

Chapter 4. Grounded Theory for Values-Based Training & Education

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In the Operational Army, the relevant driving factors for OBTE are information abundance, rapidly changing environments, individual adaptability and collective agility demanded by changing roles in trans-extremis conditions, task organization with individuals and units from unfamiliar organizations and cultures, decentralized decision-making and action, and the potential strategic importance of individual action irrespective of rank (French, 2002; Kilcullen, 2006; Meigs, 2003; Petreaus, 2006). We have concluded that this kind of complexity demands a more integrated approach to training and education with reworked scientific underpinnings (Lakkala, Muukkonen, Paavola, & Hakkarainen, 2008; Scardamali & Bereiter, 2005). The development of formative measures for instructors (Chapter 2) began a dialectic involving many different scientific and operational perspectives that extended over more than a year (see Section 3.1). As principles and practices were identified and refined (Chapter 3), connections to the scientific literature became clearer (see Chapters 2 and 3). Moving forward, there is a need to articulate theoretical and empirical foundations that are conceptually consistent, or at least complementary, and are well established in the scientific literature. This is necessary to ensure a systematic approach to the continuing development of OBTE and its sustainability as an instructional service system (see Chapters 1 and 11). The principles and practices of OBTE grounded our search for the relevant science. They provide a bridge between theory and praxis.

4.1 Exploration of Holistic and Functionalistic Underpinnings for OBTE

The definition of OBTE through this investigation has been the result of broad and deep collaborative inquiry with individuals who could represent the collective wisdom about an integrated approach to leadership, education, training, and service in the Army. Among other things, the definition of OBTE emphasizes individual adaptability and a balance of choice and responsibility in a collective context. This has two important implications for continuing development of OBTE as a service system. First, best practices will emerge and evolve from the initiative of individuals and the decentralized decision-making in a variety of programs at a variety of sites in the institutional Army. In fact, we have witnessed such decentralized innovation over the course of this investigation. Secondly, and equally important, promulgation of best practices and increasingly clarity (even simplicity) of the approach requires a framework that can be used collectively to interpret and adapt such innovation. While it may be counter-intuitive, a rigorous framework is more important for an adaptable system than it is for a prescribed and momentarily optimized system.

In Chapter 1, we claimed that a rigorous approach to service system development “enables initiative by ensuring that there is accountability within a rigorous yet flexible framework for understanding the evolving and interrelated activities of an organization” and that “rigorous description of intent and execution provides desirable constraints on innovation, while flexibility of the framework allows an organization to make sense of the results of innovation.” Most importantly, in the context of this investigation, we claimed that “the behavioral and social sciences are indispensable to definition and measurement for a service system... that is tailored from the organization’s set of standard processes according to the organization’s tailoring guidelines and contributes work products, measures, and other process improvement information to the organizational process assets” (p. 11). The science that appears to be most consistent with the assumptions of OBTE draws predominantly on a philosophy that is traceable, at least within

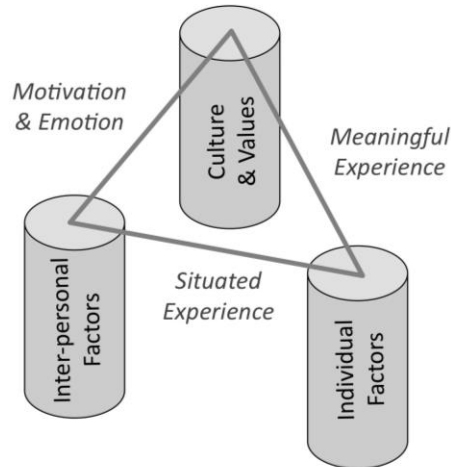


Figure 2. Notional framework for scientific underpinnings of OBTE.

4.1.2 Nested Time Scales and Adaptability

OBTE is an approach that reflects a kind of multicriterion decision making that takes into account the dynamic interplay among experiences in nested time scales over which the consequences of decisions and actions unfold. We assume that awareness of such near-far relationships, and the ability to discover them, imbues individuals with adaptability in uncertain or changing conditions in a manner analogous to adaptive dual control in dynamical systems (Feldbaum, 1965; Filatov & Unbehauen, 2004; Grass, Caulkins, Feichtinger, Tragler, & Behrens, 2008; Riccio, 1993b; Riccio & Vicente, 2001; Safonov, 2001; cf., Chemero & Turvey, 2007; Sheridan, 1999). Research on adaptive control systems in uncertain or changing conditions reveals a formal problem in assessing whether change in such systems is stable (truly adaptive) or unstable (maladaptive). A resolution to this formal problem is the recognition that stability and robustness of a broad class of such systems is characterized by asymptotic convergence on veridical observation of the dynamical relationship between a system and its surroundings. Asymptotic convergence is fostered by persistent excitation (i.e., activity useful for observation rather than control) that is sufficiently rich (e.g., goes beyond the immediate needs for control) and does not interfere with performance on the task at hand (cf., Canudas de Wit, 1988; Chalam, 1987; Narendra, 1986). The relevant lesson from this body of work is that exploratory experience is important in successful adaptation and that such activity can be concurrent with performance and non-interfering.

Asymptotic convergence in adaptive dual control is related to the concept of trajectorial objectives in dynamical systems insofar as the objectives by which adaptive performance can be evaluated reflect the journey as well as the destination (B. Glaser, 2002; cf., Pellegrino, Chudowsky, & R. Glaser, 2001). The correspondence is even tighter in light of the “bi-criterial synthesis” in adaptive dual control that employs two cost functions, one for control per se with respect to the task at hand, and one for reduction in uncertainty about the dynamical context for control (see e.g., Filatov & Unbehauen, 2004). The latter cost function (uncertainty reduction) places learning, about the ways in which tasks are situated, on equal epistemological footing with momentary capabilities for performance on a task (E. Gibson, Riccio, Schmuckler, Stoffregen, Rosenberg, & Taormina, 1987; Riccio & Stoffregen, 1988, 1991; Riccio, 1993a; Riccio & McDonald, 1988; Van Wegen, van Emmerik, & Riccio, 2002). The relevant lesson is that learning and doing are not necessarily separable activities. This is not to say simply that one learns by doing as is often implied by the term “experiential learning.” The more important point

is that, by doing, one can learn about the context that is relevant to what one might do next (see Chapter 3, section 3.2.1).

One way in which exploration can be concurrent and non-interfering with performance is for it to occur on time scales that are smaller than and nested within the decisions and actions that determine the nature and level of performance on a task. This principle holds at all time scales from milliseconds up to and beyond the periods of time over which formal learning events are executed. It also holds across all kinds of interactions with the environment from those involving physical contact forces to those involving action based on the pick up of information about the surroundings (Riccio, 1993a,b). Figure 3 shows an example of nested exploration and performance in the context of a novel postural control task (specifically, an astronaut learning how to control posture in a space suit so that manual tasks can be performed during “extravehicular activity”). In this case, an individual may have to execute a movement or make a decision about how to move once or twice a second but the individual can experience interactions with the surroundings more frequently than this.

