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THE ROLE OF EXPERIENTIAL LEARNING AND SIMULATION IN TEACHING MANAGEMENT SKILLS

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ABSTRACT

This is an empirical Study that questioned college alumni who were graduated during the years 1982, 1983 and 1984. To be included in this study, each subject was to have had an exposure to either simulation or experiential exercises in either their graduate or undergraduate program. Each person was asked to report the importance of a set of 41 attributes or skills to their current jobs. In addition, they were asked to rate various teaching methods on how well each method conveyed this set of predetermined skills. The analysis of the data showed the following results; teaching methods employing experiential exercises best taught how to develop consensus, how to appraise performance and how to resolve conflict, while the use of simulations best taught how to measure objectives, how to solve problems systematically and how to forecast. The use of the case method best taught how to conceptualize, how to put structure to unstructured problems and how to think creatively. The only skill or attribute that traditional lectures taught best was how to listen reflectively.

THE CONCEPT

Members at ABSEL meetings have consistently discussed the role of simulations and experiential learning techniques in conveying knowledge about a set of skills which are needed by the students when they enter the job market after graduation. Frequently these discussions compared the hands-on techniques of experiential learning and business simulations to the more traditional case methodology. The authors of this paper considered the various concepts, reviewed some of the literature (Whetten, 1984), (Cohen, 1984), (Rocklin, 1987) and put forth their own hypothesis: Each teaching technique has its own advantages." That is, one teaching method conveys a particular set of skills better than others and different teaching methods convey different sets of skills. Thus, a mixture of teaching techniques is able to leach the entire set of desired skills better than any single method(Tough, 1979). The question remained. Which skills are best taught by what teaching methods?" (Brush, 1983)

In order to answer this question. ii was decided to go to those individuals who had been in the work force for three to five years after college and who had experienced at least one of these two teaching methods while enrolled in a college or university. The sampling frame was determined by a two stage process. First, a letter was sent to all attendees of the 1987 ABSEL meeting. (This letter was sent to 110 attendees.) The letter asked each person to go into their files and select 10 students per year from their class roles of 1 982, '83 and '84. Then, they were to obtain these previous student's current addresses from the school's alumni office and send the list to one of the authors. Twenty-two ABSEL members responded with a list of 602 names and addresses. An individualized cover letter and a questionnaire was sent to every name submitted. At the time of this analysis 78, questionnaires had been returned. There was 1 questionnaire which was not usable and 16 which were only partially completed. The partials did not complete the section regarding the rating of the various teaching methods. Thus, this analysis was based upon 62 completed questionnaires. (At the time of submitting this paper, 135 questionnaires had been returned.)

THE DEVELOPMENT OF THE QUESTIONNAIRE

The literature was searched to define the skills and attributes that "managers" need and the tasks they employ in plying their trade. A set of 41 tasks, skills and/or attributes was developed (Waters, 1980) (Livingstone, 1971) (Mintzberg, 1973). First, each respondent was asked to rate the importance of each skill or attribute to him or herself in terms of their current position. Exhibit 1 details the questionnaire's instructions for the first section.

EXHIBIT 1

> Following is a list or 41 attributes that have proven to be critical in effective management. First, read the entire list. Second, select about 8 attributes which you consider to be the most important in your current position and circle the "I" beside each. Next, select about 8 more attributes which you consider to be slightly less important and circle a "2". Continue selecting sets or about S attributes in descending order of importance until you have exhausted the list (the last set will have a rating or 5). if you have some sets with 9 and a few with 7, that is OK, but be sure to use all 5 scale values.

The second section repeated the set of attributes and asked the respondent to evaluate the attributes on the basis of importance to their first position after being awarded their first college degree.

The third section repeated the same set of attributes and ask the respondents to rate the quality of up to five educational experiences based upon where he or she had learned the listed skills. The educational experiences listed were 1) Undergraduate Program; 2) Graduate Program; 3) On the Job Training; 4) Professional Development or Continuing Education; and 5) Other (Specify). Exhibit 2 details the instructions for this part of the questionnaire.

EXHIBIT 2

> Below is the same list or attributes. This time we would like you to consider where you have learned or acquired these skills. We have listed S possible educational experiences. For each attribute, please rate the source where you acquired this skill with a '9" being the best possible source, and a "1" being the worst possible source. ir you have not been exposed to any one or the educational experiences listed, insert an "N" in the appropriate column(s).

