Challenges in Learner Motivation:  
A Holistic, Integrative Model for Research and Design on Learner Motivation

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Abstract

Challenges in learner motivation have many sources. They can result from the challenge of identifying the specific types of motivational problems of given learners, challenges faced by teachers and facilitators as they try to motivate themselves to teach a particular topic, environmental challenges due to poorly designed or boring learning materials, or lack of knowledge among teachers and instructional designers about motivational strategies and design processes. The literature on motivation is frequently not especially helpful because studies of motivation, whether in controlled or action settings, tend to focus on individual or isolated sets of variables. These approaches tend not to offer effective guidance for constructing research and design studies that capture the rich complexity of the action settings in which much design-based research is conducted. Furthermore, from a design perspective, these approaches tend not to offer much guidance for analyzing a given learning environment or a group of learners to determine what, if any, types of motivational challenges exist within that setting. This would be an important first step in any systematic design process in order to separate symptoms from causes of problems and to create appropriate solutions. Thus, it could be beneficial for guiding research and practice to have theories that are integrative in nature; that help explain relationships among variables and theories in relation to motivation, volition, learning, and performance. However, to have integrative theories it is necessary to move outside of the given paradigms and demonstrate how these various approaches can be combined to provide more explanatory frames of reference than any one of them can do by itself. In this paper such an integrative theory is proposed. It preserves the integrity of the concepts and theories that are integrated within the theory and its associated model, and it provides a basis for cross-paradigm studies. This theory of motivation, volition, and performance (MVP) builds upon an established integrative theory but expands it by incorporating the concept of intentions, action control, and information processing within the framework of a system model. Furthermore, the theory illustrates how environmental (external) influences on behavior combine with internal psychological constructs and processes in relation to goal directed effort, performance, consequences, and outcomes. The paper concludes with a discussion of implications of the theory for research and practice.

Key Words/Phrases: motivation, motivational challenges, motivational design, intentions, volition, ARCS model, self-regulation, performance, learning, design-based research
1. Introduction

Based upon your experience, what are some of the challenges in motivating learners? Would any of the following items be on your list? Are there any of these items that would not be on your list?

- Determining what kinds of motivational tactics will be most appropriate in a given situation
- Distinguishing between symptoms and causes of motivational problems
- Distinguishing between basic motivational deficits and poor volitional or self-regulatory behaviors
- Identifying relevant social (for example, peer group) and cultural influences on motivation
- How to add motivational tactics to an already crowded lesson plan
- How to overcome feelings of isolation among distance learners
- How to overcome the barriers of individual differences when designing for groups
- How to integrate motivational planning into instructional design
- Identifying instructor/facilitator attitudes and behaviors that affect learner motivation

This is a formidable list of challenges, but it is actually quite short compared to what it could be. The question is, how can you respond to all of these challenges? Does anyone respond to all of them? The answer is that people’s responses to these challenges tend to be narrowly focused and piecemeal. For example, a teacher exclaims, “this lesson is boring,” and then proceeds to infuse it with cartoons or other features to “pep it up.” Or, a researcher decides to study a volitional, or self-regulatory, strategy dealing with the personal management of distractions in an online learning environment. The researcher then develops treatment and control groups related to the distraction-management strategy to use in a controlled study. However, these instructional practices and research studies often produce little or no reliable or valid outcomes. Why? Because the teacher’s judgment that the lesson is boring might be correct, but his diagnosis of the cause of the problem and the solution might be incorrect. Boredom can result from a lack of perceived relevance, a teacher or narrator’s monotone voice, excessive text in screen displays, or other causes of low levels of stimulation. Thus, the teacher’s choice of solutions in the above example could be totally wrong. Furthermore, in the controlled study, the researcher might fail to get significant results from testing a distraction management strategy because many of the students in the study might already know how to manage distractions. The real problem might be that the content is so irrelevant that the students have no interest in using their volitional strategies or, conversely, the content is so engaging that the students would maintain their attention even without the researcher-designed strategies.

What do these examples suggest? They suggest several things:

- The importance of correctly distinguishing between symptoms and causes
- Diagnosing the correct cause
- Developing motivational strategies that are directly related to the cause of the motivational problem
- Determining that a specific problem exists before implementing a solution
- Being able to identify and manage multiple aspects of a learning environment

The problem is that traditional design and research approaches typically do not allow for the consideration of multiple, interacting influences on motivation or offer adequate guidance for distinguishing among the many symptoms and causes of motivational difficulties among learners.
There are many theories and models that explain aspects of motivation, volition, and learning but most of them tend to stand alone as relatively independent areas of inquiry. Examples include research on need for achievement (McClelland, 1985), curiosity (Berlyne, 1954), self-determination (Deci & Ryan, 1985), and attributions (Weiner, 1974). Furthermore, research on motivation usually includes learning as a dependent variable, but none of the preceding theories systematically incorporates learning theory in relation to the motivational factors under consideration.

