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THE DEVELOPMENT OF A THEORY OF LEARNING PERFORMANCE: A FIRST STEP

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ABSTRACT

Prior research that examined the effectiveness of face-to-face versus various computer-assisted teaching methods has resulted in "no significant differences." However, this research was conducted without the benefit of a theoretical model that could be tested empirically with structural equation modeling techniques. The purpose of this paper is to develop such a model that will be operationalized with appropriate data as a second step.

Keywords: Distance Learning, Learning Models, Learning Performance

INTRODUCTION

Distance learning is not a new concept. Correspondence courses have long been a means of educating students at all grade levels that are geographically removed from institutions of learning. These types of courses have also been a low cost method of delivering adult education programs. In the 1960s television and teaching machines [2] became the modern mode of delivering course materials. The 1970s introduced the VCR and low cost audiocassette components opening the door to audio and video type programs. The 1980s and 1990s launched inexpensive personal computers and enabled the development of teleconferencing technologies. We now have the Internet and a whole new set of resources available for use as teaching tools.

Each of these media has its own strengths and weaknesses. Television broadcasting and teleconferencing are both limited to being in the synchronous mode. All participants have to be present at the same time (although not in the same place) and the instructor controls the pace at which the material is presented. However research has shown that the synchronous mode of learning is less desirable. A positive relationship was found to exist at the college level between student control of the learning pace with motivation and performance [1, 5].

Video-based, audio-based, and correspondence courses all have the benefit of being asynchronous in that participants can learn at different times and places from each other and the instructor. But these methods lack interaction between the student and the instructor or students with other students. Some correspondence courses have limited written or e-mail interaction between the instructor and the participant. However the lack of timeliness of the postal service and the instructor's responses moderates any beneficial interaction effect. Some learning theories view learning as a social process that occurs more effectively through interaction in a cooperative context [8]. The need for interaction cannot be satisfied by such one-way teaching methods.

Instruction using Internet technologies is currently the only method of teaching that allows for instructor-student interaction, student-student interaction, and asynchronous processing allowing the student to control the pace of learning. In addition, Internet-based learning also has the advantage of being available anywhere there is a telephone plug. In today's global economy, punctuated with business men and women with their laptops, effective learning need not require a classroom.

The cost of Internet-based learning is also very attractive. Teleconferencing requires a large investment in classrooms with computers built into the desks, large screen video displays, cameras in each classroom, audio pickup and broadcast, broadband transmission capability, routers, and modems. By comparison, Internet-based learning requires only a personal computer or laptop with a modem, a server, an Internet service provider, and a telephone plug. Virtually all business people today already have the equipment needed.

This paper will develop a theory of learning performance from a review of current literature. The purpose of this theory is to develop a model that can be used to empirically test learning effectiveness resulting from two different teaching methods; specifically, an Internet-based approach as compared to a traditional face-to-face classroom format.

Previous research in the field repeatedly results in "no significant differences" between face-to-face and various computer-assisted methods. However, none of these studies used a causal path model that would explain the constructs and interactions occurring in the learning process.

It is important to mention one point relative to generalizability. The Theory of Learning Performance is developed specifically for the academic environment at the high school, college or university level. Although many aspects of the Theory of Learning Performance are applicable to lower levels, it is not intended for those purposes. The basic theory is goal attainment oriented and relates goal attainment to academic attainment. As will be discussed later, previous research has shown these constructs to be related using high school age subjects. Goal setting and attainment at the sub-high school level may not result in the same relationships as it does at the high school and college level.

CONSTRUCTION OF THE THEORY OF LEARNING PERFORMANCE

Porter and Lawler [9] developed the notion of Expectancy Theory as a means of understanding the relationships between motivation and performance behaviors. There are three concepts that are the building blocks for the theory; performance-outcome expectancy, valence, and effort-performance expectancy. Performance-outcome expectancy states that every behavior has associated with it, in an individual's mind, an expected outcome (rewards or punishments). The individual believes that if he/she behaves in a certain way then he/she will obtain certain things. Valence is the value, worth, attractiveness of an outcome to the individual. People put different values on a reward or punishment based on their own perceptions of relevance. Effort-performance expectancy represents the individual's perception of how difficult it will be to achieve a behavior and the probability of successful achievement of that behavior.