The fourth section repeated the attribute or skill list again. This lime, the respondents were asked 10 rate a set of teaching methodologies based upon the methods ability 10 teach the listed skills. Exhibit 3 provides the instructions provided for this part of the questionnaire. The balance of the questionnaire collected demographics on each subject.

EXHIBIT 3.

Below is the same set of attributes once again. This time we would like you to consider the different teaching techniques that you have experienced in learning these sets of skills. These - teaching techniques include: Lectures. Case Study, Experiential Learning Exercises (Role Playing, etc.), Projects or Independent Study, and Business Simulations (Business Games(. For each attribute, please rate each teaching technique on its importance in your learning the skill. Please use a "9" for the very best teaching method down to a "1" for the worst teaching method. If you have e not experienced one of these methods, please insert an ' V in the appropriate column(s)

THE SAMPLE BASE

Because at the time of this analysis only a few of the coded questionnaires rated either Special Projects or internships, these teaching methodologies were not included in this analysis. Table 1 displays the distribution of completed questionnaires by the respondents last collegiate educations: experience.

TABLE 1

DISTRIBUTION OF THE QUESTIONNAIRE RESPONDENTS

Armstrong State	1	Savannah State	1
Bryant	7	Southern Nazarene	2
Cal State @Fresno	2	SUNY @ Fredonia	2
Clemson	5	Rollins	2
College of St Thomas	2	Rutgers	1
Ga. Tech	15	Univ. of Iowa	1
Georgia Southern	3	Univ. of Tulsa	3
Illinois State	7	Univ. of Wisconsin	
Mankato State	1	@ Whitewater	1
Norfolk State	2	Washburn Univ	2

The total number of completed questionnaires analyzed was 62.

STANDARDIZING THE DATA ON THE TEACHING METHOD RATINGS

When individuals fill out rating scales. some tend to be "yea" sayers and others are "nay" sayers. some individuals use only the upper end of the allowable responses, while others use only the lower end, and still others use the entire range. Since the measure of interest was the relative importance of each teaching method as it contributed to the learning of each attribute by each respondent, the data could be standardized within each subject without losing information. For each –respondent, the mean response along with its standard deviation across all teaching methods was found and a Z score (Mean 0.0 and the Standard Deviation = 1.0) for each response was calculated. These Z scores were then compared across subjects without concern about 'yea' and 'nay' sayers. The following analysis was done using the Z score data for those questions Pertaining to the ratings of teaching methods.

THE RESULTS

The Univariate Analysis

The grand mean Z score for each attribute was calculated across all teaching methods as well as for each individual teaching method. An F lest was run so see it the distribution of responses for each skill or attribute was unique for each of :he leaching methods. The results were surprising. The distribution of ratings for virtually every skill or attribute was different for each teaching method. If one were to use the .05 level of significance, there was only one attribute (the ability to set goals whose distribution would not be considered to be different across the four reaching methods. The grand mean of the Z scores and the Z score mean for each teaching method along with the significance of the F test for each skill or attribute is shown in Table 2, in alphabetical order, the same order in which they were presented to the respondents. Table 2 also shows the significance of the F test of the differences between groups. The significance is shown rounded to the nearest one thousandths. In all but 8 of the skills, there is less than 5 chances in ten thousand that this difference across teaching methods is the result of chance.

As described in Exhibit 1, the subjects were asked to rate the degree of the importance of each of the attributes to their current job or position. The ratings were based on a 5 point scale with 1 being labeled "Most Important" and 5 labeled "Least Important". The subjects were asked to constrain their responses in a way that forced the use of all (lie values in approximately equal numbers. This provides the property of (almost) equal variance among the subjects of the ratings across the 41 attributes. The grand mean across all 41 attributes and 62 subjects was 3.01, the minimum attribute mean score was 1.96 (Make Decisions) and the maximum attribute mean score was 4.22 (Conduct Interviews). It seems ironic that while the attribute of "conducting interviews" was seen as the most important skill in the prescribed set to the respondents' current jobs: the ability of any of the investigated teaching methods to teach this skill was considered to be very low, with a mean Z score across all teaching methods of -.34.

