ON THE RELATIONSHIPS OF LEARNING STYLE, PERCEIVED LEARNING, AND PERFORMANCE IN AN EXPERIENTIAL LEARNING ENVIRONMENT

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A great deal of research has been devoted to learning style during the latter 1960's and the early 1970's (2). There are numerous reasons why so much effort has been devoted to the study of learning styles. If we can discover how people approach the learning process, we may be able to distinguish between approaches or styles which are successful and those which are unsuccessful. We may even he able to identify learning styles which are successful in specific learning environments and other styles which are more successful in other environments. Given this knowledge, we could possibly alter the learning environment in order to increase the learning efficiency or we could attempt to alter the learning style of a person toward a more successful learning style for the task the individual is attempting to master.

Learning style information could also be very helpful in counseling and career planning activities. By identifying a person's learning style and the learning environments associated with various career opportunities, an individual could be advised to follow a path which has a high probability for success. Thus, learning style information could be used both to improve the efficiency of the educational process and to improve career
satisfaction.

Much of the learning style research has focused upon the establishment of differing learning styles and the examination of personal differences which accompany the differing styles. Kolb has conducted some interesting research relating learning styles to college majors and to a limited extent to occupations (3,4). Wolfe and Byrne have examined differing learning styles and team performance in an experiential learning environment (6). However, no work has apparently been done relating individual learning styles to success in an experiential learning environment. The present study is a first step in that direction. Specifically, the present study will attempt to discover whether there is a significant relationship between a student's learning style and his course performance. In addition, a relationship will be sought between the student's perception of learning and his learning style and between the student's perception of learning and his course performance. A student's perception of learning can have two important impacts. First, the perception may determine the amount of effort he puts into the course. Second, his perception can have a significant impact upon his attitude towards the course, the instructor, and possibly the school.

METHODOLOGY

Three hypotheses were developed to focus upon the relationships among learning style, perceived learning, and course performance. They are as follows:

1. Specific learning styles are associated with high student performance, while other styles are associated with lower performance.

2. Certain learning styles are associated with a perception of a great deal of learning while other styles are associated with a perception of little learning.

3. A student's perception of learning is directly related to his measured learning.

There are several instruments available which purport to measure learning style. It is interesting to note that there is no general agreement regarding what measures actually constitute learning style. The available instruments appear to be measuring different variables under the guise of learning style. The instrument developed by Kolb was selected for use in the current study (3,p.2[2]). It is based upon the experiential learning model (3, p. l) and thus, has an attractive theoretical construct. In addition, it has been used in learning style research involving business students and thus will yield results which are somewhat parallel to other studies.

The instrument used to collect data regarding a student's perception of learning was designed by the writer. It contains twelve statements describing a student's beliefs regarding the knowledge he is acquiring from the course. The responses were recorded on a five point Likert scale. A copy of the instrument may be found in the Appendix.

Course performance was measured by the numerical weighted total upon which the letter grade for the course was based. This measure is, of course, a proxy for the knowledge gained from the course. It consists of scores from two examinations, game performance, and class participation.

The subjects studied consisted of 84 undergraduate students at the Rochester Institute of Technology who were enrolled in the marketing principles course taught by the author during the fall and winter quarter 1975-76. The students were generally sophomore or junior business majors. However, several nonbusiness majors came from the colleges of photography and science. The format of the course was similar to that used in the experimental section reported

by the author in a previous paper (1). The students were not informed as to the purpose of the data collection until the final day of the course. However, it was stressed at the time of the administration of each instrument that their response had absolutely no effect upon their grade for the course.

FINDINGS

The Kolb instrument classifies learning styles into four categories: the divergers, assimilators, convergers, and the accommodators (4, p. 6).

> The Diverger....is best at Concrete Experience (CE) and Reflective Observation (RO). His greatest strength lies in his Imaginative ability.
>
> The Assimilator's dominant learning abilities are Abstract Conceptualization (AC) and Reflective Observation (RO). His greatest strength lies in his ability to create theoretical models.
>
> The Converger's dominant learning abilities are Abstract Conceptualization (AC) and Active Experimentation (AE). His greatest strength lies in the practical application of ideas.
>
> The Accommodator has the opposite strengths of the Assimilator. He is best at Concrete Experience (CE) and Active Experimentation (AE). His greatest strength lies in doing things, in carrying out plans and experiments and involving himself in new experiences (4, pp. 7-8).

We will first examine whether student grades vary significantly over the four learning styles by testing Hypothesis One: specific learning styles are associated with high student performance, while other styles are associated with lower performance. The actual student grades partitioned by learning style are shown in Table 1. While there is some variation among the mean student grades by learning style, this variation is not significant when subjected to an analysis of variance. Thus Hypothesis One does not hold.