These concepts can be put together and reflect that motivation will be greatest when

a) The individual believes that the behavior will lead to outcomes (performance-outcome expectancy).
b) The individual believes that these outcomes have positive value for him/her (valence)
c) The individual believes that he/she is able to perform at the desired level (effort-performance expectancy).

Figure 1 shows the basic motivation-behavior sequence described by Expectancy Theory along with a single moderator. Ability to achieve the behavior moderates the effort-to-performance relationship. An individual can be highly motivated and put out the effort but because of limitations in ability, he or she is not able to fully achieve the necessary level of performance. Similarly, a low level of effort could still result in acceptable performance when there are high levels of abilities.

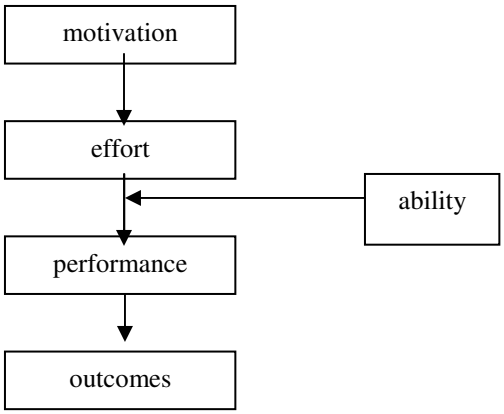

Figure 1. Motivation-Behavior Sequence

Adaptation to a Learning Theory

John Keller [4] adapted the motivation-behavior sequence from Expectancy Theory to a learning environment by making certain changes to the definitions of the constructs. The change to the above Figure 1 is that "performance" becomes "learning" and the "outcomes" are more specifically defined as "goal attainment." Learning is operationalized in five different ways: volume of information acquired, ability to retain information acquired, ability to apply information acquired to applicable situations, changes in attitudes towards the value of the subject matter, and perception of one's own learning. The goal attainment outcomes are those goals associated with learning, such as being able to perform a certain task or be qualified for a new job.

This Theory of Learning Performance then can be further defined with the implied propositions as follows:

P_1 The greater a person's motivation to learn, the more effort he or she will expend in learning.
P_2 The greater the effort applied to learning, the greater the learning performance.

P_3 The greater the ability to learn, the greater the learning performance.
P_4 The greater the learning performance, the greater the chances of attaining goals.
P_5 The greater the perceived value of the goal, the greater the motivation.

In George Homan's [10] exchange propositions, his success proposition, value proposition, and stimulus proposition closely parallel the Porter and Lawler concepts of performance-outcome expect-ancy, valence, and effort-performance expectancy. However, Homan's perspective generates additional propositions to be evaluated in the Theory of Learning Performance as follows:

P_6 The more learning success a person has experienced in the past, the more effort they will apply to current learning.
P_7 The more valuable a person perceives the goal to be, the greater the effort they will expend.

Operationalization of Constructs

In order to empirically test the Theory of Learning Performance, learning would become the dependent variable rather than goal attainment. Learning can be measured a lot more precisely. Volume of information learned can be measured with a before/after test. Retention can be measured with a before/after/after test. Perceptions of learning and changes in attitudes toward the value of the subject matter can be uncovered with scaled measures. The ability to apply information acquired can be determined experimentally.

There are also various measures of ability such as GRE or SAT score, grades earned in previous classroom environments, or even IQ tests. Motivation and effort can both be measured with scaled questionnaires.

Accounting for the Learning Environment

Kurt Lewin [11] developed the idea that behavior is a function of a person in his/her environment. This concept was specifically restated to the learning environment by Hunt and Sullivan [3] in their Social Learning Theory and codified as follows:

$$B = f (P \& E)$$

The environmental issues impacting the educational system can be categorized either as within the immediate academic environment or in the broader societal environment. Academic environment influences include social norms within the peer groups. The societal environment includes cultural, community, and family influences. The positive or negative attitudes of the peers, family, community, and cultural group towards education and the educational system will have an influence on the student's attitudes, motivations and other behaviors within the learning process.