Table 3 groups the 41 Skills into clusters based upon the Z score means across all the respondents who rated each particular teaching technique. Each cluster contains those skills with the highest Z score means for that particular teaching method. Note hat 9 skills had their maximum under teaching by the case method. There were 15 skills whose mean Z scores were at their maximum when the teaching method of experiential exercises was evaluated. Only 1 skill (listening reflectively) was at its maximum when evaluating the lecture method and 13 skills were at their maximum for teaching methods using simulations. The order of presentation in Table 3 is based upon the ranking of the Z score within each teaching method. The skill with the highest Z score under each teaching method is shown first. Those skills which were rated above the average level of importance are shown in bold type.

Note those skills the respondents considered to be most important. The ability to conduct interviews. develop consensus, to supervise, to appraise performance, to enforce the rules and to speak in public were rated as the 6 most important skills and all 6 were best acquired through the same teaching method: experiential learning. The next most important skill, the ability to measure objectives, came from the teaching method of simulation.

If one were to ask managers with much more experience than 3 to 5 years. the authors feel confident that the ratings of importance of the 41 skills would be quite different (Culbertson, 1980). Certainly the skill of planning, ranked 36th by the subjects in this study, would be more important for experienced managers. II is important for the reader to understand that this research confined its study to recent graduates and not experienced managers (Hayes, 1981).

A discriminant analysis was performed to discover if the different teaching methods could be distinguished from each other on the basis of the ratings of each teaching method across all the attributes. Discriminant analysis is a statistical method in which group membership (a discrete variable) is the dependant variable and a linear combination of the independent variables is formed in a way that maximizes the probability of correct classification of the observations, For this analysis. the teaching method ratings for each of the attributes are the independent variables and the teaching methods are the dependent variables,

This analysis was done using a step-wise procedure. The independent variables (the ratings) are not orthogonal to or independent of each other. Technically, the linear discriminant function requires the independent variables to have multivariate normal distributions. However, the discriminant technique is fairly robust even if the concision does not hold (Wahl & Kronmal, 1977).

TABLE 2.

SURVEY RESUOLTS BASED ON INDIVIDUALIZED Z SCORES

Attribute	Grand Mean	Mean Z Scores Across Teaching Methods: Lect	Cases	Exp Learn.	Sim	Sig*
Adapt to New Tasks, Environments & Situations	.02	-.92	.03	.50	.58	.000
Analyze data	.36	-.02	.89	-.05	.6	.000
Analyze Problems	.45	-.20	1.00	.34	.6	.000
Appraise Performance	-.16	-.76	-.17	.22	.17	.000
Assess a Situation Quickly	.14	-.90	.38	.60	.57	.000
Conceptualize	.25	-.11	.57	.23	.33	.001
Conduct Interviews	-.34	-.74	-.71	.41	-.23	.000
Delegate Responsibility	-.32	-.89	-.42	.10	.21	.000
Develop Consensus	-.18	-.93	-.22	.31	.24	.000
Develop People or Teams	-.10	-.98	.08	.24	.37	.000
Direct the Work of Others	-.26	-1.01	-.31	.27	.12	.000
Enforce Rules or Policies	-.38	-.76	-.56	-.02	-.11	.000
Exert Influence	.24	-1.05	-.33	.33	.23	.000
Forecast	.09	-.19	.15	-.26	.71	.000
Form Coalitions	-.43	-1.06	-.37	.07	-.16	.000
Gather Pertinent Info	.37	-.05	.71	.26	.59	.000
Lead	-.20	-1.03	-.19	.33	.19	.000
Listen Reflectively	-.00	.37	.41	.26	-.24	.000
Make Decisions	.08	-.79	.18	.28	.76	.000
Make Presentations	-.05	-.74	.07	.26	.29	.000
Manage People	-.36	-.91	-.44	.04	-.04	.000
Manage Stress	-.42	-.74	-.62	-.09	-.15	.000
Manage Time	-.22	-.47	-.28	-.19	.12	.004
Measure Objectives	-.02	-.25	-.01	-.04	.27	.011
Motivate Others	-.19	-.59	-.30	.24	-.06	.000
Organize	.09	-.28	.20	.06	.42	.000
Persuade	-.12	-.78	-.19	.42	.18	.000
Plan	.07	-.27	.09	.07	.46	.000
Prioritize Tasks	-.06	-.42	-.11	.09	.27	.000
Put Structure to Unstructured Problems	.20	-.16	.47	.24	.28	.001
Resolve Conflict	-.07	-.69	-.17	.46	.19	.000
Schedule and Coordinate	-.08	-.36	-.09	-.15	.32	.000
See the Big Picture	.07	-.17	.25	.02	.18	.035
Set Goals	-.08	-.21	-.03	-.21	.13	.080
Set Objectives	-.07	-.27	.01	-.13	.14	.042
Solve Problems Creatively	.19	-.46	.43	.42	.40	.000
Solve Problems Systematically	.27	-.00	.40	.23	.46	.016
Speak in Public	-.09	-.63	-.07	.31	.08	.000
Supervise	-.42	-.95	-.55	.05	-.13	.000
Think Creatively	.16	-.26	.42	.22	.23	.000
Write Effectively	-.11	-.16	.31	-.43	-.19	.000
Sample Size	233	62	62	55	54	

