AN INSTRUMENT FOR THE ASSESSMENT OF LEARNING DIMENSIONS: A PROGRESS REPORT ON THE LEARNING DIMENSION SCALE (LDS)[1]

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ABSTRACT

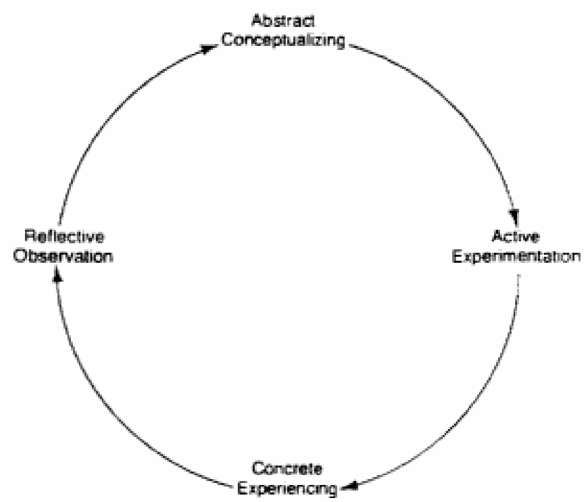
INTRODUCTION

The use of experiential materials by instructors in various learning situations has established itself as more than a passing instructional fad. In the area of management, as with many other business areas, although relatively few experientially oriented texts were published in the more distant past (19), an in-creasing number has appeared in the more immediate (1, 9, 14) and very recent pasts (5, 8, 22). During this same time frame, the focus of experientially related research and other scholarly works has seemed to shift somewhat from "should an instructor use various experientially oriented versus non-experientially oriented pedagogic devices (2, 4)", to "how should one best use and/or design experiential materials (13, 23)". In line with this trend, the purpose of this paper is threefold: 1) to summarize a movement over the past few years to access and use individual learning dimensions in the design and conduct of experiential learning materials; 2) to present an intended step forward by introducing a proposal for the development of the Learning Dimension Scale (LDS), an instrument which will better enable instructors to evaluate and use individual learning dimensions to enhance the effectiveness and efficiency of experiential learning materials, and; 3) to encourage others to pursue similar instruments due to the worthwhileness and high need for such measurement tools.

THE ASSESSMENT OF LEARNING DIMENSIONS IN THE PAST

A learning dimension is defined as a major characteristic of the process individuals use in order to acquire new knowledge. It is therefore, fundamental that in order to discuss these dimensions one must first understand how people acquire new knowledge (learn). According to a model synthesized by Kolb (16), the learning process is a four-stage cycle. Concrete experience (Stage One or CE) serves as the foundation for reflections and observations (Stage Two or RO) which result in abstract concepts (Stage Three or AC) which are then tested through active experimentation (Stage Four or AE) in new situations. These four stages are continually repeated as the cycle depicted in Figure 1 implies.

Figure 1



The Kolb Learning Cycle

The Learning Styles Inventory (LSI) is probably the most pervasive instrument which has been designed to measure the degree to which individuals use concrete experience, reflective observation, abstract concepts, and active experimentation in their learning processes (17). Basically, the LSI is purported to determine: 1) AC, CE, AE, and RO scores for individuals dependent upon the relative emphasis they place on each stage during the learning process, and; 2) scores reflecting the relative emphasis individuals place on abstractness versus concreteness (AC score minus CE score) and activeness versus reflectiveness (AE score minus RO score). The LSI and related scoring procedures are presented in Figure 2.

Unfortunately, the LSI has not withstood the test of close empirical scrutiny. Freedman and Stumpf (10) administered the LSI to one group of 1179 students on a one time basis and to a second group of 101 students on a test-retest basis. These authors state that overall, the LSI is a worthwhile idea but that the credibility of the LSI is seriously suspect due to its rather unreliable nature. These researchers conclude both with the thought that LSI instrument bias is related to completion and scoring procedures and with the question of what, if anything, does the LSI measure?" More recently, similar conclusions have been reinforced and extended by Freedman and Stumpf (11).

