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LEARNING STYLE AND PERFORMANCE

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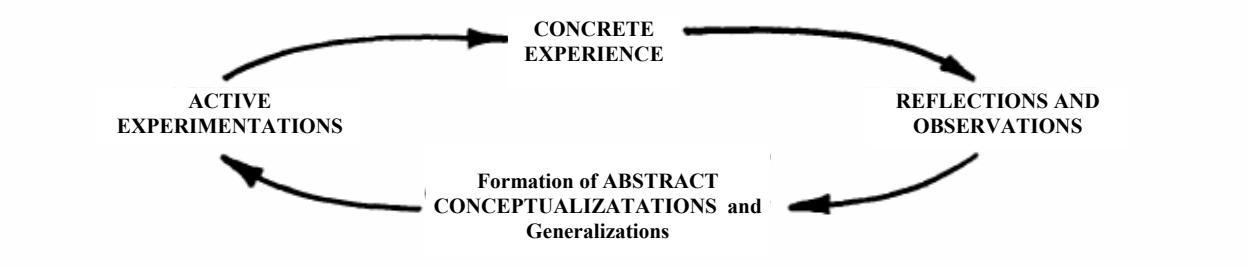
THE ISSUE

Most faculty members, particularly those involved in innovative teaching methods, have probably experienced the wide variety of student responses that occurs to a particular teaching approach. Some students may respond with high motivation to a game situation, for example, but react very negatively to a lecture format. Faculty utilizing different teaching approaches may also have encountered the student who dislikes working in group situations, preferring the anonymity or the individual independence of the lecture hail, and who in fact does well in this environment. The variety of possible responses is immense, which suggests that people have different learning styles, which in turn implies that their learning performance will vary with different learning environments.

Kolb (4) has developed an experiential model of learning inculcating the concept of learning styles. The core of the model is the learning cycle shown in Figure 1.

FIGURE 1 - THE EXPERIENTIAL LEARNING MODEL



The model is best summarized in Kolb's own words:

> Learning is conceived of as a four-stage cycle. Immediate, concrete experience is the basis for observation and reflection. These observations are assimilated into a "theory" from which new implications or hypotheses then serve as guides in acting to create new experiences. (4, p. 28)

In order to be effective, the learner needs four different kinds of abilities. He must be able to involve himself openly in new, concrete experiences (CE), to reflect on and observe these experiences from many perspectives (RO), to create abstract concepts which integrate these observations to form theories (AC), and to utilize these theories by actively testing them out in problem situations (AE). Yet these abilities are, by their very nature, quite different and even polar opposites. As a result, most people develop a learning style in which some learning abilities are emphasized over others.

Kolb suggests that on the learning dimension represented by

the concrete experiencing of events at one end and abstract conceptualization at the other, that individuals will in fact tend to be dominant in one or the other of these abilities. Likewise, they will develop a dominance in either active experimentation or reflective observation on the other major learning dimension. As can be seen from Figure 1, each ability (abstract conceptualization or concrete experience, and active experimentation or reflective observation) is paired with its opposite on the other side of the learning cycle. The combination of dominant abilities along each of these two dimensions defines an individual's learning style, as shown in Table 1 below.

A pedagogical question posed by the idea of learning styles is whether an individual with a particular learning style will tend to learn better under an approach matched to that learning style than under other teaching methods not as well matched to that learning style. If this is true, then it suggests that a variety of teaching approaches should be consciously offered and that the student should be helped to choose the approach that matches his style. An alternative strategy might be to help students without

TABLE 1
FOUR DIFFERENT LEARNING STYLES

Learning Style	Combination of Abilities	Characteristics of the Style
Converger	AC + AE	Greatest strength is practical application of ideas - engineers
Assimilator	AC + RO	Greatest strength is creation of theoretical models – researchers
Accomodator	CE + AE	Greatest Strength lies in doing things – marketing or sales
Diverger	CE + RO	Greatest strength lies in imaginative ability – managers with humanities or liberal arts backgrounds

learning skills matched to the dominant instructional approach used in their classes to develop the appropriate abilities.

The purpose of the research effort reported here was to determine if different learning styles of students affected their performance in the classroom.

EXPERIMENTAL DESIGN

Two classes in an introductory Individual and Organization Behavior course were taught using a highly experiential format. The book used in the course was Effective Behavior in Organizations by Cohen, Fink, Gadon, and Willits. The instructor's manual for the text provided a basic outline and the framework for the course. Students invest a majority of their time in the course working in groups producing joint case analyses and analyzing their own processes in that activity. Grades were based on the ~ evaluation of their joint products weighted by the group's opinion as to the relative contribution of its individual members. Periodic objective exams, provided by the instructor's manual,

and a final examination were also given. Each student also wrote an analysis of the functioning of his group in the class. The combination of the above items served to make up the total evaluation for the class, and were used, individually and collectively, as the measure of the learning that took place.