In contrast to this situation, a cardinal premise in the present paper is that it is necessary to integrate the primary theories and concepts related to motivation and learning in order to provide an adequate basis for learning environment design and inquiry. Even though the primary focus of this paper is on learner motivation, including the initial motivation of learners and their continued motivation (volition), other components of the overall learning environment must also be taken into consideration in the design process. There has been some development of integrated theories and models, but it has been limited. For example, a well-established theory pertaining to motivation is the ARCS model (Keller, 1999) which provides a synthesis of motivational concepts and theories and a motivational design process. With regard to volition, Kuhl’s action control theory (Kuhl, 1985), Gollwitzer’s work on implementation intentions (Gollwitzer & Brandstätter, 1997), and research on self-regulated learning behaviors (Corno, 2001; Zimmerman & Schunk, 2001) are well established in this area. With regard to the various theories of learning, information processing theory (Atkinson & Schiffrin, 1971) has more of a process focus and still provides a good foundation for research in the context of learning environment design (Mayer, 2001). However, a limitation of each of the preceding research areas is they provide limited if any guidance for the interactions among the various motivational, volitional, and learning components of learning environment design. With respect to more integrative approaches, there are a few theories and models, some of them quite recent (Astleitner & Wiesner, 2004), that attempt to bridge between motivation, volition, and learning, but each of them has limitations that are addressed in the current paper.

Thus, the aim of this paper is to present a theory of motivation, volition, and performance (MVP) that integrates these and other factors in a manner that illustrates their interrelationships and facilitates the identification of specific motivational challenges that can be addressed by targeted motivational strategies. The method of accomplishing this is to portray the various theories and concepts in a systems model that illustrates how they are connected with regard to inputs, processes, and outputs and also preserves the theoretical integrity of each component. As previously described by Keller (1983, 2008, 2010) this type of theory can be characterized as a concatenated theory (Kaplan, 1964) or a constructive theory as Einstein called it (Kaplan, 1964) in contrast to a hierarchical theory. A concatenated theory consists of an assembly of explanatory components pertaining to a central phenomenon, in the present case learner motivation and performance. This is in contrast to a hierarchical theory in which the component laws and principles are derived from a set of basic principles, as in a hypothetico-deductive theory.

The MVP theory builds on an existing theory of learning motivation and motivational design, called the ARCS model, which is described in the following section. The ARCS model was, itself, part of a larger, macro-level theory that integrates psychological with environmental influences on performance which was simply called the macro model of motivation, learning, and performance (Keller, 1979, 1983). A description of this theory is followed by an explanation of how it was expanded into the MVP model by incorporating volitional concepts, an information processing model of learning, and a network of linkages among these various components with respect to learning and performance. The paper also includes examples from applied, or design, situations and a research perspective. The paper concludes with a discussion of potential benefits and implications of this theory for research and design.
2. Motivation, Learning, and Performance

Motivational research includes numerous micro theories and motivational constructs as well as at least one theory that synthesizes these various conceptual areas. The motivational theory to be incorporated in this paper is the ARCS model of motivational design (Keller, 1979, 1983, 1999). It is a well established and validated theory (Astleitner & Hufnagl, 2003; Naime-Diffenbach, 1991; Small & Gluck, 1994) that synthesizes motivational theories and constructs into four categories based on shared attributes. It also provides a systematic approach (Keller, 2010) to diagnosing motivational problems and designing motivational tactics into instruction. It incorporates needs assessment based on an analysis of the target audience and existing instructional materials, supports the creation of motivational objectives and measurements based on the analyses, provides guidance for creating and selecting motivational tactics, and follows a process that integrates well with instructional design and lesson planning (Keller, 2000 February). The analysis of motivational needs and corresponding selection of tactics are based on four dimensions of motivation that were derived from the synthesis of motivational concepts and theories, and are known as attention (A), relevance (R), confidence (C), and satisfaction (S). Each of these categories contains several subcategories that facilitate more specific diagnosis of motivational challenges.