Certo and Lamb (6) compared LSI results generated by student response to LSI results generated by a random numbers table. This comparison led the authors to conclude that a significant degree of artificial correlation built into the LSI rendered the instrument deficient. A related study by Certo and Lamb (7) led to similar conclusions.

[1] A version of this paper has been developed into a grant proposal, the final disposition of which is still pending.

Figure 2

LEARNING-STYLE INVENTORY*

This inventory is designed to assess your method of learning. As you take the inventory, give a high rank those words which best characterize the way you learn and a low rank to the words which are least characteristic of your learning style.

You may find it hard to choose the words that best describe your learning style because there are no right or wrong answers. Different characteristics described in the inventory are equally good. The aim of the inventory is to describe how you learn, not to evaulate your learning ability.

Instructions

There are nine sets of four words listed below. Rank each set of four words assigning a 4 to the word which best characterizes your learning style, a 3 to the word which next best characterizes your learning style, a 2 to the next most characteristic word, and a 1 to the word which is least characteristic of you as a learner. Be sure to assign a different rank number to each of the four words in each set. Do not make ties.

	[CE#]**	[RO#]	[AC#]	[AE#]
1.	___discriminating	___tentative	___involved	___practical
2.	___receptive	___relevant	___analytical	___impartial
3.	___feeling	___watching	___thinking	___doing
4.	___accepting	___risk-taker	___evaluative	___aware
5.	___intuitive	___productive	___logical	___questioning
6.	___abstract	___observing	___concrete	___active
7.	___present-oriented	___reflecting	___future-oriented	___pragmatic
8.	___experience	___observation	___conceptualization	___experimenatation
9.	___intense	___reserved	___rational	___responsible

FOR SCORING ONLY

CE______	RO______	AC______	AE______
234578	136789	234589	136789

*In order to score each of the four abilities, six of the nine items under each classification are totaled. Then, to determine the extent to which an individual emphasizes abstractness over concreteness (AC-CE), the total for concrete experience is subtracted from the total for abstract conceptualization. Next, to determine the extent to which an individual emphasizes active experimentation over reflection (AE-RO), the total for reflective observation is subtracted from the total for active experimentation.

**The bracketed labels are included so that the reader may identify the items used in each table. They were not included in the test instrument.

Evidence concerning the high value of a sound instrument such as the LSI is not difficult to gather. According to Hall, Bowen, Lewicki, and Hall, (12, p. 27) "understanding one's learning style helps the manager to seek out learning and problem-solving situations which are likely to contribute most to his or her continued development." In addition, preferred learning styles can be studied against various teaching methodologies in order to enhance the learning situation (3). Lastly, as evidenced by its inclusion in two popular organizational behavior texts (12, 18), the LSI can serve as excellent basis for classroom discussion.

THE ASSESSMENT OF LEARNING DIMENSIONS IN THE FUTURE: THE LDS

Initial Item Identification and Development

The first task in the development of the LDS will be to identify a set of questions or items which is capable of assessing an individual's identification with the AC, CE, AE, RD learning dimensions. Items will be generated which have little mystic associated with them and clearly characterize one dimension or another. Newman (20) reports that within the development of his Perceived Work Environment (PWE) instrument, great care was taken to assure that the questionnaire items were as nonevaluative as possible by developing items that maximized description and minimized evaluation.

The items will be developed using a seven-point Likert scale instead of using a forced rank instrument. The Likert scale will not force any negative correlation thus allowing any correlation that exists between dimensions to be estimated. Attention, however, will also be focused on the limitations *of* the Likert scale such as consistency of responses through the development of a mental set. Items will not be developed so that subjects are forced to choose between dimensions. A question phrased in such a manner could also develop an artificial mental set in a students' mind that could create a bias in that individuals response to other items.