* Significance of an F test between groups
(Between groups mean square)/(Within groups mean square)

TABLE 3

SKILLS OF MANAGERS CLUSTERED BY MOST EFFECTIVE TEACHING METHODS

	Mean of Importance (Range 1-5)	Mean Z Score by Teaching Method: Lect	Cases	Exp Learn.	Sim.
CASES TEACH THESE TASKS BEST					
Analyze Problems	2.33	-.20	1.00*	.34	.69
Analyze data	2.48	-.02	.89	-.05	.60
Gather Pertinent Info	2.19	-.05	.71	.26	.58
Conceptualize	3.13	-.11	.57	.23	.33
Put Structure to Unstructured Problems	2.76	-.16	.47	.24	.28
Solve Problems Creatively	2.69	-.46	.43	.42	.40
Think Creatively	2.48	-.26	.42	.22	.28
Write Effectively	2.43	-.16	.31	-.43	-.19
See the "Big Picture"	2.30	-.17	.25	.02	.18
SIMULATIONS TEACH THESE TASKS BEST					
Make Decisions	1.96	-.79	.18	.28	.76*
Forecast	3.32	-.19	.15	-.26	.71
Adapt to New Tasks	2.81	-.92	.03	.50	.58
Solve Problems Systematically	2.96	-.00	.40	.23	.46
Plan	2.06	-.27	.09	.07	.46
Organize	2.02	-.28	.20	.06	.42
Develop People or Teams	3.38	-.98	.08	.24	.37
Schedule & Coordinate	2.67	-.36	-.09	-.15	.32
Make Presentations	2.91	-.74	.07	.26	.29
Measure Objectives	3.48	-.25	-.01	-.04	.27
Prioritize Tasks	2.24	-.42	.11	.09	.27
Set Objectives	2.80	-.27	.01	-.13	.14
Set Goals	2.85	-.21	-.03	-.21	.13
Manage Time	2.26	-.47	-.28	-.19	.12
EXPERIENTIAL EXERCISES TEACH THESE TASKS BEST					
Assess a Situation Quickly	2.30	-.90	.38	.60*	.57
Resolve Conflict	3.32	-.69	-.17	.46	.19
Persuade	3.15	-.78	-.19	.42	.18
Conduct Interviews	4.22	-.74	-.71	.41	-.23
Exert Influence	3.04	-1.05	-.33	.33	.23
Lead	2.74	-1.03	-.19	.33	.19
Develop Consensus	4.06	-.93	-.22	.31	.24
Speak in Public	3.52	-.63	-.07	.31	.08
Direct the Work of Others	3.28	-1.01	-.31	.27	.12
Motivate Others	2.93	-.59	-.30	.24	-.06
Appraise Performance	3.78	-.76	-.17	.22	.17
Delegate Responsibility	3.15	-.89	-.42	.10	.01
Supervise	3.89	-.95	-.55	.05	-.13
Manage People	3.17	-.91	-.44	.04	-.04
Enforce Rules or Policies	3.70	-.76	-.56	-.02	-.11
Form coalitions	2.33	-1.06	-.37	-.07	-.16
Manage Stress	2.05	-.42	-.62	-.09	-.15
LECTURES TEACH THEIS TASK BEST					
Listen Reflectively	2.54	.37	-.41	.26	.24

Multivariate Analysis

Univariate tests of significant differences such as the F tests re. ported above arid the use of variable means provide basic information about groups of observations However, in multivariate analysis. the set of variables are considered simultaneously and not one at a time (Harris. 1975)

Since the ratings were converted to Z scores, the variable distributions approached normality but they were still highly correlated with one another. Using all the variables, when intercorrelations exist, is a little like double counting. By employing a step-wise procedure. the variables are selected one at a time and a new variable is added only if the additional (orthogonal) information is sufficient to warrant its inclusion. Table 4 details the order in which the variables entered the discriminant analysis.