However, the motivational dynamics represented by the four categories of the ARCS model do not occur in isolation from other influences on learning and performance. Their interactive influences can be illustrated in a process, or systems, model of motivation, learning, and performance (Figure 1). This model illustrates how a person’s curiosity (“attention”) and motives, or values, (“relevance”) combined with his or her expectancy for success (“confidence”) will determine which goals have the highest saliency and will therefore lead to purposeful effort to accomplish the goal. Environmental influences such as teacher enthusiasm and social values, quality of instruction, clarity of expectations, and availability of resources will also influence goal-directed effort and lead toward some degree of achievement, or performance, which will also be influenced by one’s knowledge, ability, and skills. One’s performance combined with the way in which reinforcement contingencies are administered determines the consequences of achievement with respect to whether it leads to an expected outcome. These consequences combined with one’s cognitive evaluations and reflections determine levels of satisfaction with the process and outcomes. With respect to feedback loops, represented by dotted lines in Figure 1, one’s perceptions of the relationship between effort and performance and between performance and consequences each feed back into and modify one’s expectancies (Weiner, 1974). Satisfaction level feeds back into motives and values to either strengthen or weaken the value one attaches to a given goal. Even though these lines follow a traditional representation as feedback loops which is convenient for graphical purposes, this model is a process model that illustrates how various internal and environmental events influence behavior over time. Therefore, the feedback lines are in essence feed forward lines. A person’s motives and values at time a will result in a chain of events as represented in the model. When an outcome is reached and internally, cognitively, evaluated, the results of one’s feelings of satisfaction or dissatisfaction on motives and values would be at time b. Hence, the model represents a series of cycles, not changes in a static situation. However, motives and expectancies are not always the starting point in the process. It is possible to begin with a set of observations at any point in the process and examine their relationship to other elements of the model.
This macro model has been useful in guiding inquiry on motivation and learning and providing a basis for identifying design issues. For example, audience analysis can be used to identify sources of motivation and learning problems and to then design solutions that incorporate the appropriate strategies (environmental stimuli) with regard to motivation, instructional design, and contingency management. As a process model, this macro model illustrates the relationships among various structures but does not detailed illustrations of the activities that occur within the major components. For that, one would have to look into the theories and procedures within the given component. For example, with regard to the expectancy-value part of the model, it is assumed that the goals with the highest valence will automatically result in action in the form of effort to accomplish the desired goals (Pintrich & Schunk, 2002). While this is true, this example also illustrates one of the shortcomings of the model that led to its expansion. Descriptions of the macro-model and the associated ARCS model explain the challenges of sustaining learners’ efforts to accomplish a given goal despite distractions and competing goals, but the model does not include specific concepts or procedures pertaining to this problem. Therefore, it would be useful to expand the model to explain the internal volitional, or self-regulatory, processes together with external supports that can assist learners in moving from goal selection to goal-directed actions and persistence. The following sections of this paper summarize how this macro model has been expanded to include various volitional factors along with a more detailed representation of learning theory in order to provide a more comprehensive integrated theory of motivation, volition, and performance (MVP). For a more detailed explanation, see Keller (2008).
3. Volition

Historically, motivation was considered to have two levels. The first is “will” which refers to a person’s desires, wants, or purposes together with a belief about whether it is within one’s power to satisfy the desire, or achieve the goal (James, 1890; Pintrich & Schunk, 2002). The second level is the act of using the will, or “volition,” which refers to a process for converting intentions into actions. Much of motivation research has focused on understanding what people’s goals are and why they choose them. For example, the original conceptualization of “will” as being a combination of desires and beliefs (James, 1890) about being able to achieve them is reflected in expectancy-value theory (Vroom, 1964) which postulates that behavior potential is a function, assumed to be multiplicative, of the perceived importance of a given goal in relation to other goals (value) and one’s subjective probability of being able to achieve the goal (expectancy). While this theory has had a powerful influence in motivational theory and is an integral part of the model illustrated in Figure 1, its primary contribution is in explaining how people choose a particular goal or set of goals.