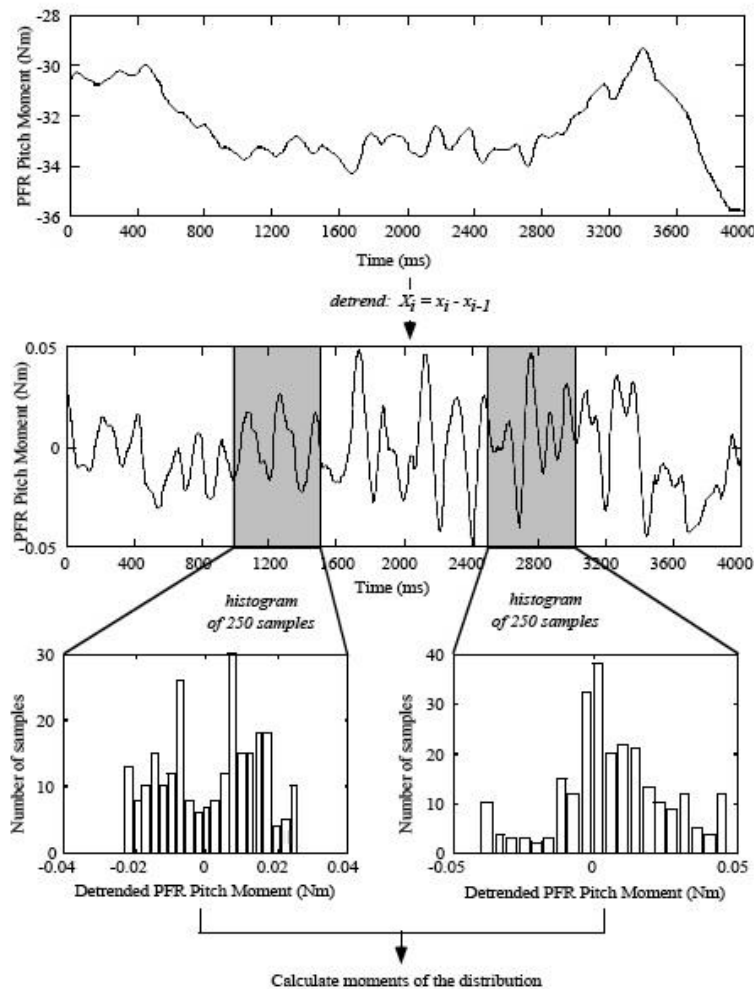


Figure 3. Information in nested time scales (from Riccio & McDonald, 1998).

The point is that one can experience interactions with the surroundings on time scales within and around those required for performance on a task. This is important because it means that one can identify the surroundings or changes in the surroundings (i.e., context for a task) that can inform changes (adaptation) in how one interacts with the surroundings. In the postural control example, this may be as simple as tracking changes in the asymmetry of fluctuations that indicate a departure from equilibrium. Experience with such information and the adaptation it affords provides one with a strategy for postural adaptation in general. This esoteric example is interesting because expert instructors in OBTE employ strategies that enable this very kind of experience and adaptation in marksmanship training (see e.g., Chapter 2, section 2.3.2). The more general point, however, is that adaptability may depend critically on “micro-experiences” that can help one achieve veridical understanding of the consequences of one’s actions. We believe that micro-experiences are directly analogous to persistent excitation in adaptive dual control. In-stride decisions (adaptation) thus, in principle, can be grounded in reality.

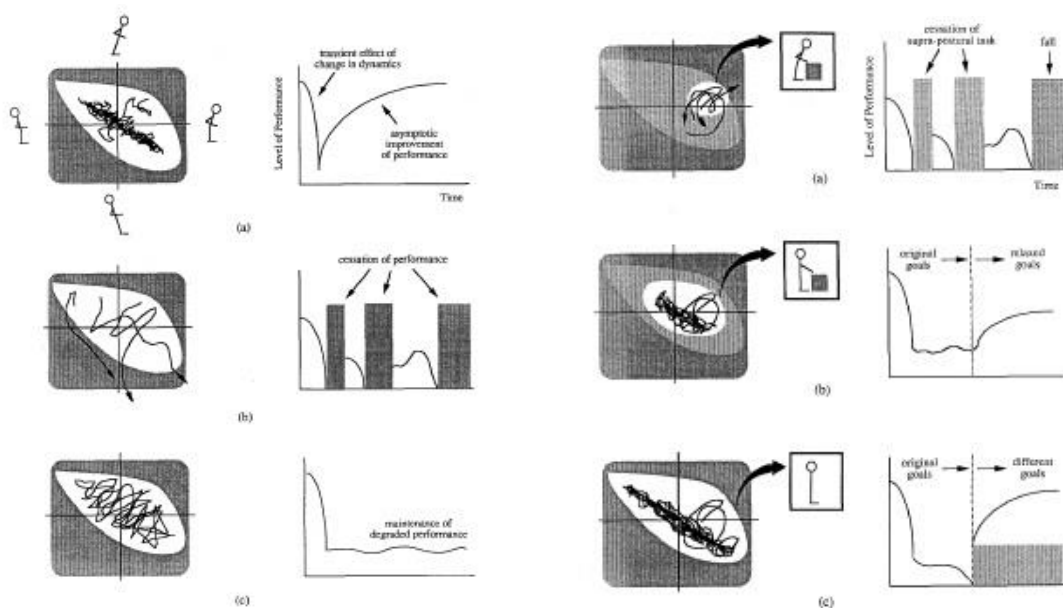


Figure 4. Information-driven adaptation (from Riccio & Stoffregen, 1991). Stable adaptation indicated by asymptotic improvement in performance that implies asymptotic convergence on a veridical observation of interactions with the surroundings (left panel). Adaptation also can manifest as in-stride changes to the task at hand (right panel).

4.1.3 Adaptability and Ambiguity

Another important homology between adaptability in dynamical systems and OBTE is the focus on tangible practical implications about the dynamic interplay between the known and the unknown and the downstream consequences of this interplay (see section 3.2.1-3.2.2). Adaptive dual control, and the bi-criterial synthesis in particular, address the role of exploration in the reduction of uncertainty given what is known. Micro-experiences, for example, need not be arbitrary or serendipitous. Exploration can focus on aspects of the persistent context that are most ambiguous or on ambiguities that are having the biggest impact on performance. One can be more confident in venturing into the unknown if one has some sense of boundaries that cannot be crossed without irrevocable consequences (Figure 4). This is consistent with approaches to control of dynamical systems that blend robust control and adaptive control in ways that take into account that there almost always is a continuum between complete certainty and complete

uncertainty (e.g., Gutman, 2001; Riccio, 1993a; Riccio & McDonald, 1998). In such approaches, the range of behavior can be partitioned into subsets within which there is freedom to explore and innovate but between which there are clear boundaries (Figure 4). Another approach is a form of supervisory control in which some experimentation is allowed, in which non-catastrophic failures become informative, and where lack of failure becomes an indicator of success (Safonov, 2001). The approach of “unfalsified control” essentially is a survival of the fittest. In principle, this approach also requires a sense of some boundaries lest an unfit strategy destroy the context in which another potential strategy could survive. This is analogous to the focus on exploration of boundaries in our approach to stability and control of dynamical systems (Riccio, 1993a; van Wegen, et al., 2002).

The importance of boundaries in adaptive dual control is analogous to the role of constraints, restrictions, and limitations in adaptive operations pursuant to a higher commander’s intent in mission command (HQDA, 2003). In our work on communication of commander’s intent, we concluded that a sense of shared values is important in interpretation of an intent statement with respect to details of an operational situation that are different from or at a finer grain than addressed in the intent (Freeman, Sidman, Aten, Diedrich, Cooke, Winner, Rowe, & Riccio, 2008). The implications for OBTE are that values can provide omnipresent boundary conditions on adaptability can become fundamental to everything a Soldier does. We believe much of this relationship can be understood in terms of the interplay between choice and responsibility (see Chapter 3). Furthermore, we believe that exploration of such values-based relationships is why OBTE emphasizes micro-experiences in learning and the development of adaptability in individuals (cf., Riccio et al., 2004). Micro-experiences that reveal values-based implications of learning are an important theme in our exploration of scientific foundations for OBTE.

There are empirical reasons to believe that exploratory micro-experiences can be invaluable in adaptability of human systems and collective tasks in military operations. One source of evidence for this is from the nuclear power industry (see e.g., Kaufman, Lanik, Spense, & Trager, 1992; Mumaw, Roth, Vicente, & Burns, 2000; Roth, Mumaw, & Lewis, 1994). There are a number of key similarities between this industry and the military, such as: (a) operation of exceedingly complex systems, (b) coordination among teams of teams of operators, (c) years of training for operators and especially for leadership positions, (d) standards and procedures developed by a regulating organization, (e) range and combinations of potential events that are impossible to address comprehensively by standards and procedures, (f) control and decision-making that is somewhat distributed and decentralized, (g) formal capture of lessons learned, and (h) innovation at the ground level that may not be captured in lessons learned.

