Typology of Learning Outcomes in Cognitive Domain: What Is Said vs. What Is Measured

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Based on extensive literature review, this study reports the result of a meta analysis of learning outcome studies and presents an integrated typology of content types and learning outcomes. Examining the ERIC database for learning studies conducted from 1992 until 2006 shows that most empirical studies have assessed the learning outcome at lower levels of knowledge and competence. Only 8 out of 113 cases were assessing learning outcomes at the performance level. Discussions and implications for HRD and future studies are included.

Keywords: Typology of Learning Outcome, Typology of Learning Content, Meta Analysis

HRD professionals commonly ask questions such as what the target audience should learn and what the learning outcomes should be. The study of learning outcomes has been one of the most important research topics in education (Gagné & Discoll, 1988; Kraiger, Ford, & Sals, 1993). Although many attempted to answer what constitutes learning outcomes, there has been little congruent agreement yet. At present, practicing HRD professionals are largely left alone to choose context-fitting theories and views of learning, such as how adults learn (Knowles, Horton, & Swanson, 1998), how brains receives and processes information (Gagné, 1995), how authentic or community-based practices improves meaning making (Brown, Collins, & Duguid, 1989). They are short-guided about what to assess for the results of learning.

Significance of the Study and Research Questions

Studies are repeatedly conducted to examine the impact of instructional or contextual variables (e.g., organizational, environmental, cultural, and situational) on learning outcomes. However, the lack of established criteria for learning outcomes and empirical findings about their correlational or causal relationships with other work-affecting variables, such as learning motivation, learning presence, learning transfer, and work performance contributes to a cynicism about learning as a less justifiable investment. The present picture of loose definition of learning and inconsistent typology of learning outcomes is detrimental for HRD professionals to prove the validity of various learning initiatives they perform. It is our belief that a clearer and consistent typology of HRD-fitting learning outcomes is in order and worth developing based upon the synthesis of past work and expected responsibilities.

Research Questions

The purpose of this research study was to review the existing literature about learning outcomes and conduct a meta analysis to summarize the current status of learning outcome studies. The following research questions were developed to address our research purpose.

1. What kinds of typology of learning outcomes have been established among researchers in education?
2. How many studies have assessed the different types of learning outcomes?
3. Which learning outcome levels and content types have been mostly studied?

Review of Traditional Taxonomy of Learning Content and Outcomes

In classifying different types of learning outcomes occurring in various learning environments, some researchers

used content attributes to develop the taxonomy of learning outcomes. Gagné postulated that different types of learning outcomes required different conditions of learning (Gagne, 1977, 1984). He proposed five categories of learning content: *verbal information*, *intellectual skills*, *cognitive strategies*, *motor skills*, and *attitudes*. *Verbal knowledge*, known as declarative knowledge (Anderson, 1982), is about "knowing what" to include facts, names, or labels and organized bodies of knowledge. *Intellectual skills*, known as procedural knowledge (Anderson, 1982), are characterized as "knowing how" such as discriminations, concepts, rules, and higher order rules. The third category, *cognitive strategies* are called strategic knowledge (Greeno, 1978) that allows people to manage their own thinking and learning processes. *Motor skills*, the fourth category, are capabilities that require physical movements executing with accuracy, smoothness, and timing. Lastly, *attitude* is considered as internal states composing of cognitive (belief), affective (emotional), and behavioral (actions followed by disposition) components.

Merrill's (1983) study of the Component Display Theory (CDT) built up on Gagne's taxonomy of learning content. Compared to Gagné's one-dimensional classification system, Merrill suggested a two-dimensional classification system of learning content so as to distinguish the presentation of information for recall from the application/practice (i.e., performance) of what was presented (Merrill, 1983; Merrill & Wood, 1974). According to Merrill (1983), the types of content include *facts*, *concepts*, *processes*, *principles*, and *procedures* and the desired levels of performance include *remember*, *use*, and *find*. It is interesting to note that Merrill's three levels of performance (remember, use, and find) roughly correspond to Gagne's three cognitive domains in verbal information, intellectual skills, and cognitive strategies, respectively.