The second level of “will” is the primary area of focus in research on volition, or self-regulation. Strong motivation provides a necessary but not always sufficient condition for understanding what impels people to action and helps them sustain their efforts to achieve a goal, especially when motivation is weakened due to lack of progress or competing intentions. In this situation, the concepts of action control (Kuhl, 1987), implementation intentions (Gollwitzer, 1999), and self-regulation (Zimmerman, 1998) are relevant. All of these pertain to the problem of maintaining goal-oriented behavior and overcoming discouragement and procrastination, which are frequently encountered problems in self-directed learning environments or in classroom courses that require independent projects of long duration. Wolters (1998) commented about how students can express sincere desires to accomplish a goal but have a very difficult time in managing competing goals and distractions that interfere with their academic work. Similarly, Pintrich and Garcia (1994) pointed out that the influence of volition becomes even more important for college students “who, when you talk to them, are very motivated and concerned about doing well, but often have a very difficult time enacting their intentions, given all the internal and external distractions they confront in college life” (p. 126f). These observations are, of course, readily apparent to teachers, counselors, therapists, or anyone else who tries to facilitate change in people.

Kuhl’s theory (Kuhl, 1984) postulates six action control strategies that can be employed as soon as a goal (“an action tendency”) becomes a strong current intention. These can be voluntarily utilized by an individual or can be applied in ways to support a learner’s efforts to stay on task. The six strategies are:

1. Selective attention: also called the “protective function of volition” (Kuhl, 1984, p. 125): it shields the current intention by inhibiting the processing of information about competing action tendencies.
2. Encoding control: facilitates the protective function of volition by selectively encoding those features of incoming stimulus that are related to the current intention and ignoring irrelevant features.
3. Emotion control: managing emotional states to allow those that support the current intention and suppress those, such as sadness or attraction, in regard to a competing intention that might undermine it.
4. Motivation control: maintaining and reestablishing saliency of the current intention, especially when the strength of the original tendency was not strong (“I must do this even though I don’t really want to.”)
5. Environment control: Creating an environment that is free of uncontrollable distractions and making social commitments, such as telling people what you plan to do, that help you protect the current intention.
6. Parsimonious information processing: Knowing when to stop, making judgments about how much information is enough and to make decisions that maintain active behaviors to support the current intentions.

The effectiveness of employing action control strategies has been confirmed in many studies in a variety of behavior change settings (Kuhl, 1987) as well as in educational settings (Corno, 2001; Zimmerman, 2001). Consequently, action control, or self-regulation, was incorporated as an important component of the MVP theory. However, action control theory does not provide detailed explanation of the process by which one moves from the state of having a predominant goal to active commitment to achieving the goal. For this, Gollwitzer’s work (Gollwitzer, 1996) on intention commitment, or implementation intentions is helpful.

The first step in moving from desire to action, that is, from the identification and acceptance of a personal goal to a set of actions to accomplish the goal is that of intention formation. On the one hand, having good intentions is typically considered to be a weak level of motivation and the connotation is that good intentions typically do not result in goal accomplishment. However, Gollwitzer has demonstrated how strong intentions versus weak intentions are good predictors of performance (Gollwitzer, 1996; Gollwitzer & Schaal, 2001). In Gollwitzer’s work, implementation intentions are but one part of a more complete theory, called the Rubicon model, which explains the transition from goals to action (Gollwitzer, 1996). The first phase of this model describes the formation of goals and is similar to the expectancy-value basis of the ARCS model. Phase 2 describes the transition from goals to full commitment, which is why it is metaphorically called the Rubicon model. It refers to Julius Caesar’s famous decision to cross the Rubicon into Italy proper which was against the law and from which there was no turning back. This “committed phase” is the pre-actional phase of volition which includes committing oneself to action and developing what Gollwitzer calls “strong” intentions that result from anticipating and immunizing oneself against obstacles. The third phase covers volitional, or self-regulatory, activities that help sustain goal seeking behaviors. It is in this part of the Rubicon model that Kuhl’s action control theory can add depth in regard to volition. The final phase of the Rubicon model consists of post-actional motivational behaviors such as reflecting on one’s actions and conducting a self-evaluation of outcomes. This is similar to the cognitive evaluation, equity part of Keller’s macro model (Figure 1).

4. Integrating volitional influences into the MVP model

Keller’s (1983) original macro model (Figure 1) illustrates the influences of personal and environmental variables on several different outcome variables (effort, performance, consequences, and satisfaction). The MVP model has the same components but there are graphical modifications and revisions to accommodate the changes related to motivation and volition (Figure 2). Notice that in the MVP model there are three types of effort: effort direction, effort initiation, and effort persistence. Instead of the unitary designation of effort (Figure 1) the result of choosing a goal is called effort direction (Figure 2), which refers to a person’s desires, or goal choices. Next is effort initiation which refers to the initiation of effort to achieve the chosen goals. This corresponds to Gollwitzer’s pre-actional stage in the Rubicon model (Gollwitzer, 1999). The third is effort persistence which is the action stage that represents volition as encompassed by the six components of Kuhl’s action control theory and other concepts of self-regulation (Corno, 2001; Zimmerman, 2001). Effort
persistence is influenced by the strength of the goal, the level of commitment, and the use of volitional strategies if any that are employed by the learner.