The step-wise procedure employed in this study started with the variable that was best at discriminating among the four teaching methodologies (lectures, case methods, experiential exercises and simulations), based upon the ratings reported by the respondents. The first variable was the skill of analyzing problems. After the first variable was included, the analysis searched the remaining variables and found the one that explained most of the remaining variance. The second variable was the rating on the ability to forecast. This procedure was repeated for 19 steps, bringing in 19 variables. The 20th step was different. In this case, since all of the variables are correlated, the amount of explained variance accounted for by the rating on "Solve Problems Systematically" was no longer significant when all of the first 19 variables were considered simultaneously, and that variable was removed from the analysis. This entering and removing process continued for a total of 32 steps and. at the end, included the 24 variables listed in Table 4, and labeled "in" under the 2nd heading, "Included". The Column labeled "F value' is the result of an F test for the variable (attribute or skills, When the F value fell below 1.0. the variable was removed from the analysis. The column labeled "Mm D sq." is a distance measure between the closest two group centroids. The greater this distance, the greater the ability to distinguish between the teaching techniques on the basis of the Z scores of the variables evaluated by tile subjects. This particular analysis was run in a way that maximized this distance function.

TABLE 4

SUMMARY TABLE FOR THE INCLUSION OF VARIABLES IN THE ANALYSIS

Attribute	Step	Included	F Value	Min.D^2
Analyze Problems	1	in	1.86	.13
Forecast	2	in	9.54	.49
Adapt to New Tasks, Environments & Situations	3	in	9.19	1.20
Analyze data	4	in	2.57	1.35
Make Decisions	5	in	8.85	1.51
Conduct Interviews	6	in	4.71	1.80
Write Effectively	7	in	5.21	2.29
Gather Pertinent Info	8	in	1.03	2.48
Schedule & Coordinate	9	in	1.73	2.60
Put Structure to Unstructured Problems	10	in	1.83	2.75
Supervise	11	in	1.00	2.89
Develop Consensus	12	in	3.61	3.07
Manage Time	13	in	2.96	3.15
Direct the Work of Others	14	in	2.90	3.20
Solve Problems Creatively	15	in	1.53	3.25
Solve Problems Systematically	16	in	1.54	3.31
Motivate Others	17	in	1.46	3.35
Prioritize Tasks	18	in	2.20	3.37
Develop People or Teams	19	in	1.84	3.41

TABLE 4.(continued)

Attribute	Step	Included	F Value	Min.D^2
Solve Problems Systematically	20	out	.54	3.35
Listen Reflectively	21	in	8.92	3.37
Motivate Others	22	out	.46	3.36
Form Coalitions	23	in	1.58	3.38
Set Objectives	24	in	2.73	3.38
Enforce Rules or Policies	25	in	2.19	3.39
Gather Pertinent Info	26	out	.03	3.27
See the "Big Picture"	27	in	2.25	3.27
Assess a Situation Quickly	28	in	3.37	3.27
Gather Pertinent Info	29	in	1.03	3.39
Speak in Public	30	in	1.78	3.39
Lead	31	in	1.71	3.39
Supervise	32	out	.98	3.32

Table 5 shows the set of variables that were not included in the final stage of the discriminant analysis. This does not mean that the ratings on these attributes or tasks are the same for all the teaching methods. It only indicates that the additional information, given the first 24 variables, is not significant in distinguishing between teaching methods. The included variables, taken as a whole, overlap the information contained in these remaining 17 variables. The "F to Enter" value is the value of an F Test, If this value was 1 the variable would have been included in the set above.