Compared to Gagné or Merrill, who focused primarily on the cognitive process of thinking, Kraiger, Ford, and Salsa (1993) provided a multidimensional perspective on learning outcomes by broadly classifying various types of learning outcomes into three categories: *cognitive*, *skill-based*, and *affective*. According to them, *cognitive* learning outcomes include three sub domains of verbal knowledge, knowledge organization, and cognitive strategies (similar to the taxonomy by Gagné). For skill-based learning outcomes, they adapted the theories of skill development (Anderson, 1982; Fitts & Posner, 1967) emphasizing three definable stages: (a) initial acquisition, (b) skill compilation, and (c) skill automaticity. Among the three stages, these researchers classified the skill compilation and skill atutomaticity stages as skill-based outcomes. For affective domain, they identified attitudinal and motivational outcomes such as motivational dispositions, self-efficacy, and goal setting.

Instead of defining types of learning outcomes by content attributes, other educational psychologists utilized a different approach by classifying educational goals and objectives for an instruction. One widely adopted view has been the taxonomy proposed by Bloom (1956). His taxonomy of learning objectives proposed the six cognitive levels ranging from *knowledge* (recall), *comprehension*, *application*, *analysis*, *synthesis*, and *evaluation*. According to Bloom, these six levels are hierarchical in nature. The levels of *knowledge*, *comprehension*, and *application* are grouped as a low level, while *analysis*, *synthesis* and *evaluation* are put together as a high level. During the 1990's, Bloom and his protégé, Forehand, initiated updating the taxonomy reflecting the changes in contemporary learning environments. Their first task was changing the Bloom's six major categories from noun to verb forms to reflect the shift of emphases on learner performance. In the newly framed model, *knowledge* was changed to *remembering*, and *comprehension* and *synthesis* were renamed to *understanding* and *creating* respectively. In addition, Forehand (2005) expanded the original taxonomy of Bloom to two dimensions in which one dimension identifies different content attributes (factual, conceptual, procedural, and meta-cognitive), while the other represents the continuum of cognitive difficulties in order of *remember*, *understand*, *apply*, *evaluate*, and *create* (Anderson & Krathwohl, 2001).

Most of the frameworks reviewed above fall under the cognitive domain which focuses on how individuals receive auditory and visual input from external environments, and process input to acculturate and assimilate within the limitation of working memory and the schema of the learners' established knowledge. Some researches viewed such a framework not reflective of how people more frequently learn by interacting with problematic (but realistic) situations negotiating and recreating meanings with others in a given context (Jonassen, 1999; Duffy & Cunningham, 1996). Constructivists maintained that outcomes and objectives created and imposed by designers as pedantic. They maintained that more attention be given to designing appropriate learning environments and valuing learner-initiated experiences, particularly through learner collaboration. The literature in problem-based learning (Albanese & Mitchell, 1993), collaborative work groups (Johnson & Johnson, 1999), and communities of practice (Wenger & Snyder, 2000) support the benefits of constructivism-oriented approaches, such as greater problem solving skills and knowledge sharing. In responding to a growing demand for more usable guideline, Jonassen (2000) proposed a taxonomy of problems ranging from simple to more complex and ill-structured (e.g., logical, algorithmic, rule-using, storytelling, decision making, troubleshooting, diagnosis-solution, strategic and tactical, design, and dilemma). He attempted to explain how a particular problem type is identified and what its major characteristics are (Jonassen, 2002). However, his taxonomy has not received wide endorsement yet due to the lack of clarity and details, such as

how a troubleshooting task differs from a diagnosis-solution task, what is the scope and boundary of a design task, what does it take or how one develops instruction for a design task, and most of all, how learning with or from others fit along the taxonomy of problems. In view of these, Table 1 summarizes the comparative descriptions of the different typologies reviewed above leaving out the social constructive aspects of learning.