The relative magnitudes of each of these three types of effort influence their overall patterns. For example, if a person’s initial motivation is extremely high, then little conscious activity will be required for effort initiation or persistence. Deliberate activities to build commitment and support persistence become necessary when a person’s initial motivation is not especially strong because, for example, it is primarily extrinsically motivated. Students majoring in engineering are typically required to take a course in calculus which means that they will have greater difficulty maintaining their effort than students who are intrinsically motivated by the subject. These extrinsically motivated students can be expected to require a greater use of volitional strategies which can be self-initiated or incorporated into the design of the learning materials. Even when a person is intrinsically motivated it might be necessary to use volitional strategies to remain on task. This is because life is complex and people can have multiple goals that are competing for their attention.

The remaining part of the motivational components in the MVP model is related to satisfaction and is essentially the same as in the original model. This phase incorporates Gollwitzer’s post actional phase and incorporates both cognitive reflection and emotional processing. It is now called “outcomes processing” and includes these elements. Also, note that the influence of behavior management by means of reinforcement contingencies has been retained from Keller’s original model, but there is a new block (Figure 2) within external inputs that refers to strategies that can be implemented to influence how people manage their emotional and evaluative reactions to events.

[Figure 2] Integration of volitional and post-actional concepts into Keller’s macro model
In summary, keep in mind that the goal of the MVP, as with Keller’s original macro model and ARCS model, is to provide an explanatory shell that synthesizes theories and models based on shared attributes and to organize them by means of a general systems model that illustrates mutual influences on other aspects of learning and performance. This is not a glib aggregation based on a few similarities in semantics or “surface level” attributes, but is based on the theory, purpose, and empirical research underlying each of these components. However, as synthesis requires generalization, some of the unique properties of each of the component theories and constructs will not be highlighted in this concatenated theory. This theory does not purport to supplant any of the component theories and constructs, but only to portray their relationships with the aim of facilitating new directions in research and aiding designers in diagnosing motivational challenges and developing solutions to human performance problems.

5. Information Processing

Another limitation of Keller’s (1983) macro model is that it does not illustrate how information processing elements are part of the learning process and how they interact with motivation and volition. In other words, even though Keller’s macro-model illustrates that abilities, knowledge, and skills influence performance (Figure 1), it does not illustrate the dynamics of perceptual and cognitive activities involved in learning. Thus, the MVP model (Figure 3) incorporates information processing theory (see Keller, 2008, for a complete explanation) and of particular interest is the concept of cognitive load (Paas, Renkl, & Sweller, 2003), which refers to the amount of information that a person can process in working memory. Sweller (1994) distinguishes between intrinsic cognitive load which refers to the inherent complexity of the material to be learned, germane cognitive load which refers to the level of cognitive activity resulting from task-oriented efforts of the learner, and extraneous cognitive load which is induced by instructional activities and distractions that are divergent and not effective in accomplishing the task. Furthermore, there are several ways in which cognitive load is related to both learning and motivational challenges.

The complexity of the learning content affects a person’s capacity for learning it but it also affects confidence. Tasks that either are too difficult or are perceived by the learner to be excessively challenging can reduce confidence which can lead to levels of performance that are lower than the actual capabilities of a learner. Managing the intrinsic levels of task complexity relative to learner abilities has been a challenge in self-directed learning since the early days of programmed instruction. Programs of instruction would be used by students with differing entry levels of knowledge and skill, but it was not feasible to provide a single program that would not produce cognitive overload for some students and under-load for others despite the efforts to include features such as branching (Markle, 1969).

With respect to germane cognitive load, task activities that are perceived to be directly related to goal accomplishment can increase a sense of relevance and induce higher levels of effort. And, finally, extraneous cognitive load is closely tied to motivational dispositions that lead the learner away from germane activities which can interfere with a learner’s efforts to stay on task. Furthermore, extraneous cognitive load can be strongly influenced by the design of the learning environment, including the instructional materials. In both classroom and online learning environments the incorporation of many types of media greatly increases the number and types of stimuli that can occur. With the availability of hot links, internet excursions, video clips, and multiple stimuli (rollovers, branching topics, navigational innovations) in the perceptual environment, the potential for excessive extraneous cognitive load is high. Deimann & Keller (2006) documented many of these problems such
as “lost in hyperspace” and the “serendipity effect” and how they can be managed by the appropriate use of volitional, or self-regulatory, strategies.