Specifically with regard to micro-experiences, in the nuclear power industry, the phenomenon of “extra-procedural activity” refers to decision making and behavior that is not prescribed by policy and that appears to be essential in the collective agility of teams in dealing with unforeseen events (Roth, et al., 1993). This activity comes about because of the complexity of a nuclear power plant and the uncountably large number of possible combinations of events, however rare, that can occur and to which some response is required that goes beyond what previously had been anticipated by extant procedures. Riccio & Vicente (2001) recommended that the nuclear power industry set up formal processes to track the development of such procedures and codify the innovations that the industry comes to understand and approve after the fact. They also recommended that the industry develop training programs to familiarize operators with boundaries on such activity that allow some license to engage in this activity (Figure 5). In essence, our recommendations about decentralized design in OBTE (e.g., Chapter 14 and Appendix C) are the same as these recommendations to the nuclear power industry.

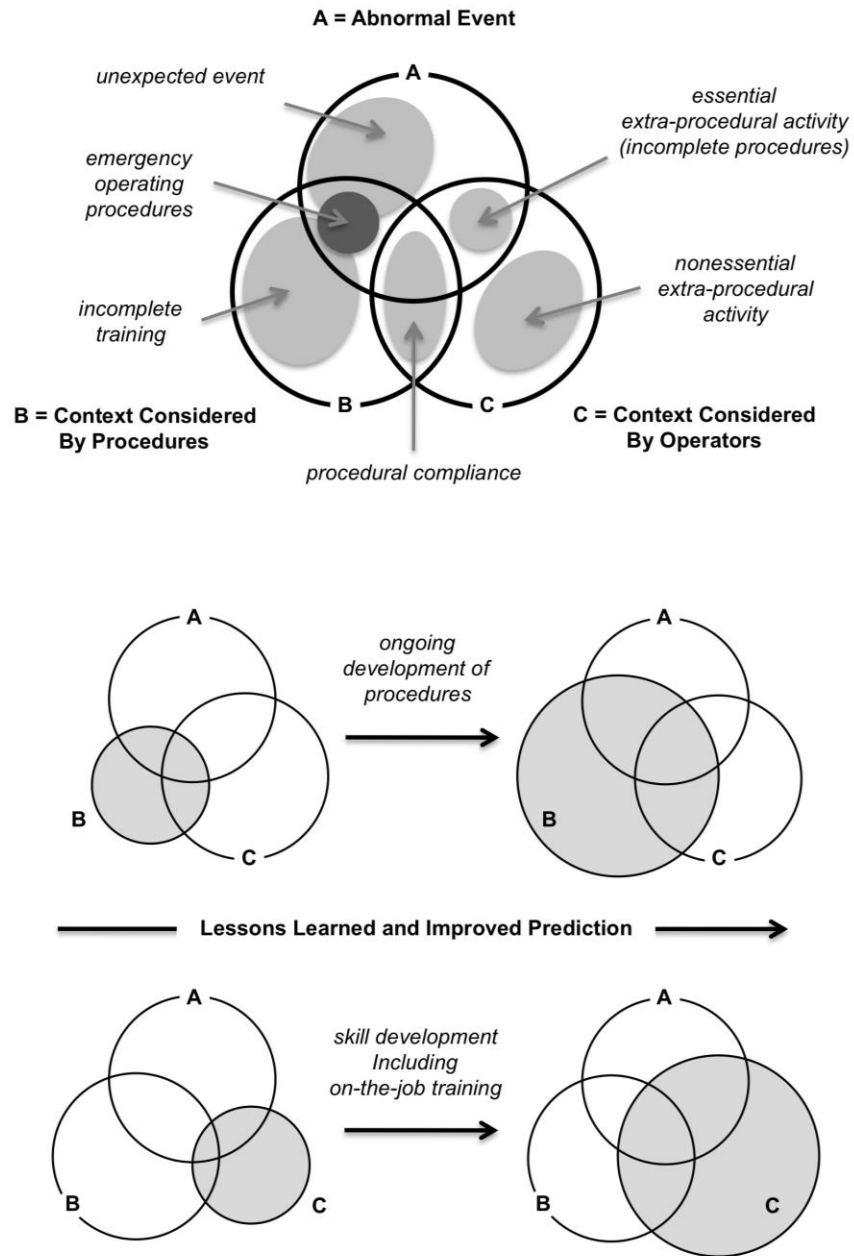


Figure 5. Micro-experiences as extra-procedural activity (adapted from Riccio & Vicente, 2001).

4.1.4 Mechanistic Analogies and Predominant Experimental Paradigms

The point of considering analogy and homology between OBTE and dynamical systems is not that we should view Soldiers or students as a different kind of machine, a more sophisticated machine. One reason for addressing adaptability in dynamical systems is that it can be viewed as a particularly concrete and rigorous manifestation of an analytic philosophy of relevance to

human adaptability and the design of environments that foster such adaptability. Another reason for mentioning this line of research in a human context is to minimize the tendency to consider physical analogies for human cognition, and the associated analytical philosophies, only with respect to relatively familiar computer architectures (Anderson, Bothell, Byrne, Douglass, Lebiere, & Qin, 2004; Newell, 1990; Newell, Simon, & Shaw, 1958). As suggested above, there are a wide variety of ways to model human cognition by way of analogy to physics or machines (see also, Gray, 2007; Richardson, Shockley, Riley, Fajen, & Turvey, 2008; Tschacher & Dauwalder, 2003; Wolfram, 2002). Ultimately the validity of any such attempt has to take into account an understanding of human cognition that, on the face of it, also captures essential aspects of what it means to be human. Our purpose is to ground our inquiry into OBTE in a trans-disciplinary context that is sufficiently rich to appreciate such essential attributes.

In OBTE, uniquely human qualities of interest are the development of values-based behavior and the associated inter-temporal decision making that guides the balance and tension of choice and responsibility. The issue of nested time scales is relatively neglected in scientific psychology because it is problematic for the predominant experimental paradigms that are limited to investigation of human capabilities over time scales commensurate with the attention span assumed by most entertainment in popular culture (i.e., fractions of a second to a few hours). The tyranny of these time scales is evident even in longitudinal research or times-series methodologies in which the interactions among brief intermittent events (e.g., transformations) typically are not addressed directly. We believe that education, on the other hand, requires consideration of nested time scales as well as hypotheses about causality sufficient for inquiry into cognition and behavior that is meaningfully situated, grounded, adaptable, and sustainable. As the scientific foundation for OBTE develops, there will be considerable value in the development of paradigms for empirical research that respond to the needs of programmatic decision making in education (see, e.g., Bailar, 1997; Denzin & Lincoln, 2003; Glasziou & Haynes, 2005; Godfrey-Smith, 2003; Mislavy & Riconscente, 2006; Pelligrino et al., 2001, Swales, 2000) and that, while grounded in psychological theory, are not limited to predominant experimental paradigms of scientific psychology (consider, e.g., Barnes, 1959; Cotkin, 2003; Solomon, 2004a; Wise, 1980).

4.2 Three Pillars for the Scientific Foundation of OBTE

The citations in Chapters 2 through 5 reflect the constant comparison between our collaborative inquiry with the progenitors of OBTE and relevant scientific literature. Our comparisons with the scientific literature obviously were influenced by our prior histories but certainly were not limited to these biases. Frankly, the inquiry led us to lines of research we did not anticipate and that, in some cases, were surprising. Two criteria have been critical in our consideration of relevant scientific research. One is that there must be a strong theoretical underpinning for the research characterized by scholarly debate and refinement over the time span of decades. The second is that there should be a strong empirical component that helps build a bridge between theory and praxis. In other words, the theoretical connection should be actionable for individuals involved in some phase of the ADDIE process, preferably in all phases. The research should help individuals understand OBTE, and it should help them communicate and collaborate about it in planning, execution, and assessment.