Table 1. *Comparison of Different Learning Content Taxonomies*

Content Domains	Gagne	Merrill	Kraiger et al.	Bloom
Cognitive Domain	Verbal information	Remember verbatim/ paraphrased	Cognitive learning	Knowledge Comprehension
	Intellectual skill	Use a generality		Application
	Cognitive strategy	Find a generality		Analysis Synthesis Evaluation
Psychomotor Domain	Motor skills		Skill based learning	
Affective Domain	Attitude		Affective learning	

Learning vs. Transfer Outcomes

Learning vs. Transfer Needs

In the contexts of HRD, one critical aspect of learning outcomes is if the learning has transferred to the learners' work situations (Broad & Newstrom, 1996; Ford & Weissbein, 1999; Lim & Morris, 2006; Sullivan, 2002). In this study, transfer of learning is defined as "the effective and continuing application, by learners to their jobs, of the knowledge and skills gained in training both on and off the job" (Broad & Newstrom, 1996, p. 6). Since the primary goals and objectives of any instructional programs within workplace settings are to extend the effectiveness of learning into work performance domains, it is natural to expect the transfer of learners' new knowledge and skills to their jobs and tasks, resulting in a higher level of performance in the quality of work and services in their organizations (Lim, 2000; Sullivan, 2002). In order to facilitate learning transfer, the task of instructors and instructional designers requires the analysis of transfer needs of the learners' skill and knowledge deficiencies. As Broad and Newstrom (1996) claimed, learning may result in a relatively low level transfer (unsupported transfer) particularly if instructional designers focus on developing instructional programs meeting the learning needs only. For many organizations, learning is of little value unless it is transferred to performance (Holton, Bates, Seyler, & Carvalho, 1997; Kuchinke, 1995). In order for learning transfer outcomes to be maximized, many organizations utilize the systematic process of transfer management that addresses transfer variables in learner, instructor, supervisor, and work environment before, during, and after a learning experience to promote more transfer outcomes (Broad & Newstrom, 1996; Newstrom & Davis, 1997; Sullivan, 2002).

Near vs. Far Transfer of Learning

Application of learning content is another important issue to enhance learners' learning experiences and to improve learning transfer outcomes in education and workplace settings. Designing an instruction with emphases in learning transfer requires quite different approaches from the needs assessment of an instruction to designing its learning activities and developing evaluation criteria than that of focusing on learning level (Boyd, Boll, Brawner, & Villaumer, 1998). When focusing on learning level only, instructional designers tend to use learning activities that sustain the memory of facts, concepts, procedure, and skills based on the instructional curriculum (Herrington, Herrington, & Oliver, 1999). When focusing on learning transfer level, instructional designers should emphasize problem-solving and reflective skills within the instruction that assist learners to apply those skills in novel situations, which will result in far transfer (Clark & Taylor, 1992). Requiring independent practice after an instruction through a similar construct but with different application content is an example instructional strategy to promote transfer of the learned content to different context (far transfer). Merrill (1983) earlier noted that varied

contexts are important and effective to reinforce and reshape the knowledge gained, especially for the higher level content of rules and principles. Near transfer of learning occurs when learners apply learned skills and knowledge to learning or work situations that are similar to the learning environment. As an example of near transfer strategy of instruction, a step-by-step guided practice after a segment of instruction followed by an individual practice is an effective way to promote immediate application of learning to work.

Proposed Typology of Learning Outcomes for Cognitive Domain

Learning content itself in instructional situations can be viewed as a collection of information and knowledge that emerge and converge from interactions between people and given tasks or objects. Content can have its own structures as supported by Gagne and other researchers (Gagne, 1984; Merrill, 1983) and be used as a guide to select appropriate delivery modes and establish targeted learning outcomes. In proposing a typology of learning outcomes that capture both the types of learning contents and outcomes tied to workplace performance, the researchers have agreed that the literature base and the application potentials are the strongest for the cognitive domain while the psychomotor and the affective domain leave rooms for further research. To develop a work-transfer facilitating typology of learning outcomes, we categorized different types of learning contents in cognitive domain consisting of *facts*, *concepts*, *procedures* and *principles*, *problem solving*, and *cognitive strategy*, while integrating the classification of learning levels from Merrill (1983) and Bloom (Bloom & Krathwohl, 1984). This approach signifies that the construction of learning content needs to reflect the levels of learning outcomes that clearly manifest how presented contents would be used for work, particularly at the performance level (see Table 2). For the level of learning outcomes, we propose using three incremental levels of learning outcomes since these levels are simple enough to distinguish what would and should have been internalized (knowing and competence) from outward manifestation of work (performance). We also find that the internalization of learning contents can benefit from a simple distinction of two levels: low and high. The low level does not include any applicative use of presented contents, but plays a foundational role for the learner to apply them in simulated (competency) or work (performance) settings. This three level classification system also provides a more flexible construct to compare learning outcome results between subjects (content types) and study settings (school and work).