In addition to the motivational challenges that can be induced by inappropriate demands on cognitive load, motivation levels can influence one’s cognitive load capacity. For example, Fleming & Levie, in their exhaustive effort to derive principles from the established research literature, pointed out (Fleming & Levie, 1978) in Principle 2.1.9 that “the more mature and/or the more motivated the learner, the greater can be the size of an instructional unit” (p. 123). This principle predates the formalization of the cognitive load concept but it seems to apply here since they are talking about the relationship between motivation and both the quantity of information and duration of task-focused activity that a person can accommodate. They also present additional principles that are related to learning but can also be presumed to relate to cognitive load and motivation by facilitating task-oriented efforts and reducing distractions. One such example, based on the work of Anderson and Faust (1973), is Principle 2.12 (Fleming & Levie, 1978) “Learning is facilitated where criterial cues are salient (dominant, apparent, conspicuous). Add non-criterial cues only if and as necessary” (p. 115). Unnecessary cues would add to extraneous cognitive load.
[Figure 3] The MVP model of motivation, volition, and performance
6. Motivation in Relation to Information Processing

One of the limitations of information processing theory in general is that it does not include motivational or volitional considerations. Astleitner & Wiesner (2004), building on the work of Mayer (2001), Rheinberg, Vollmeyer, and Rollet (2000), and Keller (1983, 1997, 1999) have proposed an integrated theory of information processing and motivation that includes “motivational processing” as well as elements of mental resource management. They draw primarily on Kuhl (1985) who postulated that such things as wishes, intentions, values, and emotions are also part of working memory in addition to the traditionally recognized perceptual and cognitive processing components. Motivational components such as goal setting and action control are connected to the information processing model by means of mental resource management activities such as attention, engagement, and monitoring which have been placed in a special section of the MVP model in order to illustrate how they interface between motivation and information processing (see Figure 3, Section 3). It should be noted that Astleitner & Wiesner’s (2004) use of the term “attention” refers to actions that facilitate learning, such as providing cues to focus attention to salient parts of the mental tasks at hand. This is different from using “attention” in the motivational sense (Keller, 1999) which refers to stimulating and sustaining arousal and curiosity. Astleitner & Wiesner’s model also lists several mental management activities that are related to the filtering of input information and the control processes in working memory (Figure 3, Section 4). These processes are also helpful in identifying motivational challenges to learning. For example, failure to exercise effective control over relevant input information can lead to excessive cognitive load and demotivation.

Two other distinctive characteristics of the information and psychomotor processing component of the MVP model are the explicit references to cognitive load and practice. The dual processing elements are not specified due to the already complex structure of the model, but they are presumed to be within the sensory inputs and working memory components. Although there are numerous control processes within working memory (Atkinson & Schiffrin, 1971), attention is called to the concept of cognitive load (Sweller, 1994) in the present model. This variable is presumed by many to be a key factor in designing instruction, especially in regard to designing instruction for the teaching of complex cognitive skills (Van Merriënboer, Kirschner, & Kester, 2003) where the stimulus arrays can be complex and distracting and have a direct influence on motivation. Also, the concept of practice is included because, as shown by Ericsson (2006), the type of practice that distinguishes superior performers, called deliberate practice, is a behavior that combines psychomotor, cognitive, and motivational elements in the development and maintenance of expert performance.

7. Implications of This Model for Conceptual and Theoretical Research

What, one may ask, is the value of this type of theoretical integration? High-level theories can be confusing and are by nature complex. Furthermore, for every class of variables and specification of relationships that are included, there are others that could be included. Models such as these have the danger of becoming like an expanding universe as each version leads to the incorporation and conceptualization of multiplicatively more concepts, subordinate models, and relationships. Thus, it is important even in an abstract theory such as that represented by the MVP model, to sustain a sense of parsimony and testability. In the present situation, the goal is to continue efforts to explain the dynamics and inner workings of motivation, learning, achievement, satisfaction and continuing
motivation. Therefore, the model has been expanded only insofar as necessary to integrate a few essential major concepts and variables that will help accomplish this goal.

