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Board 237: Classroom Skills Desired by Students

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Classroom Skills Desired by Students

Abstract: Over last few decades, education researchers have focused heavily on pedagogy, learning outcomes, academic achievement, retention and graduation, among other host of factors. Instructors and their content delivery techniques and methods (pedagogy) have received a lot of attention and rightly so because instructors have the pivotal role influencing not only the delivery but also the learning outcomes and achievements. Good teaching practices (Classroom skills) ensure conducive learning environment, thereby enhancing the learning experience and the outcomes. In this short manuscript we examine the results of a 40—item survey instrument, originally developed by the Center for Research and Development in Higher Ed., U of CA, Berkeley, and modified subsequently by CU-Denver Office of Teaching Effectiveness. This survey is administered to a junior-level class over a period of six semesters. A subset of twenty-two items is identified. Subsequently, a two-factor structure comprising of 13 items is proposed.

Introduction

A classroom has two major components: Physical (building, blackboard, overhead projector, lighting, seating, IT infrastructure, etc.) and Human component (students and instructor(s)) [1], [2]. While physical aspect of a classroom is static, more or less, the human component is dynamic and evolving. This component creates a multidimensional dynamic environment comprising of social and psychological interactions between student-to-student and student-to-instructor. "The dynamics of the classroom, the tone, the interpersonal forces at play, and the nature and structure of communication patterns all combine to either support or inhibit the students' motivation to pursue a goal" [3].

During the last six decades, the research on classroom environment has received increased attention for high schools and vocational institutions [4], [5], [6], [7]. While many universities and colleges have made significant investments in upgrading classrooms with customized packages, computers, and technology-led infrastructure, the studies on the impact of classroom environment at post-secondary institutions are relatively few [8]. Research shows that classroom environment can affect student motivation and learning [3], [9]. Since instructors help providing opportunities for student-to-instructor interaction and setting the right learning environment, this paper explores instructor-related classroom skills which may influence the learning environment positively.

Motivation

As briefly summarized above, an instructor is responsible to set the right learning environment within the classroom and to some degree outside the classroom. Since a large number of strategies to choose from are available to the instructor, what options or strategies the instructor may pursue to optimize the resulting benefits? It is therefore of interest to identify, if possible, students' perceptions about various strategies available to the instructor. The first objective in the study reported on here is to determine "Which classroom skills *do students value more and want to be practiced by the instructor?"* The second objective is *to reduce the number of prompts to some manageable count* and to identify underlying latent structure, if any.

Methods

A. Participants

The participants in this study were students enrolled at a Southwest Hispanic-Serving Land-Grant University in a junior-level electrical engineering class, EE351- Applied Electromagnetics. Spread over six semesters, a total of 159 students consented to participate in the study. The participants' demographic breakdown is roughly 60% Hispanic and 15% females.

B. Data Collection Instrument and Data Preparation

The survey instrument, in Appendix A, came from Center for Research and Development in Higher Ed., University of CA, Berkeley [10]. The survey consisted of 40 prompts, labelled 1 through 40 and grouped in six sections. This survey was administered to each class at the start of the semester. Each survey item was Likert scale coded from 1 to 5, from the least to the highest interest. Students were asked to select a number (1= Not at all interested, 2= Not interested, 3=Neutral, 4=Interested, and 5=Very interested) for each prompt based on their interest and desire to see instructor practicing the skills in that prompt.

C. Data Analysis

As a first step, the entire data was examined for internal consistency, resulting in Cronbach's Alpha value of 0.92. Subsequently, the data consisting of 40 survey prompts and 159 responses each was averaged. These averages are shown in Figure 1. As is evident from Figure 1, there are about three clusters of prompts getting mean values of 4 or greater.
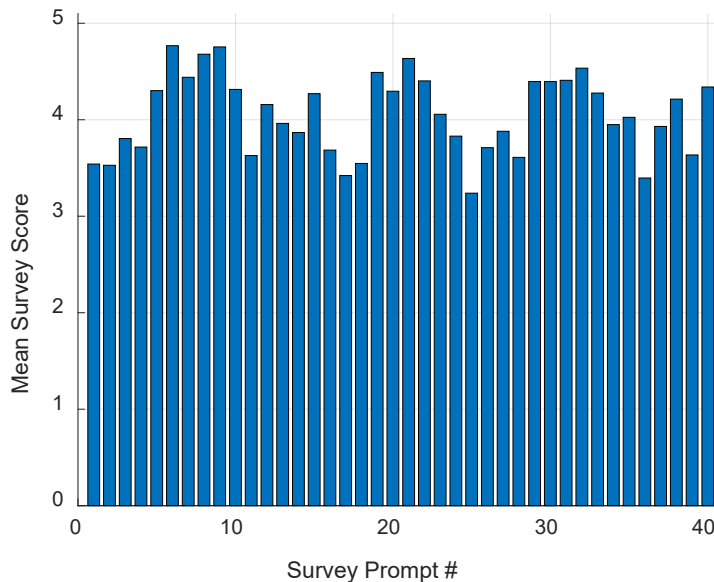

Figure 1: Mean survey score pertaining to each survey prompt (or item). Data pertaining to mean score of 4 or greater is also given in Table 1.