The first level of learning outcomes is the *knowing* (syntactic) level that is characterized as the acquisition and comprehension of information and knowledge of specific content areas. Since its focus is on the information and knowledge acquisition, this level is syntactic in its nature. The second level is the *competency* (semantic) level that includes four sub-intellectual activities of application, analysis, synthesis, and evaluation. This is different from what Forehand (2005) suggested to include the *application* at the low level. We also like to point out that the hierarchy of levels between those four activities claimed by Bloom call for validity verification because learners may view and conduct them as supplementary or complementary use-oriented activities to improve competence before put into performance. At the *competency* level, the focus of learning outcomes is preparing competent learners who are ready to perform on the job or who can apply principles to complex cases within an academic setting. Since the focus is on intellectual application, analysis, synthesis, and evaluation of the learning content, this level entails semantic level of learning. The third level is *performing on the job* (pragmatic level). This level brings about actual performance outcomes through application, analysis, synthesis, and evaluation of the learned contents into a learner's jobs and tasks. The major instructional goal at this level is to develop instructional programs that learning is transferred into learners' jobs and tasks.

Methods: A Meta Analysis of Learning Outcome Studies

To identify current status of research on learning outcome studies, we conducted a meta analysis of existing learning outcome studies using the Education Resources Information Center (ERIC) database. ERIC was chosen because the database provided access to a wide range of education-related journals and non-journal literature including books, curricula, government documents, dissertations, reports, and other educational materials. The researchers searched the appearance of the term, 'learning outcomes' within the title or keywords and limited studies to those conducted between 1992 and 2006. This method resulted in the identification of 199 studies. Among them, 140 were non empirical studies to be excluded from our examination. The remaining 59 empirical studies were reviewed. For data analysis, each study was examined for using descriptors as source, year, title, participants, sample size, and learning outcome variables measured. After that, the learning outcome variables from each study were categorized according to our proposed typology of learning outcomes. When more than one learning content and desired learning outcome level was recognized, we assigned them into multiple categories.

Table 2. *Typology of Learning Outcomes for Cognitive Domains*

Learning Outcome Level		Content Area					
		Facts	Concept	Principles & Rules	Procedure	Problem Solving	Cognitive Strategy
Knowing (Syntactic) Level	Knowledge	x	x	x	x	x	x
	Comprehension		x	x	x	x	x
Competency (Semantic) Level	Application	x	x	x	x	x	x
	Analysis		x	x	x	x	x
	Synthesis					x	x
	Evaluation		x	x	x	x	x
Performing (Pragmatic) Level	Application	x	x	x	x	x	x
	Analysis		x	x	x	x	x
	Synthesis					x	x
	Evaluation		x	x	x	x	x

* X marked areas indicate if each content area occurs at what performance levels.

Findings

Table 3 presents which specific contents or topics appeared in those 59 empirical studies and what types of actions or activities were examined for the accomplishment of desired learning outcomes.

Table 3. *Expressions of Learning Outcome Variables*

Learning Outcome Levels	Content Types					
	Facts	Concept	Principles Rules	Procedure	Problem Solving	Cognitive Strategy
Knowing Level	Recall of information presented	Recognition Reading Grammar Literacy	Science Physics			GPA (grades) Final exam
Competency Level				Use library, computer, or Web	Gains in job skill Problem solving Fundamental problem	Language proficiency Communication skill Self-efficacy Attitude Learning satisfaction Subjective evaluation
Performance Level					Portfolio	Teaching practice Laboratory practice examination Integrated interaction Critical thinking Group dynamics

Table 4 summarizes the frequency of content types measured at different outcome levels. Not surprisingly, the number of study variables focusing at the knowing level was the highest at 58. Empirical studies measuring the achievement in work were disproportionately sparse. On the other hand, it was encouraging to find that about 42% of all the empirical study variables attempted to measure the learners' mastery via using, analyzing, synthesizing, or evaluating presented content types. In terms of content types studied, cognitive strategy (47) and concept (32) were most frequently measured accounting for about 70% of all studies variables examined. Regarding the distribution of study samples, the most frequently studied group was undergraduate students (31) followed by middle school students (8), graduate students (6), elementary school students (6), high school students (4), adult learners (3), handicapped (2), vocational students (2), and others (1).