The Kolb Learning Style Inventory (5, p. 23) was administered early in the course to ascertain the learning style of each student.

In addition to these two major measures, a course evaluation form was administered toward the end of the course. This form is a standard evaluation given in all courses in the college. It was developed through a factor analytic study at this school and includes fifteen different questions. In order to relate to other measures, students were required to sign their evaluations. However, a system was devised to assure the student that the instructor could not obtain this information.

In addition, each class member Vs sex, year of study, major field of study, and cumulative grade point average (GPA) were acquired from available records.

RESULTS

The first question explored was the relationship of demographic variables to the four learning ability measurements, to the exam grade, and to the final grade in the course. The exam grade represents one measure of the degree to which concepts from the course have been cognized. The final grade in the course includes the exam grade (17%) in addition to grades on three quizzes (10%), six papers produced jointly in groups (40%), and a grade on the individual's analysis of the group in which he was a member (33%). Table 2 presents the results of the analysis of variance of these variables.

TABLE 2
EFFECTS OF DEMOGRAPHIC VARIABLES

	CE	RO	AC	AE	EXAM GRADE	COURSE GRADE
SEX	--	--	--	+*	--	--
YEAR	--	--	--	--	--	--
MAJOR	--	--	--	--	--	--

*Sex was related to the measure of Active Experimentation (AE) significantly at the p = .073 level, with females scoring higher than males on this measure. No other relationships were significant at the p = .10 level

An inspection of Table 2 reveals very little influence of demographic factors on the other key variables. The one significant difference was that females scored higher than males on the learning ability variable Active Experimentation (AE). Based on these findings we chose not to control for demographic variables in the remaining analysis.

In addition, a comparison of the two course sections revealed

no significant differences between them in terms of the demographic variables or in terms of grade point averages. Hence the two sections can be lumped together for analytical purposes.

As indicated earlier the (AE) and (RU) learning ability variables should be negatively correlated as should the variables (CE) and (AC). Table 3 confirms the existence of these negative correlations in this study as expected. It should be pointed out that the scales are constructed in such a manner that they virtually must be negatively correlated.

Kolb uses the learning ability variables to classify individuals into four learning style groups that he labels convergers,

TABLE 3
CORRELATION OF LEARNING ABILITY MEASURES

	CE	RO	AC	AE	EXAM GRADE	COURSE GRADE
CE		.03	-.57 **	.03	-.24*	-.31*
RO			-.18	-.67 **	-.24*	-.35*
AC				-.20	.26*	.23*
AE					.28*	.35*

* .10 level of significance N = 62
** .001 level of significance

assimilators, accommodators, and divergers. Scores on the two basic dimensions of learning, the abstract/concrete (AC-CE) dimension and the active/reflective (AE-RO) dimension, are computed by subtracting the (CE) variable from (AC) and the (RO) variable from (AE). People scoring above the mean on both dimensions were classified as convergers. Their learning strengths are abstract conceptualization and active experimentation. Assimilators are high on the (AC-CE) scale and low on the (AR-RU) scale. Accommodators were low on the (AC-CE) scale and high on the (AE-RU)scale. Divergers are low on both the (AC-CE) and (AE-R0) dimensions.

These two variables, (AC-CE) and (AE-RO), were computed and all individuals were classified according to their dominant styles. A dominant style was determined by whether an individual scored above or below the group average score for a particular variable. For example, a person scoring above the average score of 2.58 on the variable (AE-RU) and above the average score of 4.07 on the variable (AC-CE) were classified as a converger. If a person was above the average on the (AC-CE) and below the average on the (AE-RU) variable he was an assimilator. In this fashion all individuals were classified as to their dominant learning styles.

It should be noted that these two dimensions of learning style, (AC-CE) and (AE-RU), are independent measures. The Pearson correlation coefficient between them was .037.

Table *3* provides an early indication that the learning ability variables significantly influenced the exam grade and the grade in the course. In all cases there exists a statistically significant correlation between the learning ability variables and the exam and course grades.

This brings us to the critical question of the study. Are learning cycles related to classroom performance? Stated as a null hypothesis:

A. The average final exam scores for the four learning types will not be significantly different.

B. The average course grades for learning types will not be significantly different.

Table 4 presents the analysis of variance results. Clearly the hypothesis of equal means for exam grades is rejected.

