4.0

E. My first quarter at Ball State University

(137) 35. The number of class meetings that I have missed was

A. 0 - 2

B. 3 - 5

C. 6 - 8

D. 9 - 11

E. 12 or more

Comments:

Written comments have been found to be particularly helpful to the instructor. Please use this sheet to comment about the instructor, the course, or this evaluation form. Your cooperation is appreciated.