Adding the cultural and societal subsystems to the learning performance theory also generates additional propositions:

P_8 The more positive the peer groups' attitudes towards learning, the more motivated the student.
P_9 The more positive the family's attitudes towards learning, the more motivated the student.
P_{10} The more positive the com-munity's attitudes towards learning, the more motivated the student.
P_{11} The more positive the cultural group's attitudes towards learning, the more motivated the student.

Accounting for the Presentation of the Learning Material

A construct is added to the Theory of Learning Performance for the presentation of the course material. Presentation is a combination of the attributes of the instructor, the methods used in presenting the material, and the subject matter itself. This construct is both a predictor of learning and of effort to learn. The synergies of the instructor can elicit more or less effort from the individual students or perhaps different teaching methods will influence the amount of effort the student puts forward. Leidner & Jarvenpaa [6] found, while studying three different instructors and varying degrees of electronic classroom environments, that teacher style appeared to be an important factor. They also determined that a student preference (learning style) for one teaching method over another was an important moderating variable between the method and its effect. Matta and Kern [7] found that there are student personality characteristics that effect learning success with different teaching methods. In particular, they found that introverted students performed better than did extroverted students when utilizing computer aided instruction techniques. In the following propositions, the term "fit" refers to the alignment of the student's needs, abilities, and learning styles to the instructor's teaching style, abilities, experience, and leadership qualities:

P_{12} The more effective the perceived quality of the presentation of the material, the greater the amount of effort spent to learn.
P_{13} The more effective the perceived quality of the presentation of the material, the greater the amount of learning that will occur.
P_{14} The more effective the perceived quality of the presentation of the material, the greater the motivation to learn.
P_{15} The better the "fit" of the teaching method to the student, the greater the amount of effort spent to learn.
P_{16} The better the "fit" of the teaching method to the student, the greater the amount of learning that will occur.
P_{17} The better the "fit" of the teaching method to the student, the greater the motivation to learn.
P_{18} The better the "fit" of the teaching materials to the student, the greater the amount of effort spent to learn.
P_{19} The better the "fit" of the teaching materials to the student, the greater the amount of learning that will occur.
P_{20} The better the "fit" of the teaching materials to the student, the greater the motivation to learn.
P_{21} The better the "fit" of the teacher's attributes to the student, the greater the amount of effort spent to learn.
P_{22} The better the "fit" of the teacher's attributes to the student, the greater the amount of learning that will occur.
P_{23} The better the "fit" of the teacher's attributes to the student, the greater the motivation to learn.

Accounting for the Concept of Self

Peter Blau looked at differences in power in an exchange as leading to conflict. However, this potential for conflict can be overcome when power is converted into authority. The teacher/student relationship has an imbalance of power and if the student cannot accept this imbalance in the exchange, then they will be dissatisfied and effort will be diminished. The interactionist theorists would refer to this as "role." The student must accept their role and the role of the instructor in order to deal with the imbalance of power in the relationship. The concept of role is the key mechanism of interaction according to both the Chicago and Iowa schools [10; pp 370, 371]. A construct will be added to the Theory of Learning Performance that will be designated as "concept of self." This construct will be defined to include not only the ability to accept one's role in the teacher/student exchange but also the student's self efficacy, which is the perception of the person's own abilities to accomplish their learning goals. A person expects himself or herself to perform more capably relative to another individual or other individuals. This concept is central to the notion of Expectation State as described by Joseph Berger and his associates [10; pg 452].

P_{24} The more the student can accept the power imbalance and their roles in the teacher/student exchange, the greater the amount of effort spent to learn.
P_{25} The greater the level of self-efficacy, the greater the amount of effort spent to learn.