TABLE 5

VARIABLES NOT IN THE ANALYSIS

	F to Enter		F to Enter
Appraise Performance	.622	Organize	.435
Conceptualize	.070	Persuade	.383
Delegate Responsibility	.319	Plan	.587
Exert Influence	.421	Resolve Conflict	.940
Make Presentations	.717	Set Goals	.363
Manage People	.292	Solve Problems Systematically	.537
Manage Stress	.429	Supervise	.997
Measure Objectives	.714	Think Creatively	.324
Motivate Others	.461		

One of the results of a discriminant analysis is a set of linear functions which are used for the classification of the observations or cases. Table 6 below provides the coefficients for each of the included variables in the analysis. One only need multiply these coefficients by the observed rating for the specified variable, sum these values across the variables, and add the constant. The result is a value of each function for the particular observations evaluated. Or:

$$FV_j = \left(\sum_{i=1}^{n} UFC_{ij} * OR_i\right) + k_j \qquad \text{for } j=1 \text{ to no. of functions}$$

Where:
n = the number of variables
FV_j = The function value for the j^{th} function
UFC_{ij}=The unstandardized function coefficient for the i^{th} variable and the j^{th} function
ORi = The observer rating provided by a subject
k_j = The constant value for the j^{th} function

Thus, the value is a linear combination, similar to a regression estimate. In this 4 group case, 3 function values place each teaching method evaluation at a point in 3 space.

TABLE 6

UNSTANDARDIZED FUNCTION COEFFICIENTS

Variable	Function 1	Function 2	Function 3
Adapt to New Tasks	.45	.40	-.03
Analyze Data	.48	-.40	-.14
Analyze Problems	.59	-.29	.08
Assess a Situation Quickly	.67	.82	.22
Conduct Interviews	.07	.43	.18
Develop Consensus	.32	.41	.04
Develop People	.51	.22	.02
Direct Others	.29	.41	.08
Enforce Rules	.07	.28	-.04
Forecast	.33	-.05	-.58
Form Coalitions	.27	.22	.11
Gather Pertinent Info	.39	-.18	-.25
Lead	.35	.19	.12
Listen	-.29	.19	.08
Make Decisions	.67	.29	-.35
Manage Time	.16	.13	-.25
Prioritize Tasks	.19	.19	-.16
Put Structure	.25	-.09	.12
Schedule & Coordinate	.26	.08	-.39
See the Big Picture	.21	-.09	.00
Set Objectives	.20	-.02	.16
Solve Problems	.40	-.06	.19
Speak in Public	.15	.18	.14
Write Effectively	.20	-.35	.06
Constant	-.43	.95	.81

Table 7 shows the results of applying these coefficients and classifying each set of ratings into a group on the basis of the 3 function values, Note that 01 the 62 observations that rated Lectures, 54 were correctly classified. Three were misclassified into the case study group, three were put into the experiential learning group and 2 were classified into the simulation category. Using the case study ratings, 49 out of 62 were correctly classified with most of the misclassification occurring when a case study rating was paced in the simulation group. In the experiential exercises ratings, 42 out of the 55 cases were correctly classified but in the simulation ratings only 34 out of 54 were correctly classified.

The majority of misclassified observations in the simulations category were estimated to experiential exercises. A total of 179 ratings were correctly classified. If this were a random procedure, one would expect a correct classification of only 25 percent.

TABLE 7

CLASSIFICATION TABLE

Actual Group	N Size	Predicted Group Membership: Lecture	Cases	Exp Learn	Sim.
Lecture	62	54	3	3	2
Cases	62	2	49	2	9
Exp. Exercises	55	2	5	42	6
Simulation	54	2	5	13	34

Percent of Grouped cases correctly classified: 76.82%

As noted above, three functions were used to "discriminate" between the four teaching methods. It would have been possible to obtain less than three functions but no more. The maximum number of dimensions in which four (N) items (in this case the 4 teaching methods) can be placed is three (N-1). From the original solution. Table 8 shows the explained variance of the solution (not the original data set) accounted for by each function or dimension. Keep in mind that these 3 functions are orthogonal. The first function, similar to a factor in factor analysis, explains over two thirds of the variance in classifying the teaching methods.

TABLE 8.

EXPLAINED VARIANCE OF THE DISCRIMINANT FUNCTIONS

Function	Percent of Variance	Cumulative Percent
1	68.38	68.38
2	20.48	88.85
3	11.15	100.00

As en factor analysis, it is possible to have a better understanding of the discriminating functions by a rotation of the axes in order to have the variables load heavier on one axis and less on the remaining ones. This process changes the amount of variance accounted for by each function and the variable loadings but will not change the classification results because the axes remain orthogonal. One result of rotation of the axes is that the meaning of each function may be more interpretable. Table 9 shows results of rotating the axes on the distribution of the explained variance, Note that the amount of variance explained by the first function went down from over 68 percent to just above 50 percent. The amount of variance explained by the second function went up from just over 20 percent to over 35 percent. The third remained relatively unchanged.