4.2.1 Ecological Psychology

We recommend that ecological psychology and related scholarship on dynamical systems be considered as one pillar in the scientific foundations for OBTE because the interaction between an individual and the environment is an ontological primitive, because the interplay of

exploratory and performatory behavior is an epistemological primitive, and because of a commitment to realism (see section 4.1). We also are strongly influenced by one of most important yet relatively neglected tenets of this broad and deep line of scholarship—that individuals are in a continual process of learning and development, of coming to know (e.g., E. Gibson, 1991; J. Gibson, 1979; J. Gibson & E. Gibson, 1955; Reed, 1996). In a sense, this commitment brings the arrow of time into psychology as in the physics of dynamical processes, but not limited by the physics of inert matter (e.g., Shaw, Turvey, & Mace, 1982; Kugler & Turvey, 1987; Thelen & Smith, 1994). Consideration of nested time scales is a powerful approach to understanding such learning and development and thus adaptability. While consistent with extensive theory and experience for adaptive dual control in dynamical systems, the relevant work in ecological psychology has a strong empirical component that “crosses the Rubicon” from inanimate systems to animate systems (E. Gibson, 1988; E. Gibson, Riccio, et al., 1987; Riccio, 1993a; Riccio & McDonald, 1998, van Wegen, et al., 2002). Empirical work along these lines in human experimental psychology and allied fields will be invaluable in development of measures that help make the intangible more tangible or at least verifiable.

The value of ecological psychology is partly in the broad theoretical foundations for understanding human engagement with the world. This will be helpful in coming to a better understanding of the ways in which any and all learning events influence outcomes other than those that are intended. Empirical research in ecological psychology will be particularly helpful in the development and use of measures in training and education that relate to situated perception, coordination, control, and skill (see e.g., Bernstein, Latash, & Turvey, 1996; Chemero & Turvey, 2007; Davids, Bennett, & Newell, 2005; Fajen, Riley, & Turvey, 2009; Frank, Michelbrink, Beckmann, Schollhorn, 2008; Hancock, Flach, Caird, & Vicente, 1995; Sternad, 2009; Turvey, 2007; Warren, & Wertheim, 1990). A relatively neglected principle of ecological psychology is that one must understand the nested structure of human-environment interactions to understand what it means for perception and action to be situated (J. Gibson, 1979). This does not necessarily imply intractable complexity in studying perception and action. Typically, the approach redirects analytical reduction to an intermediate level of analysis that is pluralistic and naturalistic (cf., Bunge, 1977; Treisman, 1988).

Consideration of the nested structure of an operational situation helps with bookkeeping for the influences of higher and lower levels on the most basic level of a situation (Rasmussen, 1997; Riccio, 1993b; Riccio & Stoffregen, 1988; Riccio & Vicente, 2001). Such subordinate and superordinate constraints on interactions with the surroundings often reveal ways to simplify the understanding of such interactions. The simplifying schemes characteristically emphasize the importance of 2nd-order and 3rd-order effects of such interactions (cf., Gibson, 1977). Examples of this kind of analytical reduction are show in Figure 6 for piloting an aircraft and in Figure 7 for collective operation of a nuclear power plant. We believe such an approach will be valuable in characterizing and coming to a deeper understanding of the structure of a good learning environment and, in particular, the influence of a community-centered perspective on learner-centered, knowledge-centered, and assessment-centered perspectives on the structure of a good learning environment (Bransford et al., 2000). In the context of OBTE, a deeper understanding of the nested structure of a learning environment provides clues about outcomes that are influenced in every learning event whether or not they are intended. This working assumption will guide our integration of ecological psychology with other perspectives that are necessary for a more complete understanding of a values-based approach to training and education.

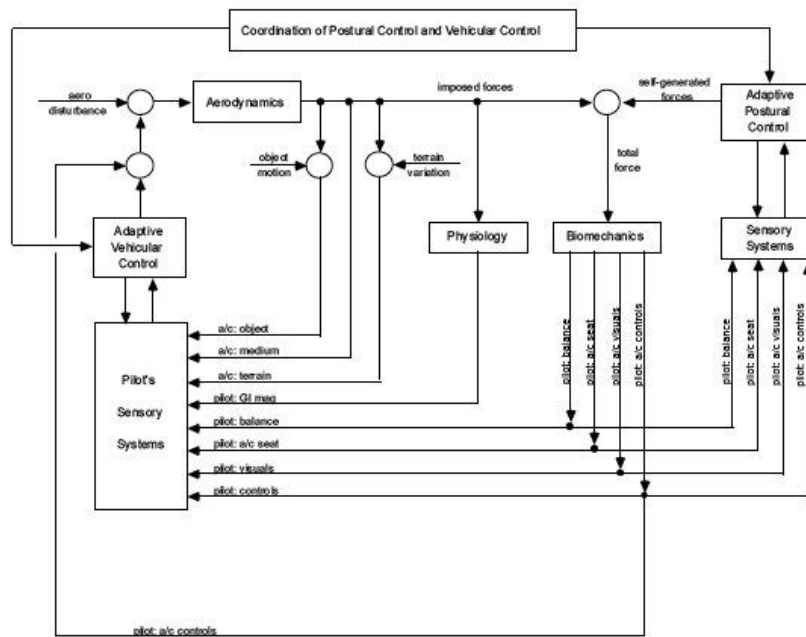


Figure 6. Consideration of basic levels and the nested structure of perception and action in piloting an aircraft (from Riccio, 1993b).

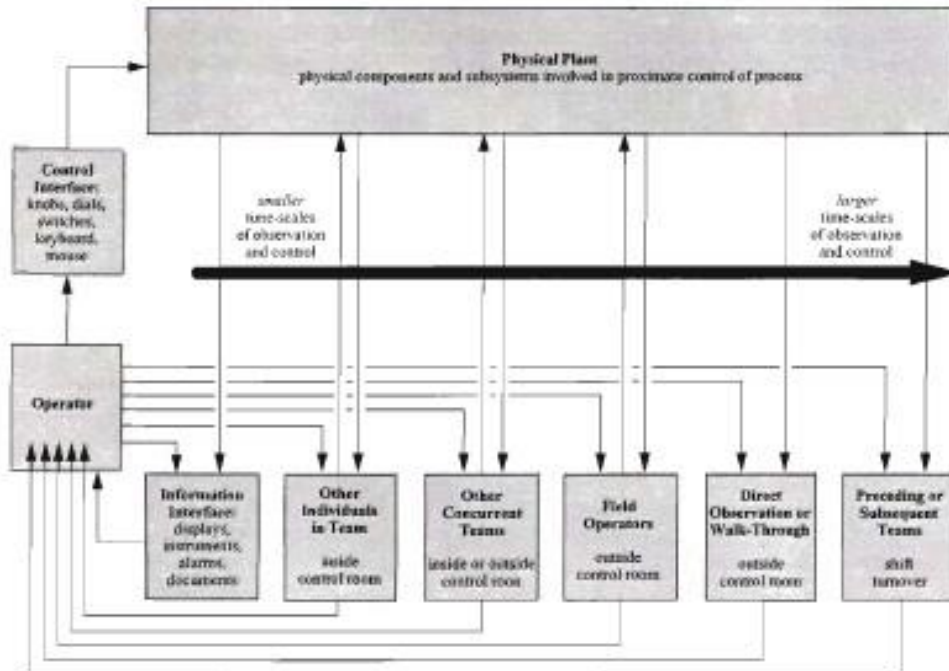


Figure 7. Consideration of basic levels and the nested structure of perception and action in the collective operation of a nuclear power plant (from Riccio & Vicente, 2001).

Ecological psychology is not sufficient for our purposes in that it has not yet provided much insight into the social and cultural issues that are critical in OBTE. Nevertheless, its commitment to realism will be quite helpful when we complement this line of research with other disciplines that can drift uncomfortably into constructs having questionable validity and verifiability with respect to the realities of OBTE. We believe that self-efficacy theory and positive psychology are the most promising complementary perspectives to ecological psychology. The principles and themes of most relevance to OBTE are highlighted below.