The frequency count of 4 or higher pertaining to each prompt is also examined. This is shown in Figure 2. The 70% frequency count line in Figure 2 can easily be compared with Figure 1, mean survey score of 4 or higher. These results are almost identical, except prompt 13 which is at 70%

count in Figure 2, whereas it is below 4 Figure 1. The resulting 22 prompts (21 common to both methods and including prompt 13) with their averages and standard deviations (Std) are shown in Table 1. The reduction of prompts from 40 prompts to 22 prompts stands at 45%. This provides a good starting point to examine these prompts further.
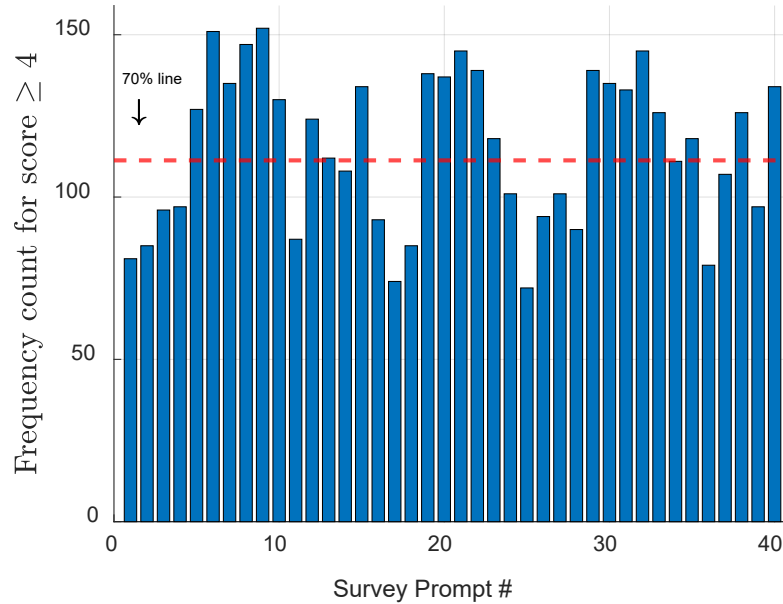

Figure 2: Total count for 4 or 5 pertaining to each survey prompt. Also shown is the 70% count line (red-dotted line).

Exploratory Factor Analysis: The retained 22 survey prompts shown in Table 1 are used for these analyses. In brief, the process moved through the following steps to arrive at the final results. All analyses are done using Matlab's Statistical and Machine Learning packages [11], [12].

1. First, the data was tested for multicollinearity. No multicollinearity was detected.
2. The prompts with communalities > 0.2 were removed one by one, iteratively running the analysis after every removal. Communalities are calculated as sum of the square of the factor loadings. This process resulted in the removal of eight prompts numbered 5, 6, 7, 8, 10, 12, 15, and 35, as numbered in Table 1.
3. We began with five factors, iteratively reducing by one, until solution stabilized for two factors.
4. Next, the cross loadings (ratio between the loadings under each prompt) greater than 75% were removed. This resulted in dropping the prompt # 29, shown in Table 1. Thus, total of nine prompts were removed.
5. Final two-factor solution comprised of thirteen prompts. This presents about 68% reduction of original forty prompts.

Table 1: Classroom skills pertaining to the mean greater than or equal to 4 (Very Interested and Interested), and 70% or higher frequency count for 4 or greater.