Table 4. *Frequencies of Learning Outcome Variables in Cognitive Domains*

Learning Outcome Levels	Content Types (by Gagne)						Sum (%)
	Facts	Concepts	Principles & Rules	Procedure	Problem Solving	Cognitive Strategy	
Knowing Level	7	28	2		3	18	58 (51 %)
Competency Level	2	4	3	7	8	23	47 (42 %)
Performance Level					2	6	8 (7 %)
Total	9	32	5	7	13	47	113

Discussion and Implication for HRD

This study started from our initial discussion and agreement on the importance but lack of the literature in learning outcomes. Given the status of wide support and various learning theories and views receive, the researchers expected to be able to identify sufficient numbers of empirical studies to understand to what extent, how often, and in what areas learning outcomes have been examined and present our syntheses. Our purpose of conducting a meta analysis was to better diagnose the current reality of studies for learning outcomes. Before we created a framework for our meta analysis, however, our literature review indicated that the current literature has yet to improve in order to enhance work practices from learning initiatives where learning will eventually be used. Our meta analysis also showed that more learning studies could be done aimed at work performance improvement.

Several reasons are possible to explain the lack of an integrated typology for learning outcomes. First, researchers seem to differ in selecting the representative types of learning contents. For instance, the number of content types in the cognitive domain greatly varies (see Table 1). Second, most studies reviewed here originated from analyzing the concept of learning from instructional-designing purposes than an evaluative perspective. In other words, those researchers' main interests were to create schemes to better address learning of different topics and designing instruction to induce desired learning. The lack of evaluative perspectives regarding learning and learning outcomes may be a reason for inconsistent learning typologies and less attention given to situating learning to work. Since most organizations expect learning to be extended to workplace performance, it becomes a critical task for instructors and instructional designers to incorporate the level of learning transfer outcomes in designing and delivering various types of learning.

Developing and validating a framework for identifying the types of learning contents and the levels of learning outcomes is an important task for researchers and practitioners in the field of HRD. Doing so can not only help people compare studies of similar topics across different content types and outcome levels, but also enhance the potential to link any learning initiatives to individual or organizational performance measures. Despite the fact that the content type of procedure is most commonly taught and far-transfer contents such as rules and principles are also

increasing in demand for corporate training, our study showed that inclusion of such topics were not common in empirical educational research endeavors. We believe that our proposed typology of content types and learning outcomes is able to capture topics of many HRD interventions and presents a clear conceptual framework to determine the target level of learning at simple comprehension, internalization of competence, and work performance level. When the types of learning contents and outcomes can be identified and classified into representative categories, instructors, training facilitators, instructional designers, and learning study researchers will all benefit from such comparative frameworks.

Future Study and Limitations

Despite the potential usefulness of the typology of learning contents and outcomes proposed from this study, caution in interpretation and calls for additional but more widely-sampled studies are suggested. Although ERIC is a comprehensive research database system, using ERIC as a sole source of empirical studies has limitations. Its educational focus than training might have excluded empirical studies conducted in training or skills transfer settings. Incorporating multiple databases in education and other fields is a logical corollary for the next step. Another, the nature of meta analysis could be more informative if effect size or quantitative findings were incorporated. In view of different subjects and topics studied with less clearly defined learning outcome levels, this was not the route the researchers sought. Lastly, we like to note that our proposed typology largely focused on the cognitive domain only due to the conceptual clarity and the extensiveness it has been examined and applied in instruction and training. A truly comprehensive and performance-applicable typology would entail the psychomotor and affective domain. HRD professionals are aware that ultimately desired behaviors from learned employees often go beyond the boundary of cognitive domain to observe behaviors such as espousing, advocating, and eliciting similar performance from others. Further studies that inquire if such levels exist or which leveling works properly to capture those desired learning outcomes will be extremely helpful.

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