TABLE 1
COURSE GRADE PARTITIONED BY LEARNING STYLE

	Learning Style Categories					
	Diver-ger	Assimi-lator	Conver-ger	Accommo-dator	F-ratio	F-prob.
Grade ($\bar{x}$)	70.6	65.6	70.9	65.3	1.40	.25
n	7	21	34	11		

Hypothesis Two - certain learning styles are associated with a perception of a great deal of learning while other styles are associated with a perception of little learning -will be tested by partitioning student responses for each of the twelve questions regarding perception of learning by learning style. The data will then be subjected to an analysis of variance to determine if the responses by learning style do indeed differ among each other.

TABLE 2
PERCEPTION OF LEARNING MEASURES PARTITIONED BY LEARNING STYLES

Measures[3]	Diverger	Assimilator	Converger	Accommodator	F-ratio	F-prob.
BUSCON ($\bar{x}$)	$4.7^{1,2}$	3.9^{1}	4.0^{2}	4.4	1.89	.14
REALPROB ($\bar{x}$)	$4.7^{1,2}$	3.6^{1}	4.2^{2}	4.1	3.17	.03
COMMIT ($\bar{x}$)	$4.4^{1,2}$	3.5^{1}	3.9^{2}	3.7	2.01	.12
ANATEC ($\bar{x}$)	4.1	3.7	3.9	3.7	.45	.68
RELATE ($\bar{x}$)	4.3	4.1	4.1	4.2	.08	.23
EXPER ($\bar{x}$)	4.1_{1}	3.1_{1}	3.7	3.9	2.68	.05
MOTIVAT ($\bar{x}$)	3.9^{1}	2.5^{1}	3.0	3.5	4.14	.01
MKTPRIN ($\bar{x}$)	4.6^{1}	3.8^{1}	4.2	4.0	1.95	.13
DEC ($\bar{x}$)	4.1_{1}	3.6_{1}	4.1	4.1	.98	.41
DATA ($\bar{x}$)	4.7^{1}	3.7^{1}	4.4	4.1	3.75	.02
EFFECT ($\bar{x}$)	$4.3_{1,2}$	3.9_{1}	4.1_{2}	4.1	.55	.64
RESPON ($\bar{x}$)	$4.7^{1,2}$	3.5^{1}	4.1^{2}	4.5	5.56	.00
N	7	19	34	11		

[1]This pair is significantly different at the .05 level.

[2]This pair is significantly different at the .05 level.

[3]BUSCON = Business Concepts, REALPROB = Real problems, COMMIT = Committee, ANATEC = Analytical techniques, RELATE = Variables relate, EXPER = Management experience, MOTIVAT = Motivate people, MKTPRIN - Marketing Principles, DEC Decisions, DATA = Data use, EFFECT = Effect of marketing variables, RESPON = Management responsibilities, see Appendix for specific questions.

Divergers were believed to provide the most accurate perception of learning due to their superior ability to reflect upon observations of concrete experiences. This belief provided the basis upon which to test for significant differences among means of perceived learning dimensions on an a priori basis using analysis of variance. Each of the remaining learning style means was compared to the diverger mean the results of which are shown in Table 2 (5, p.175).

It is interesting to note that the divergers scored higher numerically on eleven of the twelve perception of learning measures. They tied with the convergers and the accommodators on the remaining measure. Divergers indicated a significantly different perception of learning than assimilators or convergers with respect to the learning of business concepts, of real problems facing business, of how to work effectively in committee environments, and of the meanings of business responsibility. Further, divergers differed significantly from assimilators in their perception of learning how to motivate group members, in how to use data effectively, and in the discovery of marketing principles. There were no significant differences in perception between divergers and accommodators. Thus it appears that the perception of learning may be influenced by the concrete-abstract dimension of learning style.

Hypothesis Two is only partially supported. In some cases there were significant differences in the perception of learning among learning styles; however, in other cases no differences could be found. There is some evidence to suggest that students who score high on the concrete experience end of the concrete-abstraction dimension may perceive they are learning more than students who score high on the abstraction conceptualization end. However, this evidence is by no means conclusive.

The third hypothesis - a student's perception of learning is directly related to his measured learning - will be tested by comparing the mean grade among perception scores for each of the perception of learning measures discussed in the last section. As there was no a priori basis upon which to test for significance between specific means, the Student-Newman-Keul procedure will be utilized to test for a posteriori differences. As stated above, the perception scores were obtained using a five point Likert scale. Because of the small number of responses falling on the low end of the scale, the data were recoded for analysis purposes so that perception score 1 represents actual scores 1, 2 and 3. Perception score 2 represents actual score 4, and perception score 3 represents actual score 5. The measure "motivate" provides the exception to this scheme as its scores tended to be lover. Thus perception scores 1, 2 and 3 represent actual scores 1 and 2, 3, and 4 and 5 respectively.

The data in Table 3 show very little relationship among perceived learning scores and course grade. Students who perceived that they were learning little in the way of using analytical techniques scored significantly lower than the other students. In addition, students who strongly believed that they were learning how to make managerial decisions differed significantly from those who perceived that they were not learning this activity. Otherwise no significant differences existed.