It may be that analysis of the result does not support the bipolar state of learning that related instrumentation in this area espouses. It might be that learning is so interdependent that strong development in one dimension requires at least moderate development of all other dimensions.

Item Validity

In order to determine whether or not a potential Item is capable of assessing an individual's identification with a learning dimension the following procedure will be used. First, the learning model will be presented to various sets of subjects and an attempt will be made to thoroughly acquaint them with the meaning and definition *of* each of the dimensions. Next, subjects will be asked to classify each of the potential questions under its appropriate category (Ac, CE, AE, or RO) and rate the ease with which this classification is made. Only those questions that a majority of subjects are capable of classifying correctly and are judged to be easily classified will be retained. Kerlinger (15) States that "content validation consists essentially in judgment. Alone or with others, one judges the representativeness of the items." If the subjects as a majority are able to determine that a question is measuring what it is intended to measure, a significant improvement over past instrumentation in this area will be achieved.

Item Reliability

After the set of questions has been identified, an analysis of the instrument will be judged using the following techniques. A test-retest procedure will be used to determine the consistency of the responses to the instrument. That is, the same questionnaire will be administered to the same set of individuals after an appropriate period of time has passed. Correlation matrices will be formed using the test-retest scores for each item. These reliability estimates will need to be fairly high, given Nunnallv's (18) argument that test-retest reliabilities are frequently inflated. Again, if any item were to demonstrate a lack of consistency, it would need to be eliminated. However, the early attempt to select questions that demonstrated high content validity should help reduce the possibility of having items in the instrument with little reliability. A correlation matrix for the test-retest results will also be run for totals of each of the four dimensions.

Construct Validity

In order for the instrument to be judged valid, it will have to be four dimensional. That is not to say that the dimensions need be uncorrelated. However, the correlation of the items within the dimensions should be stronger than the correlation of the items among dimensions. The dimensionality of the instrument shall be determined using both correlation analysis and factor analysis techniques.

In order to determine whether or not the questions effectively identify four dimensions (independent or otherwise) using correlation analysis, data will first be analyzed through the development of two matrices. The first matrix will report the average correlation of each variable with the other variables in each of the four hypothesized dimensions. Ideally each variable should have a strong positive average correlation with the items within its own construct as compared to the Items in the other three dimensions. For clarity, if there exists twenty-six questions within the questionnaire, the matrix would be of size four by twenty-six. If an item has weak average correlation with other items within its own dimension or is more strongly correlated with items within other dimensions that item would need to be reclassified or eliminated.

The second matrix will report the average correlation value of all the paired variables within each of the four hypothesized dimensions (those values will appear on the diagonal in this matrix) and the average correlation of all paired variables between each of the paired dimensions (these values will appear as the off- diagonal items). The four correlation values on the diagonal of the matrix will be found by averaging the correlations of the variables within each of the hypothesized dimensions, whereas the six correlation values on the off-diagonal will be found by averaging the correlations of the variables between each pair of dimensions. Ideally, the table will be able to demonstrate that the average level of interaction between variables within each respective dimension is much higher than the average correlation of variables among dimensions. That is, the correlations on the diagonals would all hopefully be higher than any single correlation on the off-diagonal. This matrix would be of size four by four.

To supplement the findings of the correlation analysis, factor analysis techniques will also be used. Specifically, principal factoring using principal component analysis and Varimax four factor rotation procedures will be used. Ideally, each factor created will successfully identify one of the hypothesized dimensions. The items comprising each of the hypothesized dimensions should load heavily on its dimension while every other item within the instrument should have a small correlation value with that factor. Items that load on several dimensions or on none will have to be eliminated.

CONCLUSIONS

This paper has presented a progress report on the development of an instrument called the LDS. The development of this instrument has been planned according to generally accepted validation and reliability procedures. In addition to resulting in a finalized experiential learning measurement tool, it is hoped that this article will encourage the development of similar instruments by others.

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