Prompt	Mean	Std	Prompt	Mean	Std
5. Generalizes from examples and specific instances	4.30	0.95	22. Keeps students informed of their progress	4.40	0.78
6. Uses examples and illustrations	4.77	0.58	23. Has students apply concepts to demonstrate understanding	4.06	0.92
7. Stresses general concepts and ideas	4.44	0.82	29. Is accessible to students outside of class	4.40	0.92
8. Is well prepared	4.68	0.65	30. Has genuine interest in students	4.40	0.89
9. Explains clearly	4.75	0.73	31. Gives personal help to students having difficulty in the course	4.41	0.92
10 Gives lectures that are easy to outline	4.31	0.94	32. Has a concern for the quality of teaching and learning	4.53	0.73
12. Summarizes to emphasize major points	4.16	0.89	33. Encourages/motivates students to challenge themselves to do high quality work	4.28	0.93
15. Appears to know if class is understanding him/her or not	4.27	0.89	35. Gives interesting and simulating assignments	4.03	1.04
19. Identifies what he/she considers important for purpose of testing	4.49	0.79	38. Appears confident	4.21	0.93
20. Uses exams effectively for synthesis and understanding of course material	4.30	0.9	40. Is enthusiastic	4.34	0.94
21. Is fair and impartial in grading exams, quizzes, etc.	4.64	0.72	13.* Is able to clarify or improvise an awkward communication situation	3.96	0.95

The final two factors (Factor 1 and 2) along with respective loadings are shown in Figure 3. As can be seen in Figure 3, seven prompts (13, 23, 30, 31, 32, 33, 38, and 40; Refer to Table 1 for numbering) are aligned well with Factor 1, and prompts numbered 9, 19, 20, 21, and 22, with Factor 2. The prompt 31 is relatively better loaded on Factor 1, though not as good as other prompts. Thus, Factor 1 and 2, respectively, comprised of eight and five prompts. These prompts along with their respective loadings and other pertinent statistics are tabulated in Table 2.

Table 2: Factor loadings for two factors and pertinent statistics

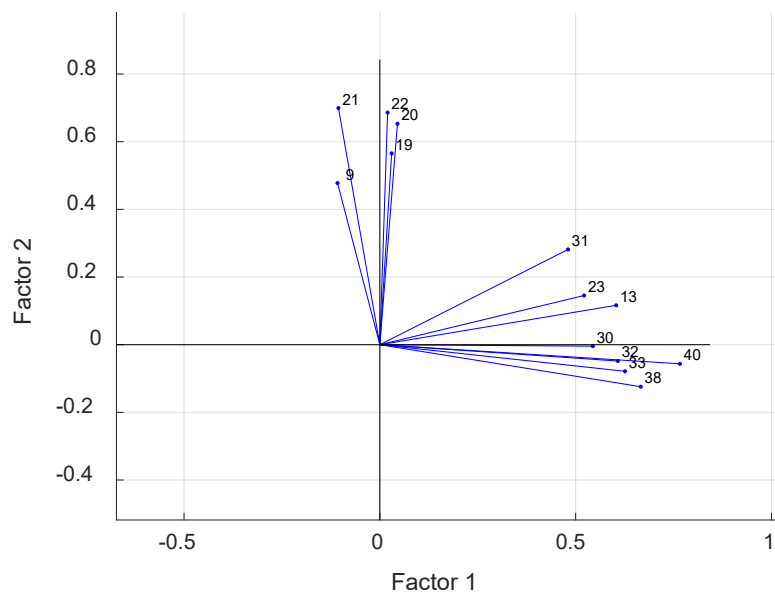| Prompt #	Loadings for each factor (For prompt details, see Table 1)												
	13	23	30	31	32	33	38	40	9	19	20	21	22
Factor 1	0.60	0.52	0.54	0.48	0.61	0.63	0.67	0.77	-0.11	0.03	0.05	-0.11	0.02
Factor 2	0.12	0.15	0.00	0.28	-0.05	-0.08	-0.12	-0.06	0.48	0.57	0.65	0.70	0.69
Other Statistics	p-Value: 0.0000, dfe: 53, Variance explained: 48.7%, Cronbach's alpha: 0.82												

Figure 3: Factor loadings for two factors, indicating total of eight and five prompts, respectively, for Factors 1 and 2. Numbers next to loadings for each factor point to numbered survey prompts in Table 1.

D. Discussion

We began with a forty prompts survey instrument to explore "the kind of classroom skills students consider to be important to them." As a starting point, twenty-two prompts were chosen based on the mean greater than or equal to 4 (Very Interested and Interested, Figure 1), and 70% or higher frequency count for 4 or greater (Figure 2). These twenty-two prompts are also tabulated in Table 1. This provides a reduction of 45% from the original 40 prompts. This could be a good starting point for an instructor to adopt and practice some of these prompts.

The *exploratory factor analysis* (Figure 3 and Table 2) indicates a two-factor latent structure. In general, these skills are mix of in-class and outside class skills. When we review these prompts, it appears that 1) Factor1 relates to "personalization and interest in student," and 2) Factor2 more closely tied with in-class teaching skills. These thirteen prompts represent 68% reduction when compared with the original forty prompts. It however captures only about 49% variance in the data. An instructor must endeavor to incorporate both in-class teaching skills and personalization skills to create a conducive and enabling learning environment.