The usefulness of the MVP theory in situating research within the overall structures of motivation, volition, and learning can be illustrated by studies of the concept of computer rage (Seligman, 2005) which appears to be occurring with greater frequency and has become a topic of interest in computer interface design. Like many new areas of inquiry, this one began as an investigation of a particular phenomenon (Klein, Moon, & Picard, 2002; Selvidge, Chaparro, & Bender, 2002) which then gradually expanded to incorporate theory. Ceaparu et al (Ceaparu, Lazar, Bessiere, Robinson, & Shneiderman, 2004) conducted a series of self-report and observational measures at two universities to determine causes and severity of user frustration when using computers. The primary components that they identified were errors, time delays, and emotional reactions.

In addition to documenting causes of problems, researchers are endeavoring to identify solution areas and theoretical bases for understanding the phenomenon. The most common explanation is grounded in the traditional frustration-aggression hypothesis (Dollard et al., 1939). However, this provides only a partial explanation because even though it has been confirmed consistently in many studies that aggression is caused by frustration (Berkowitz, 1989), the converse is not true; that is, frustration does not always lead to aggression. Consequently, researchers have been focusing on ways of alleviating frustration without aggression. The primary methods include removal of the causes of frustration by improving the quality and reliability of computer interfaces and by providing frustration alleviating feedback in the form of apologies and other kinds of messages (Klein, Moon, & Picard, 2002). To provide theoretical support for this approach, researchers are integrating theories of human emotion and emotional management, even to the point of having computers be sensitive to emotional changes in the user and then providing an appropriate response (Klein, Moon, & Picard, 2002; Scheirer, Fernandez, Klein, & Picard, 2002).

Even though this area of inquiry is broadening, it could perhaps expand even more quickly into relevant and potentially useful areas by examining an integrative theory such as that represented in the MVP model. For example, if we try to give an overall characterization of this research with reference to the MVP model, we can see that user efforts to perform well (refer to the “outputs” row, Figure 3) are frustrated by the environmental conditions (external inputs) that either facilitate or restrict performance due to poor man-machine interfaces. These deficiencies result in emotional frustration (outcomes processing) and a frequent tendency to behave aggressively toward the equipment. The concept of frustration-aggression also falls into the outcomes processing “box” (Figure 3) as an emotional reaction. However, not everyone responds the same way to frustration or to interventions such as apologies from the computer, which some people regard as inappropriate “anthropomorphizing” of the machine. It might be fruitful to incorporate investigations into goal setting (the stronger one’s goal motivation, presumably the greater one’s frustration in being thwarted from achieving the goal), volition to better understand how to immunize users against these inevitable frustrating obstacles in computer environments, and the influence of interface design on ease of information processing and cognitive load in order to preserve as much working memory as possible for the task at hand. It is, of course, possible and even perhaps likely that researchers would eventually identify some of these avenues of inquiry, but the contention of this paper is that an integrative model can facilitate and speed-up the process, and even perhaps stimulate ideas that would not have otherwise occurred to people.

8. Implications of This Model for Design-Based Research and Practice
With respect to design-based research and practice, there are numerous ways in which the MVP model can be applied. First, it is important to note that there are some fundamental differences between the use of theory in research and practice. For example, a goal of research is to find general principles and in order to do so, the typical paradigm of science is to vary the parameters of interest in a study and hold other potentially confounding parameters constant. However, this is not possible in practice. The implementation of innovations and solutions to problems is done in actual settings where it is typically not possible to hold major components of the system constant. It is common in practice to have innovations or solutions, even when based on scientifically proven principles, fail or have only limited success because of unintended outcomes or uncontrollable obstacles.

Because of these multiple levels of interaction, system theory provides an effective approach to representing the phenomena under investigation. Both research and practice incorporate principles of system thinking. As Whitehead (1938) pointed out, “Connectedness is of the essence of all things of all types” (p. 13). He also said that, “It follows that in every consideration of a single fact there is the suppressed presupposition of the environmental coordination requisite for its existence” (p. 13.) In any controlled study, there are presuppositions about conditions that can be held constant which, in the “real world” are not constant. This is commonly illustrated by many of the principles in Newtonian physics that presumed a frictionless universe. But it can also be illustrated by contemporary events such as unexpected side effects of medicines resulting from presuppositions that might not even have been evident during the development and initial testing of the drug. Even though both research and practice use system thinking, and both are concerned about inputs and outputs, the emphasis is different. In research the emphasis is more on identifying and controlling inputs (independent variables) while in practice the emphasis is more on anticipating and managing the effects of outputs. For example, with regard to practice, students may achieve mastery in job skill workshops but follow-up evaluations frequently show that the workers are not using their newly acquired skills. This could be for many reasons including lack of opportunity, lack of essential resources, conflicting demands on their time, or conflicting incentives. The lesson from this is that in practice, one must take a systems-wide perspective and attempt to manage the effects of an intervention in one system with respect to its interactive influences with coordinate systems, subsystems, and suprasystems. When workers are expected to change their skills, then job definitions, incentives, resource supports, and even management procedures might have to be changed to accommodate and support the new skill sets.