TABLE 4
ANALYSIS OF VARIANCE OF EXAM GRADE BY LEARNING STYLE

SOURCE	DF	SUM OF SQUARES	MEAN OF SQUARES	F RATIO	F PROB
BETWEEN GROUPS	3	1017.25	339.08	4.785	.005
WITHING GROUPS	58	4110.50	70.87		
TOTAL	61	5127.75			

A multiple range test further revealed an order of response, presented in Table 5, from high to low of convergers, assimilators, accommodators, and divergers. Divergers were significantly different from the other three groups while there was no significant difference between the results for the convergers, assimilators, and accommodators.

TABLE 5
LEARNING STYLE GROUP MEANS

STYLE	AVERAGE EXAM SCORE	AVERAGE COURSE GRADE
CONVERGER	80.87	76.00
ASSIMILATOR	78.00	74.33
ACCOMODATOR	77.72	75.67
DIVERGER	69.38	66.46

N = 58

A further analysis was run by means of regression. As expected the regression indicated a significant relationship. It also revealed that the Beta weights, or the effects of the two independent variables (AC-CE) and (AE-RU), were equal. The regression yielded a multiple R of .387.

The second hypothesis, concerning the course grade and learning style, was also tested by analysis of variance at the .10 level. Table 6 summarizes the results which clearly indicate a difference of means.

TABLE 6
ANALYSIS OF VARIANCE OF COURSE GRADE BY LEARNING STYLE

SOURCE	DF	SUM OF SQUARES	MEAN OF SQUARES	F RATIO	F PROB.
BETWEEN GROUPS	3	838.81	279.60	7.59	.000
WITHIN GROUPS	58	2136.69	36.84		
TOTAL	61	2975.50			

Again a multiple range test was run. The order of response, presented in Table 5, from high to low this time was converger, accommodator, assimilator, and diverger. As before, the divergers were significantly different from the other three groups, while the mean scores did not significantly differ among convergers, assimilators, and accommodators.

Regression analysis naturally indicated a significant relationship (Betas were significantly different from zero). In this case the variable (AE-RO)was more dominant than (AC-CE) as an explanatory variable for the dependent variable course grade. Comparative Beta weights were .37 for (AE-RO) and .29 for (AC-CE). This analysis yielded a multiple R of .477.

About halfway through the course a survey was conducted with each of the work groups in the classes which was scored to get a measure of the climate within the group in such terms as productivity, supportiveness, trust, etc. Correlation analysis indicated a significant correlation between the group climate and the course grade. Therefore a regression analysis using the three independent variables (AE-RO), (AC-CE), and group climate (GCLIM) was run against the course grade. Table 7 summarizes the results.

TABLE 7
REGRESSION ANALYSIS OF
GROUP CLIMATE, LEARNING STYLE, AND COURSE GRADE

STYLE VARIABLE	B	Beta
GROUP CLIMATE	1.19	.39
(AC – CE)	.33	.25
(AE – RO)	.38	.33
CONSTANT	47.69	

Multiple R = .61 F = 10.86 F^{3}_{54} (.05) = 2.78 N = 58

Note that group climate has the largest Beta weight but that the Beta weights for variables (AC-CE) and (AE-RO) have decreased only slightly from the earlier analysis when they were run alone as independent variables. This suggests that group climate is a third variable that is adding considerably to our explanation of course grade, but that this explanation is largely independent of the variables (AC-CE) and (AE-RO).

CONCLUSIONS

As an exploratory study of learning style, teaching style, and performance, this study suggests that there may be a relationship that exists between these variables. In two classes that were highly experientially oriented, individuals who were high on active experimentation and abstract conceptualization learning abilities tended to perform best in the course. Both learning abilities would tend to be emphasized in an experientially oriented course. The poorest performers were individuals that were strong in the areas of reflective observation and concrete experience. These abilities tend to suggest an individual who is somewhat detached and not involved. Again, this type of person would not be expected to do well in an experientially oriented class.

Results therefore tend to support the hypothesis that learning style and performance are related.

These results differ from some found by Basuray and Scherling in a similar study, also based on Kolb's experiential learning model. They found that "the experientially-based teaching methodology . . . is not significantly more effective than traditional lecture-recitation methods." (1, p. 15) Other investigations of these issues are ongoing as reported by Catalanello and Brenenstuhl. Their results are not yet in.

Many questions remain to be answered in future research. The most important question to examine will be whether different learning types show up stronger using other educational techniques (i.e. lectures, case studies, seminars, etc.) related to different learning types. It is conceivable that we have simply identified a learning type that does well in college (overall GPA in this study was related only to the learning ability variable abstract conceptualization), or that this instructor favors this type of individual. Conclusive evidence awaits further testing in similar classes by different instructors and utilizing different teaching methods.

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