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# A Model of Learning for Research in Information Systems Education

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# A MODEL OF LEARNING FOR RESEARCH IN INFORMATION SYSTEMS EDUCATION

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## Abstract

*Educational researchers have long studied the role of the student in educational settings with the goal of improving learning outcomes. In this paper, we review constructs commonly employed in studies reported in the education literature undertaken to better understand how and why people learn. We then incorporate these constructs into a model of learning that we hope can be utilized as a starting point in further research in information systems education.*

**Keywords:** Academic Delay of Gratification, Learning Strategies, Motivation Regulation Strategies

## Introduction

It is perhaps self-evident that the role of the student is paramount in learning and education. Not surprisingly, then, educational researchers have long studied the role of the student (termed the *learner*) in educational settings with the goal of improving learning outcomes. Ng and Bereiter (1991) identify three major streams of psychological research undertaken to help understand the role of the learner in learning: research undertaken to study the "learners' strategies, learners' beliefs, and learners' goals" (Ng and Bereiter, 1991: 244). In this work, we briefly review relevant research and introduce a model of learning for researching undertaken to help us understand learning in the information systems (IS) curriculum.

## Theoretical Development

In this section, we briefly review constructs commonly employed in studies reported in the education literature undertaken to better understand how and why people learn. We then incorporate these constructs into a model of learning that we hope can be utilized as a starting point in further research in information systems education.

### *Individual Differences*

Many individual difference variables have been studied in the education literature. Individual differences between learners stem from a variety of sources, such as age, self-efficacy, perceived ability, experience, socio-economic background, and beliefs about intelligence (e.g., fixed or variable), to name a few. For example, Neber and Schomer-Aiken (2002) researched the roles of cognitive, motivational, epistemological, and environmental variables on learning.

Harju and Eppler (1997) studied achievement motivation, flow, and irrational beliefs between traditional and non-traditional students, an individual difference variable based upon age. The authors have had many discussions with other educators in which comments regarding the differences between traditional and nontraditional students in work ethic, motivation, maturity level and other variables were noted after having been observed anecdotally; thus, we feel that this may be a fruitful area for research. Moreover, individual difference variables and constructs have been utilized in many IS studies and models.

### *Situational Factors*

Situational factors in an educational setting include such issues as course, course content, projects, etc. In the information systems curriculum, situational factors can vary between courses; an Introduction to Management Information Systems course is significantly different from an Advanced Data Communications and Networking course. Moreover, the situational context can vary within a course; one portion of a Data Communications and Networking course might involve declarative knowledge (e.g., theoretical underpinnings of the subject area, such as the OSI model), while another might include procedural knowledge (e.g., how to subnet an IP network and configure routers with the subsequent network design), reflecting separate types of knowledge being conveyed. Furthermore, instructions conveyed to students can reflect a desire on the part of the instructor to have students achieve mastery or ego-centric level learning (see below).

Indeed, the very nature of information systems (e.g., very technical, detail-oriented) itself is a prime situational factor and can be distinguished from other areas of academic learning (e.g., literature). It is known that the type of knowledge taught varies (Nicholls, 1992). Understanding how our discipline differs from others, as well as how our students differ generally (as opposed to individual differences) can inform our teaching in many potential ways.

### *Goal Orientation*

Myriad studies have been conducted regarding what learners hope to achieve while learning (typically termed *achievement goals*), primarily derived from the work of Dweck (cf. 1986) and colleagues. Learners with varying achievement goals are said to have different *goal orientations*. Three levels of, or orientations to, achievement have been identified: mastery, ego-social, and work-avoidant. (Other terms are often used to identify the same levels, such as learning goal in the place of mastery goal – see Jagacinski and Strickland, 2000, and Somuncuoglu and Yildirim, 1999; Wolters and Yu,1996, note that while there are slight theoretical differences associated with the various terms, they are generally quite similar). Learners with a mastery-orientation tend to have a focus on mastery of the task, skill enhancement, and educational growth – in short, a "focus on improvement," as Jagacinski and Strickland (2000) term it. In contrast, learners with ego-social orientations tend to have a focus on demonstrating their superior abilities to others. Finally, those with work-avoidant orientations attempt to complete a task with little chance of failure and as little effort as possible (Somuncuoglu and Yildirim, 1999). Learners with learning goals are often task-involved and intrinsically motivated to learn for internal reasons, while learners with ego-social goals are often termed performance oriented in that they can demonstrate their competence to others by successfully completing the assigned task.