It should be noted that there has been very little engagement to date, either positive or negative, among these three lines of thought. Presumably this is due to apparent philosophical dissonance among them and trans-disciplinary obstacles within the culture of academe. The study of social and cultural phenomena, for example, is preoccupied with the implications of inductive inference in interpretations of one's experience or in extrapolation to hypothetical situations, especially when there are nonintuitive or otherwise interesting inter-subjective disparities between cognition and reality. While there is little doubt about the causal potency of induction in one's experience, we do not focus on terminal induction, that is, on premature conclusions based on inductive inference. We are more interested in deductive inference over time and on the role of induction, *en passant*, in directing the focus and in identifying the limits of deductive inference (cf., Chapter 3, section 3.2.1). OBTE is concerned with the arrow of time and coming to know a reality that can be shared experientially, that can be verified, and that is valid with respect to engagements based on such knowledge. The interest, of necessity, is in adaptable and sustainable interactions with reality. We thus emphasize a commitment to realism (cf., J. Gibson, 1979; Reed, 1996; Reed & Jones, 1979, 1982) to the extent that it is possible and reasonable given the nascent confluence of these lines of thought. Initially, we believe that the philosophically tentative juxtaposition of ecological psychology with other lines of thought in social psychology can benefit greatly from a focus on the ways in which concrete and verifiable experience inside and outside of formal learning events influences self knowledge, motivation and emotion, and the development of values.

A tenet of ecological realism that fits comfortably with self-efficacy theory and positive psychology is that perception, cognition, and action must be understood as fundamentally situated in a broader context (J. Gibson, 1979; see also, Neisser, 1996; Reed & Jones, 1982; Shaw & Bransford, 1977; Shaw et al., 1982; Stoffregen, & Bardy, 2001; cf., Georgas, van der Vijver, & Berry, 2004; Heine, & Norenzayan, 2006; Heft, 2001; Henle, 1971; Hofstede, 2001; Lewin, 1951; Matsumoto, & Yoo, 2006; Wang, 2006; Winograd, Fivush, & Hirst, 1999). This axiom is much less controversial than when it was introduced three decades ago as a departure from the reductionism that was dominant in the behavioral and social sciences at that time. Consideration of context is common today, albeit often implicitly as an additive factor influencing thinking and behavior. It should be noted that the influence of context is not additive in ecological realism. The individual can have as much of an effect on the surroundings as the surroundings can have on the individual. The dynamics of the coupled system are emergent. Thus a realist commitment in OBTE avoids both structural-functionalism and cognitive constructivism in the social sciences (cf., Bandura, 1997; Denzin & Lincoln, 2003; Scott, 2000; Wenger, 1998). Meaning is constructed to the extent that individuals change their surroundings and situations, by coupling with it, and thus change what it affords for them. Meaning, whether or not constructed in this way, is observable and verifiable in the behavior and performance of individuals with respect to each other and their surroundings.

4.2.2 Self-Efficacy Theory

We recommend self-efficacy theory (e.g., Bandura, 1977, 1995, 1997) as a second pillar primarily because of the centrality of interpersonal influence, role models and social support structures in OBTE as well as the relationship between the pursuit of mastery and perception of one's abilities over time. We are interested in exploring connections with self-efficacy theory apart from aspects of social cognitive theory that take "a loan on intelligence that science can never repay" (Turvey, Shaw, Reed, & Mace, 1981, p. 248; cf., Dennett, 1971, p. 96). We recognize that selecting one component of a line of research from a broader theoretical amalgam is precarious from the perspective of scholarship, so we do so with some caution. It is worth noting, in this respect, that even Bandura points out that self-efficacy is separable, conceptually, from social cognitive theory (Bandura, 1997, p. 34; although presumably he would prefer them not to be separated in a holistic explanation of human cognition and action). As in theories of perception, in general, one can debate the relative epistemological importance of inductive and deductive inference as a basis for beliefs or about the ontological status of beliefs. We believe it is more productive to focus on identifying the information and engagements through which perception of one's own capabilities becomes grounded in reality and to consider the nature of that reality (e.g., Riccio, 1993a,b; Riccio & McDonald, 1998; Riccio & Stoffregen, 1988; Shaw et al., 1982).

We are deeply indebted to self-efficacy theory for an extensive empirical foundation that reveals the variety of causally potent aspects of the social environment for human learning and development. We seek explanations of these causal influences in terms of augmentation to an individual's perceptual systems, critical influences on the education of attention, and essential coordinative structures in the pickup of information about reality. We believe this will have concrete implications about how to improve the accuracy of an individual's self perception. In a sense, we view elements of the social environment with which an individual shares reciprocal causal relations as "informative dynamic components" in nested interpersonal systems (cf., Riccio, 1993a,b). This means that we can view others as augmentation to our own perceptual systems rather than merely as a separate source of information. While the latter suggests a source of information imposed on a passive knower, the former emphasizes an active knower who can obtain additional sources of information that complement one's own individual capabilities to know. This is one reason why OBTE stresses collaborative reflection even in the context of learning ostensibly by individuals in learning events designed for an individual (see Chapter 3).

The importance of our ecological perspective on self-efficacy is a focus on information, on coordinated action, and collaborative information pickup in task-organized groups. It changes the emphasis from the existence of social support structures to the nature of the transactions within a social group. It focuses specifically on what instructors or other members of a group do to facilitate, advise, and mentor a learner inside or outside formal learning activities. These considerations are entirely consistent with self-efficacy theory even if the causal explanations are different. We seek a multifaceted empirical program for OBTE that can yield depth in the understanding of instructor-student interactions and collaborative learning that can complement the breadth of considerations inherited from self-efficacy theory and related work in social psychology. We seek a deeper understanding of the nature of the arduous work that is critical to the pursuit of mastery (Bandura, 1997).

Ubiquitous exploration, micro-experiences, inter-temporal perception and action, and adaptability are key concepts in OBTE. We agree with Bandura (1997) that one need not postulate an inherent motivation to explore. We also agree that exploratory behavior is best understood in the context of outcomes it promotes, as in adaptive dual control theory (see Section 4.1). At the same time,

we recognize that a certain amount of exploratory potential is inherent in the variability of life, especially human perception and action; thus, all exploratory behavior need not be motivated by intended outcomes (Riccio, 1993a,b; Riccio & McDonald, 1998; van Wegen, et al., 2002). Furthermore, we allow for the possibility that exploratory behavior can lead to information-based inter-temporal decisions that change one's goals or desired outcomes (E. Gibson, Riccio, et al., 1987; Riccio, 1993; Riccio & Stroffregen, 1991; cf., Safonov, 2001). Thus, exploratory behavior can be directed and serendipitous. This has important implications for instructor behavior and for the structure of learning environments that promote learning to learn (see e.g., section 3.2.1).

The centrality of outcomes is an important commonality across the three pillars of the foundation we propose for OBTE. Importantly, self-efficacy theory emphasizes a "comprehensive functionalist view" of outcomes (Bandura, 1997, p. 22) that accommodates the immediate tangible effects of learning as well as the inter-subjective implications and meaning of learning. Self-efficacy theory thus recognizes the importance of personal and shared values in the regulation of behavior. It begs for a more extensive and nuanced treatment of these positive psychological influences on learning and development, one sufficient to explain the power they have on human thinking and action. This exigency of self-efficacy theory guides us in the direction of complementary lines of scholarship that reflect persistent themes across the millennia of philosophical reflection on the meaning of existence (e.g., Aristotle, trans. 1925; Augustine, trans. 1991; James, 1902/1982; Maslow, 1968; Plato, trans. 1892a; Solomon, 2004a).