Conclusions

The focus of our effort reported here was twofold: *(i) to identify which classroom skills do students value more, and (ii) to reduce the number of prompts to some manageable count and to identify underlying latent structure.* This paper presents findings on both aspects utilizing the data spread over 6 semesters from a junior-level class in electrical engineering. Based on the data analyses and the discussion above, we conclude that both in-class teaching skills and personalization efforts are required of an instructor to create a positive learning environment.

Ideally, we would recommend instructors to pursue all twenty-two prompts in Table 1. To economize on efforts, however, prompts mentioned in Table 2 are required for any meaningful and positive impact on the learning environment.

For instructors willing to explore this further, we recommend using the prompts in Table 1 and 2 in pre- and post-semester settings. For example, ask students to rate their interests at the beginning of the semester, and instructor continuing practicing those prompts during the semester. The same instrument may be used second time at the end of the semester (post-semester) to capture how well instructor was able to practice those prompts. This practice may enable the instructor to review and improve upon the prompts with low post-semester ratings. It is further hypothesized that this effort may improve instructor's in-class ratings, reviews, and course evaluations.

Acknowledgements

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Appendix A – Survey of Classroom Skills

SURVEY of CLASSROOM SKILLS

(1992, modified & used with permission of Center for Research & Development in Higher Ed., U of CA, Berkeley)

The items below result from research on traits confirmed to be good teaching practices. The higher the number on the graph (reverse side), the stronger the employment of a given teaching practice. Even the best paper surveys can generate bad data unless students are given instructions how to avoid the pitfalls. It is important that the data result from specific issues rather than general feelings, so students must be instructed to answer each question for the specific content it requests rather from their general feelings about the faculty member, the content, the classroom setting or anything not related to the topic of the item. Students must be instructed to leave any item blank which they don't have first-hand information about. Unless such cautions are given, students will feel obligated to guess, and in some cases guesses can overwhelm true knowledge. An example is question 29. Research shows that only a small percentage of students seek individual help, so only they know about this item. When students guess, the >90% who don't know about accessibility overwhelm the small percent who do know, and thereby two vastly different types of service to students can get the same rating. When students are informed about pitfalls of paper surveys, reliability of results shows dramatic improvement. Space for written suggestions for improvement are also provided on the form, so information comes from more than simply the items provided. The results of this survey are confidential and are a good basis for consultation between the instructor and a member of the CU - Denver Office of Teaching Effectiveness. Research shows that formative evaluation followed by consultation leads to changes that result in great gains in overall student evaluations.

Please use the following scale for your response to each question

Very descriptive (5)	(4)	Somewhat descriptive (3)	(2)	Not at all descriptive (1)

1. Discusses points of view other than his or her own.
2. Contrasts implications of theories.
3. Discusses recent developments in the field.
4. Gives references for more interesting and involved points
5. Generalizes from examples and specific instances
6. Uses examples and illustrations.
7. Stresses general concepts and ideas.
8. Is well prepared.

9. Explains clearly.
10. Gives lectures that are easy to outline (or provides prepared notes that adequately serve this same purpose).
11. States objectives of each class session.
12. Summarizes to emphasize major points.
13. Is able to clarify or improvise in awkward communication situations.
14. Makes a few major points during lecture rather than many.
15. Appears to know if class is understanding him/her or not.
16. Appears to know when students are bored.
17. Uses a variety of instructional media/resources (films, slides, overheads, guest speakers, etc.).
18. Uses a variety of teaching methods besides lectures (demonstrations, field trips, writing, group work, etc.).

19. Identifies what he or she considers important for purposes of testing.
20. Uses exams effectively for synthesis and understanding of course material.
21. Is fair and impartial in grading exams, quizzes, etc.
22. Keeps students informed of their progress.
23. Has students apply concepts to demonstrate understanding.

24. Encourages class discussion/participation.
25. Invites students to share their knowledge and experiences.
26. Invites questions, discussion or criticism about ideas presented in lecture.
27. Is able to accommodate and relate to students as individuals.
28. Asks questions of students.

29. Is accessible to students outside of class.
30. Has genuine interest in students.
31. Gives personal help to students having difficulty in the course.
32. Has a concern for the quality of teaching and learning.
33. Encourages/motivates students to challenge themselves to do high quality work.

34. Has an interesting style of presentation.
35. Gives interesting and stimulating assignments.
36. Uses a range of gestures and movement.
37. Has a sense of humor.
38. Appears confident.
39. Varies the speed and tone of voice.
40. Is enthusiastic.