By adding self-efficacy as a construct in the theory, the moderation impact of the learning ability construct previously defined will be affected. By including a person's perception of their learning ability as antecedent to their actual learning ability, the amount of variance left to be explained by the actual ability would now just represent the difference between the perceived ability of the student as reflected in self efficacy and the actual ability as measured by grade point averages, SATs, or possibly by IQ testing. There is also a causal relationship between actual and perceived ability. A person with a greater amount of learning ability is more likely to have performed better in learning situations in the past and would therefore have a perception of greater ability.

P_{26} The greater the level of actual ability, the greater the level of perceived ability.

The pieces of the Theory of Learning Performance can now be combined as diagrammed in Figure 2 (after the Reference section).

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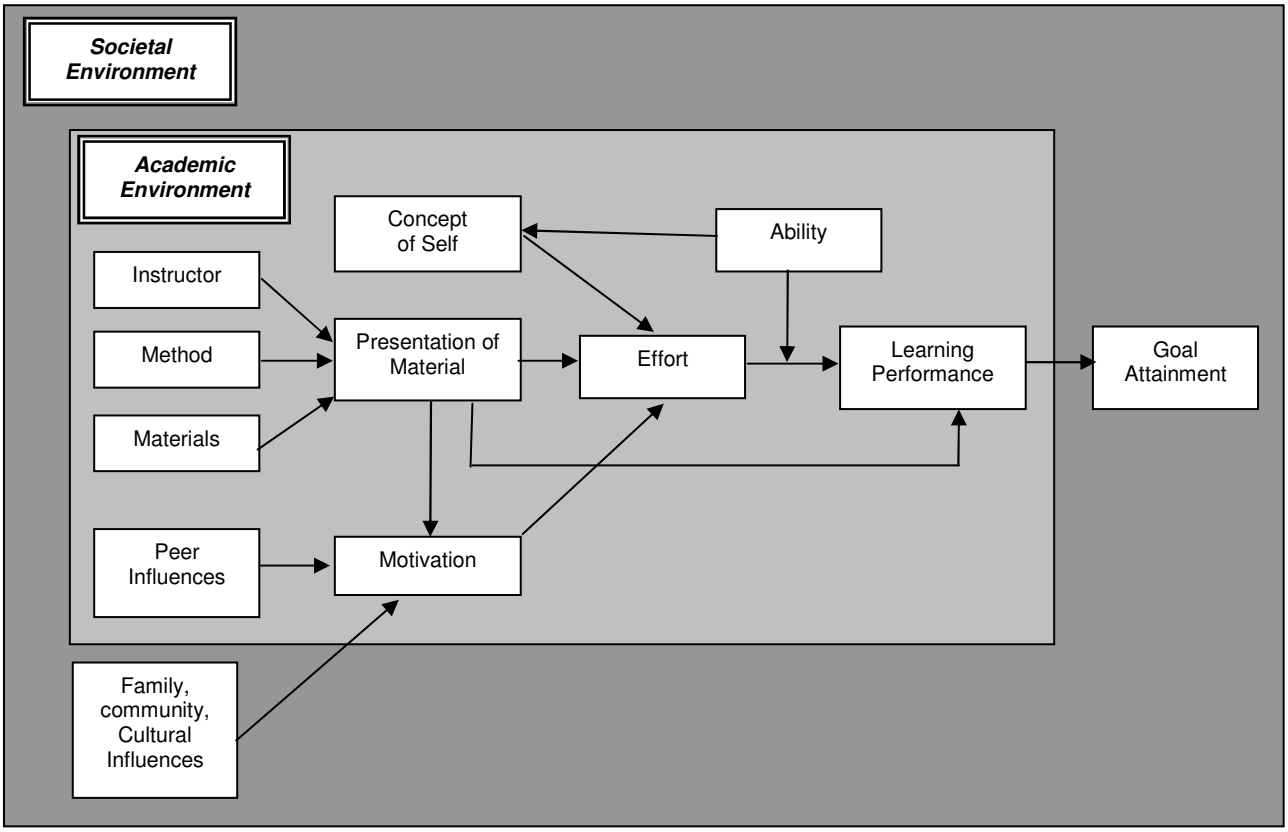

Figure 2. Theory of Learning Performance