4.2.3 Positive psychology

A third pillar in the scientific foundations for OBTE is positive psychology (e.g., Aspinwall & Staudinager, 2003; Keyes & Haidt, 2003; Lopez & Snyder, 2009; Peterson & Seligman, 2004; Seligman, Steen, Park, & Peterson, 2005; cf., Maslow, 1968) because the defining focus for OBTE is development of the individual with respect to persistent attributes embodied in Army Values and Warrior Ethos, specifically the assumption that such attributes can be addressed in concrete and verifiable ways during Army training (cf., Riccio et al., 2004). Positive psychology, while largely atheoretical, has pulled together a body of work on character strengths and values across cultures and over significant periods of history. Initially, the progenitors of this approach surveyed significant canonical texts associated with Confucianism and Taoism in China, Buddhism and Hinduism primarily in India, ancient Greece, Judeo-Christianity, and Islam after developing ten criteria for identifying strength of character (Peterson & Seligman, 2004). The authors argue for six core virtues that generalize across the traditions they surveyed: wisdom, courage, humanity, justice, temperance, and transcendence. They further defined character strengths as mediating "psychological" constructs through which virtues are displayed. Table 1 shows the initial list of twenty-four character strengths organized by the associated virtues.

The indicated virtues reflect many of the same aspirations expressed in Army Values and Warrior Ethos (see Chapter 3; Appendices D, E). Peterson & Seligman (2004, p. 14) also distinguish virtues and character strengths from "situational themes" which they refer to as behavior habits tied to particular situations and settings (e.g., work, family). Presumably these themes are analogous to performance indicators developed for OBTE (see e.g., Chapter 2). The examples they provide from the Gallup organization's situation themes include (a) anticipating the needs of others, (b) making others feel part of a group, and (c) seeing what is good in situations and in people. This indicates an important difference between the predominant methods of Positive Psychology and the methods developed for our investigation of OBTE. Positive psychology focuses on retrospective self-reports or reports of others that are not specific to any particular event. Our methods emphasize measures that can be applied to the observation of specific behavior in a specific event (concurrently or retrospectively). We believe this behavioral

grounding is essential to the scientific development of OBTE and, arguably, any intervention that seeks to influence character strengths and virtues (see e.g., Seligman et al., 2005). Such measures provide increasing clarity on what individuals actually do in sufficient detail and context to make it possible to identify consequences of such actions. At the same time, we do not diminish the value of surveys. In fact, we believe they complement behavioral measures (see e.g., Chapters 10-11) and that they will be necessary to determine the full impact of OBTE (see Epilogue). We don't believe that surveys are sufficient, however, to assess the impact of an intervention on character strengths and values (see e.g., Chapter 1).

Table 1: The twenty-four strengths and virtues of positive psychology (from Peterson & Seligman, 2004).

1. Wisdom & knowledge	Cognitive strengths that entail the acquisition and use of knowledge
Creativity	Thinking of novel and productive ways to do things
Curiosity	Taking an interest in all of ongoing experience
Open-mindedness	Thinking things through and examining them from all sides
Love of learning	Mastering new skills, topics, and bodies of knowledge
Perspective	Being able to provide wise counsel to others
2. Courage	Emotional strengths that involve the exercise of will to accomplish goals in the face of opposition, external or internal
Authenticity	Speaking the truth and presenting oneself in a genuine way
Bravery	<i>Not</i> shrinking from threat, challenge, difficulty, or pain
Persistence	Finishing what one starts
Zest	Approaching life with excitement and energy
3. Humanity	Interpersonal strengths that involve "tending and befriending" others
Kindness	Doing favors and good deeds for others
Love	Valuing close relations with others
Social intelligence	Being aware of the motives and feelings of self and others
4. Justice	Civic strengths that underlie healthy community life
Fairness	Treating all people the same according to notions of fairness and justice
Leadership	Organizing group activities and seeing that they happen
Teamwork	Working well as member of a group or team
5. Temperance	Strengths that protect against excess
Forgiveness	Forgiving those who have done wrong
Modesty	Letting one's accomplishments speak for themselves
Prudence	Being careful about one's choices; <i>not</i> saying or doing things that might later be regretted
Self-regulation	Regulating what one feels and does
6. Transcendence	Strengths that forge connections to the larger universe and provide meaning
Appreciation of beauty and excellence	Noticing and appreciating beauty, excellence, and/or skilled performance in all domains of life
Gratitude	Being aware of and thankful for the good things that happen
Hope	Expecting the best and working to achieve it
Humor	Liking to laugh and tease; bringing smiles to other people
Religiousness	Having coherent beliefs about the higher purpose and meaning of life

Surveys are not sufficient for the purposes of explanation, prediction, or assessment of interventions because they generally do not provide enough detail to identify critical situational factors that influence the behavior of individuals (cf., Bandura, 1997, p. 39-42). We are more sanguine than Bandura about the utility of surveys if they are grounded in behavioral measures in specific situations. We are in agreement with Bandura that characterization of personality traits from such surveys is, at best, a distraction in any attempt to explain or predict human behavior or to assess interventions. The interest of positive psychology in individual differences and traits seems to be a legacy of its evolution from clinical psychology. We expect such interests to become incidental to the growing body of research in this relatively recent movement in psychology (see e.g., Lopez & Snyder, 2009). The important contribution of positive psychology is that it is helping researchers understand outcomes of relevance to any intervention that claims to have an impact on values. It helps focus on development of methods and measures for acquiring evidence that can, in principle, support such claims.

Positive psychology and self-efficacy theory superficially can be misinterpreted as narcissistic, self-indulgent, or focused on simple cheerfulness. This is definitively not the intent (see e.g., Bandura, 1997; Peterson & Seligman, 2004). The intent of these independent lines of scholarship is to enable scientifically rigorous inquiry into some of the most serious aspects of the human condition, self-identity and the meaning of existence, although it seems that they will need some help living up to this potential. Ecological psychology enters into this realm by emphasizing that the ontological primitives for human cognition and behavior are not defined in terms of an isolated individual, yet neither are they subordinated to a mindless collective. It helps get us closer to a scientific understanding of values-based behavior that is observable and verifiable by emphasizing nested reciprocities between the individual and the environment as well as inter-temporal information in immediate circumstances that is relevant to future engagements with the environment. All these lines of scholarship, in essence, pointedly address something of significance that is both deeply personal and larger than the individual, something that is relevant beyond a moment in time.

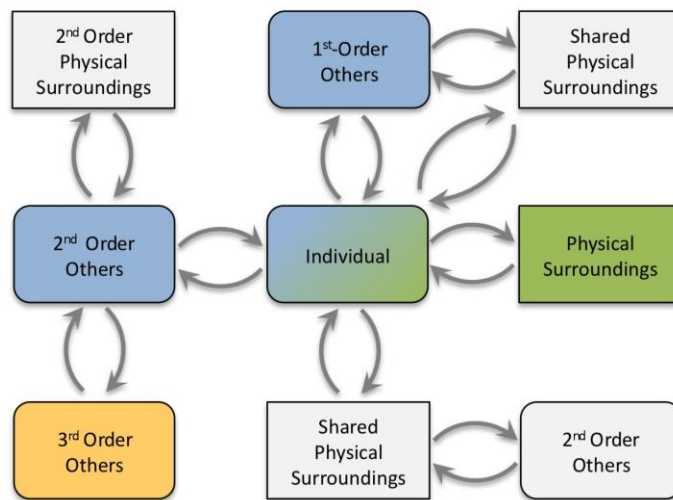


Figure 8. In principle, one can address reciprocal influences and their emergent properties in the same ways for interactions with social environment as with the physical environment. 1st-order others share the same physical context. 2nd-order others are engaged largely with a different context. Presumably coordination with such individuals is guided by more abstract commonalities such as shared values. Such values exemplify a broader community that includes 3rd-order others with whom one momentarily is not interacting.

4.3 A More Integrated Scientific Infrastructure

In the further development of a scientific infrastructure for OBTE, we will continue to focus on observable behavior of individuals, generally of individuals interacting with each other, such as in the transactions between an instructor and a student. We believe such ecologically grounded measures will provide opportunities to close the gap between the causally potent constructs of self-efficacy theory and the aspirational outcomes emphasized by positive psychology. The key to establishing these conceptual connections will be to identify behavior that is inter-subjectively valid and that has potentially verifiable relationships with values-based outcomes. In the following sections, we summarize several lines of research that can help connect the three pillars of the scientific foundation for OBTE (Figure 2).