As might be expected, given the opportunity, learners with different achievement goals often select different learning tasks. Thus, as Eppler, Carsen-Plentl, and Harju (2000) note, those with learning goals (i.e., mastery-orientation) "actively seek out and enjoy challenging tasks (and) are persistent and effective problem-solvers when faced with obstacles and challenges" while those with performance goals (i.e., ego-social orientation) "prefer easier tasks where they are sure to be successful, thus actively avoiding more challenging situations" (Eppler, Carsen-Plentl, and Harju, 2000: 354). Moreover, Pintrich and Schrauben's (1992) work suggests that students with different goal orientations utilize different learning strategies. Learners with mastery orientations typically utilize deeper cognitive processing and more sophisticated cognitive strategies (e.g., elaboration) than those with ego-social orientations. This construct seems to offer many research opportunities for IS researchers, given the multitude of projects that can be offered in IS courses.

### *Motivation Regulation Strategies*

As professional educators, we are all too familiar with students' motivations, or lack thereof. Motivation strategies are concerned with why we engage in behaviors, such as learning tasks and, as might be expected, can be influenced by individual differences or by the situational context (e.g., the learning task) (Wolters and Yu, 1996). Interestingly, educational researchers have formally studied both motivation and its impact on what is termed "academic delay of gratification" (discussed below). As Bembenutty (1999) notes, "(a)cademic delaty of gratification is multidetermined by the learners' motivational tendencies, and those tendencies should differ as a function of the students' goal orientations" (Bembenutty, 1999: 237). Researchers have studied motivation regulation strategies in the context of expectancy-value theory (Eccles, Wigfield, and Schiefele, 1998; in Bembenutty, 1998) and social expectancy for success (Anderman, 1999; in Bembenutty, 1998).

Motivation is often self-regulated, particularly in academic settings, and may be of particular interest to IS researchers trying to identify why some students persevere in the face of difficult technical problems while others simply change their career objectives.

### *Academic Delay of Gratification*

Delay of gratification is self-regulatory behavior and relates to how one manages one's motivations and self-discipline, typically without the presence of external regulators (e.g., parents) (Bembenutty, 1998). Academic delay of gratification is a specific case of delay of gratification, which is thought to be domain specific. General studies of the delay of gratification indicate that children who engage in delayed gratification tend to achieve more academically and are more socially adept in later years.

In a series of studies (discussed in Bembenutty, 1998), Bembenutty and Karabenick report results indicating that high academic delay of gratification was associated with high academic motivation, high self-efficacy, and higher intrinsic interest in learning. Moreover, in technical fields, where the sheer breadth and depth of material to be learned, understood and applied are essential to later career success, academic delay of gratification can be critical to achieving learning outcomes, and is thus included in our model.

### *Learning Strategies*

As Somuncuoglu and Yildirim (1999) note, there are many taxonomies designed to classify learning strategies (e.g., self-regulating or autonomous learning). They further categorize these varying taxonomies along two general dimensions: cognitive or metacognitive strategies. They note:

> "Cognitive strategies, basically consisting of rehearsal, elaboration, and organizing, help students encode, organize, and retrieve new information. Metacognitive strategies, basically consisting of planning, monitoring, and regulating, help students control and execute their learning processes… Furthermore, cognitive strategies are classified into (a) surface cognitive strategies, referring to rehearsal (repetition, reacting, highlighting, etc.), which helps encode new information into short-term memory only and (b) deep cognitive strategies, pertaining to elaboration and organization, which facilitate long-term retention of the target information…" (Somuncuoglu and Yildirim, 1999).