In this regard, each of the major components of the MVP model can be viewed as a subsystem with multiple interactions with the other subsystems. It is common to introduce new instructional strategies or models of instruction into a course and they tend to be successful as long as they are being implemented by the advocate who created them, but they tend to die when the advocate leaves or not succeed when other people try to use the approach. This can be because people other than the advocate understand the new approach only as a new instructional technique, which places it within the performance facilitating external inputs portion of the MVP. They might not consider changes that have to be made in techniques to motivate students, changes in volitional requirements, and scaffolding requirements to manage cognitive load. Why, then, one might ask, did the innovation succeed in the hands of the advocate, but not with others? The advocate might very well have been making the adjustments to the other subsystems, but without being consciously aware of it and not seeing these as essential parts of the intervention which he perceived to be strictly a new instructional strategy without a need to consider motivational, volitional, or information processing components. The same thing can happen in research (Rosenthal & Rosnow, 1969) where researchers are not able to reproduce the findings of the original studies but again, this tends to result from unintended influences of inputs rather than consequences of outputs.

Thus, the MVP model can be used as a tool for diagnosis and design. When there are problems in a learning system, the MVP model can guide a needs assessment to determine where the sources of the problem are located. For example, if students are not scoring well on a standardized test...
of mathematics, one can examine each input into this performance setting to identify potential causes. The problem could be due to a lack of ability on the part of the students, lack of volitional skills, lack of motivation due to boredom, irrelevance of the task, lack of confidence, or cognitive overload. It could also be due to ineffective design in the learning environment, which falls under external inputs, or a lack of reinforcing consequences when the students do succeed. The benefit of the MVP model is that it facilitates a systematic examination of all these factors and then provides the basis for a coordinated set of improvements that take all the relevant factors into consideration. Its utility can also be expanded by integrating it with instructional design models such as the 4C/ID-model (Van Merriënboer, Jelsma, & Paas, 1992) which includes four major components that are presumed to be essential in building blueprints for complex learning, especially in regard to the components called “supportive information” and “just-in-time information.” By integrating motivational and volitional support systematically with instructional support, there is a much greater likelihood that students will maintain their persistence to succeed when trying to master the learning of complex cognitive skills. This type of coordinated process was demonstrated (Bickford, 1989) with the ARCS model in which audience analysis identifies what the specific motivational deficits are in a given situation, and then motivational strategies were prepared and integrated with the instructional strategies that resulted from the application of a systematic instructional design process.

9. Conclusion

The overall purpose of this paper was to present a process-oriented model grounded in a system representation of a set of logical interfaces between several major theories and models pertaining to motivation, volition, learning, and performance. The focus has been on building a frame of reference for incorporating existing research and practices in an organized manner that facilitates efforts to move outside the boundaries of defined areas of research in order to study the relationships between and among these areas. Keller’s macro-model of motivation, learning, and performance (Keller, 1983) but underwent major modifications to incorporate such things as the concepts of implementation intentions (Gollwitzer & Brandstätter, 1997) and action control (Kuhl, 1987). Both of these have their own history of theory and research and provide useful additions to the model. They also help provide a basis for studying and explaining the relationships between motivation and mental activities in working memory. To facilitate this set of understandings and relationships, Astleitner and Wiesner’s (2004) integrated model of multimedia learning and motivation was incorporated into the present structure, but not without modification. They proposed the addition of sets of activities for mental resource management and motivational processing to Mayer’s (2001) multimedia learning theory. In the present model, the motivational processing elements were incorporated in the motivational and volitional components of the MVP model, and they were supplemented by other motivational elements that help constitute a more holistic consideration of motivational factors. The result of this process is a frame of reference, as confirmed by early empirical studies (Keller, Deimann, & Liu, 2005; Kim & Keller, 2008), that has the potential for offering a more comprehensive explanation of the relationships among motivation, learning, and performance and supports continued theory building, empirical studies, and application strategy development and testing.
References