TABLE 3
COURSE GRADE BY PERCEPTION OF LEARNING SCORE[1]

Measures[4]	1	2	3	F-ratio	F-prob.
BUSCON ($\bar{x}$)	69(12)	67(41)	71(27)	1.40	.25
REALPROB ($\bar{x}$)	68(12)	67(43)	71(24)	.82	.44
COMMIT ($\bar{x}$)	68(27)	68(35)	71(18)	.56	.57
ANATEC ($\bar{x}$)	64(27)[2]	70(36)	74(17)	4.44	.02
RELATE ($\bar{x}$)	64(13)	68(39)	72(28)	2.24	.11
EXPER ($\bar{x}$)	67(35)	69(24)	72(17)	.98	.38
MOTIVAT ($\bar{x}$)	66(24)	69(26)	70(27)	.80	.45
MKTPRIN ($\bar{x}$)	65(14)	67(37)	72(29)	1.97	.15
DEC ($\bar{x}$)	64(22)[3]	68(31)	73(27)[3]	4.17	.02
DATA ($\bar{x}$)	66(14)	66(32)	72(34)	2.22	.12
EFFECT ($\bar{x}$)	66(19)	67(36)	73(24)	2.49	.09
RESPON ($\bar{x}$)	67(16)	69(39)	68(24)	.25	.78

[1]Means tested for significant differences using the Student-Newman-Keuls procedure. N shown in parenthesis.

[2]Significantly different from other two groups at .05 level.

[3]This pair is significantly different at the .05 level.

[4]A description of these measures is found in Table 2.

DISCUSSION

In the specific experiential setting utilized in this study, a game centered marketing principles course, the Kolb Learning Style Inventory was unable to discriminate among students on the basis of class performance. One must be careful not to generalize this finding to other experiential learning environments as the present environment has some unique aspects which are not normally found in many experiential environments. It may also be that the Inventory is not sensitive to determinants of performance in the marketing discipline.

It is interesting to note that while there was no grade discrimination, there was some discrimination among perceived learning measures. Thus, on several perceived learning measures students reported learning which could be differentiated by learning style categories. However, as noted above, this difference in perception did not carry over into performance as measured by course grade. This apparent discrepancy could be due to inaccuracies in student perceptions or to the performance measure giving little or no weight to those dimensions which the students perceived differently.

This lack of carryover from perception of learning to course performance was evidenced by the very sparse relationship evidenced between the various perception measures and course performance. The insensitivity of the perception of learning instrument could possibly be due to the design of the instrument. It is new and thus has not been tested with respect to reliability and validity. Analysis of additional data collected from the study may yield some insight into the quality of the instrument.

The basic finding of the study then is that very little relationship was found among learning style, perceived learning and course performance using the present instruments. Whether some such relationship exists is open to question. It is an area requiring further study.

DIRECTIONS FOR FURTHER RESEARCH

Several areas offering opportunities for future research come readily to mind. Of major importance is the validation of the learning style instrument. Until we know we have a valid instrument, findings of studies using learning style instruments will be suspect. One of the biggest problems here is to get agreement upon what constitutes learning style. As was stated at the beginning of this paper, there are several learning style instruments presently available. Are these instruments all measuring some underlying construct or are they all measuring different dimensions which have been called learning styles by their developers?

Work could be profitably done on the development of a perception of learning instrument. The instrument in this study is only an initial attempt. As was stated earlier, levels of perception may play an important part in student actions and attitudes toward a course. Knowledge of such perceptions could assist the instructor in altering his techniques in order to assist students in areas where they perceive they are weak or are not learning as much as they had expected.

The search for the relationship between course performance and learning style is a worthy endeavor. The search needs to be pursued in both the experiential and the non- experiential learning environments. We need-to discover whether specific teaching methods are more effective with some learning styles than with others. It would also be helpful to know whether different learning styles lead to different learning perceptions.

REFERENCES

1. Fritzsche, David J., "The Lecture Vs. The Game," Simulations, Games and Experiential Learning Techniques: On the Road to a New Frontier. The proceedings of the First National ABSEL Conference, Oklahoma City, April 26-27, 1974, pp. 41-46.

2. Kazmierski, Paul R., "A Selected Bibliography On Cognitive Learning Style 1967-1975," Rochester Institute of Technology, Rochester, New York. (Typewritten)

3. Kolb, David A. "Individual Learning Styles and the Learning Process," M.I.T. Sloan School Working Paper #535-71, June 1971.

4. Kolb, David A. and Goldman, Marshall B., "Toward a Typology of Learning Styles and Learning Environments: An Investigation of the Impact of Learning Styles and Discipline Demands on the Academic Performance, Social Adaptation and Career Choices of MIT Seniors," M.I.T. Sloan School Working Paper #688-73, December, 1973.

5. This approach is consistent with that advocated by Winer. Winer, B. J. Statistical Principles in Experimental Design, (New York: McGraw-Hill, Inc., 1971).

6. Wolfe, Douglas E. and Byrne, Eugene T., "Research on Experiential Learning: Enhancing the Process," Simulation Games and Experiential Learning in Action. The proceedings of the Second National ABSEL Conference, Bloomington, Indiana, April 9-11, 1975, pp. 325-326.