TABLE 9.

EXPLAINED VARIANCE OF THE ROTATED DISCRIMINANT FUNCTIONS

Function	Percent of Variance	Cumulative Percent
1	51.6	51.6
2	35.6	87.2
3	12.8	100.0

The next step is to determine the standardized coefficients for the rotated functions and group them in a way that shows which variables contribute most heavily to each function. This procedure should add some interpretability to the results since these coefficient values are directly comparable to one another and the larger the absolute values, the greater the variable contributions to the function. Thus, a large negative coefficient value contributes as much as a variable with a positive coefficient of the same magnitude. Table 10 shows these standardized coefficients for all 24 variables. The dashed line is used to separate the variables and cluster them into sets. Each set includes those variables which contribute the most to a corresponding function.

The first function has Reflective Listening and lie ability to Enforce Rules weighted negatively while Make Decisions and Assessing a Situation Quickly are weighted positively. The second function has the ability to Adapt to New Tasks as its largest positive contributor with Developing Consensus and Prioritizing Tasks following close behind. Its important negative weighted variables are the abilities to Write Effectively and lo Analyze Data. The third function is weighted very heavily with the ability to Fore. cast with a negative value. The ability to Direct Others has a positive coefficient, but carries less than half of the weight of Forecasting..

The authors had hoped that the structure underlying these functions would become evident and easily identified. However, that is not the case and naming these functions or factors, as one would do if this were a marketing analysis. seems impossible. Therefore, the analysis will have to settle for functions 1, 2, and 3.

CONCLUSIONS

As business educators, we are concerned with teaching students both the internalization and the application of management skills. Since teaching management skills is considered more critical, often gathering information on the level of success in teaching these skills is often very limited. This is mainly due to a lack of accessibility to students after they graduate and start applying these skills in the work situation.

The intent of this study was to take the first step n providing educators with information regarding a) an identification of critical management skills and their relevance to the students first jobs, b) the sources or programs where these skills are taught, c) the most effective teaching method in conveying any one of these skills.

Each respondent was asked to report the importance of 41 managerial skills to his or her current position. They were also asked to rate various teaching techniques on how well each technique conveyed this set of predetermined skills. The analysis 01 the data (based upon 62 responses from 15 different university alumni) showed the following results:

TABLE 10

STANDARDIZED COEFFICIENTS FOR THE ROTATED FUNCTIONS
(Ordered by the Importance to each function)

Variable	Function 1	Function 2	Function 3
Reflective Listening	-.49	.04	.10
Make Decisions	.49	.19	-.30
Enforce Rules	-.33	.01	-.07
Assess a Situation Quickly	.31	.05	.14
Develop People	.30	-.22	-.05
Analyze Problems	.27	-.15	.16
Speak in Public	-.25	.14	-.20
Lead	.24	.11	.10
Adapt to New Tasks	.13	.56	-.00
Write Effectively	.17	-.43	.37
Develop Consensus	.06	.42	-.03
Analyze Data	.10	-.37	-.10
Prioritize Tasks	-.23	.37	-.15
Conduct Interviews	-.21	.33	.30
Set Objectives	.22	-.23	.07
See the Big Picture	.18	.21	.05
Forecast	.05	.01	-.92
Direct Others	.24	.07	.43
Manage Time	-.20	-.08	-.38
Schedule & Coordinate	.16	.09	-.36
Put Structure	-.02	-.18	.36
Gather Pertinent Info	-.08	-.08	.29
Solve Problems	.15	-.01	.27
Form Coalitions	.20	-.04	.23

Experiential exercises were most effective in teaching skills of developing consensus, appraising performance and resolving conflict. Simulations best taught how to measure objectives, solve problems systematically and forecast. The case method was reported most successful in teaching how to conceptualizes put structure to unstructured problems and to think creatively. Lectures best taught reflective listening skills.

Over 76 percent of grouped teaching method cases were correctly classified using multiple discriminant analysis. This compares to an expected value of 25 percent correct classifications if the data were based upon random responses. The results of the analysis clearly emphasized the effectiveness of utilizing multiple teaching techniques in teaching management skills. This finding alone could have major implications for educators who have predominantly employed a singe leaching method in conveying the art and science of management.

ENDNOTES and REFERENCES

All the statistical analysis for this study was done using SPSSx Release 2.0, SPSS, Inc. 1986.

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