4.3.1 Self Determination Theory

We have found self-determination theory (e.g., Deci & Ryan, 1985, 2008; Ryan & Deci, 2008) to be a valuable bridge between self-efficacy theory and positive psychology. To be sure, self-determination theory connects with positive psychology more comfortably (see e.g., Brown, Ryan, & Cresswell, 2007; Seligman et al., 2005) than with self-efficacy theory (see e.g., Deci & Ryan, 2000). While there are important differences between self-efficacy theory and self-determination theory, they are more complementary than one might suspect based on the opposing positions of a historically important polemic in scientific psychology about sources of motivation and personal agency. Both theories, which have matured over decades, have a nuanced appreciation of reciprocal influences of internal and external sources of motivation. The difference that matters in the present context is the centrality in self-determination theory of the triadic interplay among inherent aspects of motivation: competence, autonomy, and relatedness (see Chapter 3, section 3.2.3). This seems to capture more of the existential subtleties assumed by the intangible attributes emphasized in OBTE (e.g., confidence, initiative, and accountability) than does the equally important but somewhat vague effects of shared values in the comprehensive functionalism of self-efficacy theory.

The central thesis of self-determination theory is that there are three innate psychological needs that always influence motivation, vitality, and development (i.e., well being). Specifically, the theory assumes that the need for competence, autonomy, and relatedness has a positive effect on well being to the extent that external conditions allow them to be satisfied, and they have a negative effect to the extent that they are thwarted by external conditions (see e.g., Deci & Ryan, 2000; Ryan & Deci, 2008). In self-determination theory, competence is the need to feel effective, autonomy is the need for volition rather being controlled, and relatedness is the need to feel significant and connected. Within a commitment to realism, however, these innate endowments are inherent in the human condition of being in the perceivable world, and there is no need to suggest purely “psychological” qualities that exist apart from the perceivable world. The needs articulated by self-determination theory and external conditions need not be considered as independent ontological primitives to be compared in terms of concordance or dissonance. Individuals can influence conditions in which they are situated through purposeful engagement with their surroundings on multiple levels. In principle, individuals can influence the conditions that influence their own behavior and performance (cf., section 4.2.1). While there are limits to such nested engagement, the critically important theoretical implication is that the causal potency of “external” conditions need not connote that the individual is a pawn of the system, for good or ill, and without responsibility. The practical implication is that inquiry into the determinants of competence, autonomy, and relatedness can focus on observable and verifiable manifestations of the reciprocity between the individual and environment (i.e., the social environment and the physical environment).

The emphasis on autonomy in self-determination theory should not be confused with an internal locus of control. More fundamentally, it connotes the experience of freedom and an integrated sense of self (Deci & Ryan, 2008). The distinction is important because it implies that one can choose to yield or cede power to someone or something else and still be self-determined. Building on this, the theory thus allows for the possibility that a self-determined individual can engage in a complex undertaking in which there is a spectrum of various combinations of internal control and external control. We believe that this is precisely what occurs in a task-organized group in which individuals (e.g., Soldiers) complement each other, and even teach each other irrespective of rank or duty position. We believe that training and education can prepare Soldiers for the skills of task organization. There is a significant body of work on the pedagogical implications of such collaboration (Hmelo-Silver, 2004; Tobias & Duffy, 2009) for which the research in self-determination theory and self-efficacy theory provides a broad scientific foundation.

Giving up some measure of control is more consistent with freedom and autonomy to the extent that one shares values or significant relationships with others to whom one cedes power (cf., Bandura, 1997; Lewin & Grabbe, 1945). For such reasons, self-determination theory emphasizes the importance of the process by which an individual internalizes external sources of motivation, that is, the inculcation of shared values (Deci & Ryan, 2000; cf., Riccio et al., 2004; Peterson & Seligman, 2004). It thus is difficult, if not impossible, to separate the influential roles of autonomy and relatedness in self-determination theory. Self-determination theory seems to limit consideration of relatedness to interpersonal relationships and understanding (Deci & Ryan, 2000; cf., Hume, 1740/2009; Peterson & Seligman, 2004; Plato, trans. 1892b; Smith, 1759/1976). While the evidence about such interpersonal influence can be an important contribution to the future development of OBTE, we believe that relatedness should also take into account the reciprocal relationships with the physical environment; that is, it should include all aspects of being in the world (see also, section 4.2.1). Purposeful behavior is constrained by awareness of the consequences and implications it has on both the social and physical environment in which it is situated. In OBTE, education of the attention for better situation awareness is critical in fostering adaptability and learning to learn. Behavioral scripts, even inadvertent ones, can undermine the development of skills needed for situation awareness and the pursuit of mastery.

Competence in self-determination theory is closely related to self-efficacy and to the meaning of confidence in OBTE. As one of the inseparable intangibles of OBTE, confidence refers to a sense of self that is grounded in competence but, importantly, it also includes a sense of one's zone of proximal development (Cole, John-Steiner, Scribner, & Souberman, 1978). In OBTE, confidence is dependent on one's ability to perceive one's capabilities for developing enhanced efficacy. Given a commitment to realism, the emphasis is on one's metacognitive awareness of the strategies of attention and action that are efficacious with respect to the pursuit of mastery (see e.g., Chapter 3, section 3.2.6). Initiative at the boundaries of the known and the unknowable is essential in picking up information that grounds adaptation in better understanding of reality and, thus, that gives it a developmental character (section 3.2.1). To be robust, however, initiative must be balanced by a sense of consequences, especially consequences that are catastrophic or otherwise irrecoverable (cf., Riccio & Stoffregen, 1988, 1991; Riccio 1993a,b). This is the triadic balance that is central to OBTE (see Chapter 3, section 3.2.3), and it maps usefully into the triad of competence, autonomy, and accountability of self-determination theory. This mapping is exceedingly important for the further development of OBTE given that the findings and applications of this body of work have direct relevance to training and education (Deci & Ryan, 2008; Guay et al., 2008).

4.3.2 Situated Learning Theory

Our broad intent has been to identify the relevance and lessons of OBTE for formal programs of training and education in the Army. We chose not to begin with theories and best practices in formal programs of training and education in general even though there is an extensive literature behind it (e.g., in educational psychology). Instead, our strategy has been to begin with the identification of principles and practices of OBTE and the associated wisdom of Soldiers as professionals, leaders, and members of a community with well-defined values. We then allowed this to take us wherever we needed to go to identify the most relevant scientific underpinnings. In a sense, we have peeled back the layers of pedagogical theory and practice to reveal that there is a core with clear and uncluttered relevance to the needs of the Army. Returning to foundations of pedagogy in psychological science minimizes the distractions of incidental details in particular applications of psychological theory to pedagogical practice. It also avoids problems that derive from replicate fading in the translation of psychological theory to pedagogical theory as is the case, for example, in adaptations such as “adult learning theory.”

It is noteworthy that the common foundation we have identified is not at the most abstract level, that is, not at the level of scientific or philosophical conjecture about properties of the mind of an individual learner. Nor did we seek a common foundation in the considerable bodies of reductionistic scientific research in “learning theory” that such abstracta have spawned over the last one hundred years or so. Instead, our aim has been to identify foundations for teaching and learning that cut across the myriad of settings in which learning occurs. A key objective is to inform curriculum-level or career-level programmatic reflection and decisions about teaching and learning in the context of its impact on development of individuals in a community with common values. The basic level of inquiry to which we thus were led concerns learning that is explicitly and irreducibly situated in a physical, social, and cultural environment (see Figures 2, 7 and 8).