Learning strategies can be seen to play a critical role in learning outcomes. In fact, the learning strategy is perhaps the most critical element to achieving learning objectives. In introductory IS courses, where students may perceive their primary learning objective as memorization relating to a functional business area not their major, surface cognitive strategies are likely to be employed. On the other hand, in information systems major core courses, where understanding is critical for later application in an employment setting (e.g., database), a deep cognitive strategy may prove more appropriate.

## A Model of Learning

Figure 1 below incorporates the constructs or variables reviewed above into a research model we hope can be utilized to study learning and achievement in an academic information systems setting. As can be seen, individual differences as well as situational factors directly affect learners' goal orientations as well as the learner's motivation regulation strategies. Learners' goal orientations influence learning strategy directly and indirectly through motivation regulation strategies and academic delay of gratification. Motivation regulation strategies influence learning strategy directly and indirectly via the learner's academic delay of gratification. The learners' learning strategy, including both cognitive and metacognitive dimensions, then has the primary affect on learning outcomes.

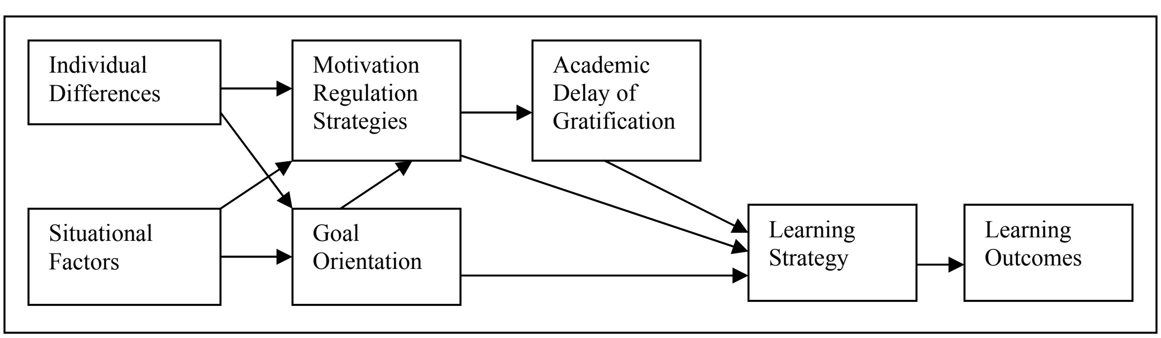

**Figure 1: A Model of Learning**

## Conclusions

In this paper, we have briefly reviewed relevant research from the educational literature with the goal of informing IS educators. Major constructs or variables were incorporated into a general model of learning that, while not specific to the IS field, can nonetheless be utilized to help study learning as related to the IS curriculum.

Other additional factors can be incorporated into the model. For example, IS course material can be categorized by the type of knowledge conveyed: declarative or procedural. Class activities can also be structured to account for the type of learning desired: implicit or explicit. Moreover, we believe that it might be beneficial to consider not only to content of the various courses that comprise a typical IS curriculum but also the order in which those courses are taken. If Lee and Vakoch (1996) are correct in their assertion that implicit knowledge hinders one's ability to learn new material, we should consider attempting to make implicit knowledge explicit before having students proceed to their next learning experience. For example, students who have taken Visual BASIC are often, without realizing it explicitly, embedding crisp, ordered logic into their programs (e.g., creating a logical sequence of screens that the application's users would progress through while using the application). If the next programming course they take is COBOL, a language which relies on structure and ordered logic, the students' lack of awareness of the logic skills they developed in their Visual BASIC course may cause them to have difficulty in grasping the logical nature of COBOL.

We hope that the relationships reflected in the model will be tested and the model modified as necessary to help improve overall IS education.

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