To this point, we have highlighted significant bodies of scientific research in the behavioral and social sciences that offer theoretically well-established methods and measures with direct implications and utility for verification, validation, and further development of a values-based approach to training and education (see Chapter 1). The theoretical and empirical foundations are relevant to outcomes that have meaning in a common community and have relevance to the environment within which the practices of a community have purpose (i.e., situated learning). Adding to this foundation, it is important to point out relevant applications of situated learning theory outside the Army. In particular, we briefly highlight the work on communities of practice (e.g., Lave & Wenger, 1991; Wenger, 1998). This is a different kind of evidence with respect to the claims of OBTE. Unlike the research cited in previous sections, it is not a source of evidence that directly addresses claims about the causal potency of the principles and practices of OBTE, nor is it evidence for the trustworthiness of methods and measures with which the impact of OBTE can be evaluated. The work on communities of practice is important, however, insofar as it promulgates lessons learned about problems and opportunities in applying situated learning theory in various organizational settings and its implications for transfer of learning. Free from unnecessarily limiting dependence on cognitive constructivism or information-processing metaphors, this work helps establish a tighter connection between other social learning theories (e.g., self-efficacy theory) and ecological psychology; that is, it helps unify the social and physical elements of reciprocal influence between an individual and the environment.

Wenger and Lave are much more deferential to postmodern sociopolitical sensibilities than we are inclined to be. We certainly do not share many of the motivations and conclusions of postmodern thought, especially in its occasional dalliances with science (Hacking, 1999; Latour, 2004). Nevertheless, the convergence of our thinking with that of Wenger and Lave does reflect

some common concerns across these diverse perspectives, such as identifying a proper role for science in social and programmatic decision-making (see Flyvbjerg, 2001; Schrim, & Caterino, 2006; see also Chapter 11). In this respect, the work of Wenger and Lave is noteworthy because it represents an anthropological style of inquiry to which we aspired in our investigation of OBTE. It looks at what people actually do and experience in particular settings irrespective of how those settings are designed or independently characterized. This is critically important in situations characterized by change, innovation, decentralized adaptation, or what we refer to as task organization. It is not surprising that, in our own inquiry, we have come to conclusions similar to that of Wenger and Lave (e.g., Wenger, 1998).

The work on communities of practice reveals that most people spend much more time learning, and in a wider variety of settings, than is suggested by the body of research on educational theory and practice. Individuals engage in significant learning outside of formally designed curricula and fabricated learning environments. They make connections between situations, between the learning that occurs in different situations, and they integrate that knowledge. They do so whether or not the situations are designed as part of same curriculum. Learning and knowledge in one situation (e.g., outside a formal educational setting) certainly can influence learning in a different situation (e.g., inside a formal educational setting) whether or not the different situations are even considered by instructional designers (cf., Bransford et al., 2000). For us, the implication is that anyone with a programmatic stake in understanding and influencing such integrated learning has an even greater need for methods of verification, validation, and continuous improvement (e.g., formative assessment) than someone who is committed more narrowly to programmatic control of a learning environment. This is the only way to identify and accommodate factors affecting the transfer of learning over which students have more control than curriculum designers. In OBTE, rigorousness will be associated with formative assessment that is organic and habitual rather than with maximally detailed scripts for instruction and equally detailed specifications for learning environments.

Formative assessments should focus on the most important factors that influence learning. Importantly, our inquiry converges with the work on communities of practice in concluding that (a) social factors are the most important determinants of learning outside of formal learning environments and perhaps even inside such formal settings, and (b) social factors have their greatest causal potency in a shared environment within which there is a common purpose (Wenger, 1998). We join Wenger in expressing some surprise that such a conclusion is noteworthy. That it is noteworthy emphasizes how a hegemonic focus on the structure of knowledge, and debate over the various methods of implanting it in the mind of a student, have allowed educational research to drift from exigencies associated with the obvious fact that a student is a human being and, as such, has a natural proclivity to find meaning and establish an identity through engagement with the real world, most notably with others from whom the student can learn (e.g., Augustine, trans. 1953; Keatinge, 1896). For this reason, from the outset, our inquiry has focused on identification of instructor-student interactions that are explicitly relevant to the conditions of learning and the task at hand. This focus enabled the development of formative assessments that capture and promulgate instructional best practices.

Another important connection with communities of practice is the realization that teaching and learning can be roles that shift within and between situations, that there is not necessarily an immutable power asymmetry between individuals within a community. There may be particular settings in which one person has a formal role as a teacher and others have formal roles as students but, beyond this context, individuals generally need to move into and out of such roles from moment to moment (see e.g., section 3.2.6). For us, this is an important consideration in “far transfer” of knowledge and skills from a formal learning environment. Equally important, and

implicit in this assumption, is that there is transfer of learning from prior experience to formal learning environments. This becomes a more important consideration for instructional design during times of broad cultural change. While many of the claims about the “information age” are debatable, a strong case certainly can be made that the current generation of adolescents have much more experience in the obtaining of stimulation, the active pick up of information, and the generation of content through web-based engagement because of the increasing capabilities of emerging electronic media in entertainment and education (Lakkala, et al. 2008; Paavola & Hakkarainen, 2005; Scardamali & Bereiter, 2006).

Learning theory that is based on the ubiquity of communities of practice gives us a broader appreciation of the various ways that individuals engage with their surroundings and helps us understand the influence of these engagements on continuous learning and development. An individual’s identity is an important focus of this work. The emphasis is on the developmental nature of identity, that it is a dynamic weave of trajectories over time within and across the various communities with which one concurrently and sequentially has membership (Wenger, 1998). Every individual has a multiplicity of developmental trajectories because of community-specific outcomes and associated modes of engagement and belonging. At the same time, there is a coherence to these trajectories that both drives and reflects the development of an individual’s identity. An important implication of this observation is that learning can be influenced strongly by such coherence, that is, by the personal and contextual factors that influence transfer of learning among concurrent and sequential engagements with reality. This, in turn, implies that instructors can have a powerful effect on learning by leveraging such factors. A fundamental tenet of OBTE is that intangible attributes such as confidence, initiative, and accountability are enabling outcomes that can be influenced in every learning event and, in fact, that are influenced in any meaningful engagement with reality. We believe that these are an important set of factors that influence the trajectory coherence that is critical to the development of identity and to both persistence and change in one’s identity (see section 4.1.2).

The development of identity within the context of multiple concurrent and sequential communities of practice also emphasizes the importance of cultural values as a coherent context within and across communities of practice (see section 4.2.3). Values are a transcendent aspect of the coherence in one’s developmental trajectories and in one’s engagement with reality (cf., Lopez & Snyder, 2009; Maslow, 1968; May, 1983). The scientific foundations for OBTE require that we avoid viewing students as passive receptacles for information about values or an indifferent lump of clay to be molded through the craft of applying pressure here and there over a period of time. Individuals engage with their surroundings and situations in ways that may or may not be obvious. They find meaning and create meaning in their surroundings through their engagements and through their experiences that have both a history and a future. An instructor can create a momentary set of conditions in which a student has no apparent control but that does not mean the instructor has total control of the meaning that students make of the situation. The student’s experience will be influenced by the history and values that influence their interpretation of the situation, in the moment, as well as what they take away from the situation and employ in future engagements within which they have more control (Wenger, 1998).

4.3.3 Existential Psychology

There is an obvious convergence of the elegant prose and accessible philosophy of Wenger and Lave with the influence of existential thought on psychology, such as reflected in the equally cogent writing of Rollo May (e.g., May, 1983; May, Angel, & Ellenberger, 1958). Existentialism may be a direct influence on situated learning theory, or the convergence may be an intellectual homology due to reflection on personal agency and development of identity in situations

characterized by existentially significant events and change. In any case our own qualitative inquiry into the principles and practices of OBTE, the situations in the Army to which they are a response, and our constant comparison with relevant scholarship, has led us inexorably to existentialism. We believe it is important to make this explicit because existentialism provides a powerful grounding for further development of OBTE given the historical depth and breadth of the scholarship in this tradition (see also Chapter 5). It would be difficult to find a more poignant and insightful body of thought about an individual's engagement with reality with clear implications for the behavioral and social sciences. We thus look to existential psychology to facilitate identification of these implications (e.g., Greenberg, Koole, & Pyszczynski, 2004; Hoffman, et al., 2009; May, 1983; May et al., 1958).

In addition to the direct relevance of existential psychology to OBTE, it also is useful in establishing an integrated scientific foundation for OBTE. In particular, it dovetails with ecological psychology and positive psychology in deep and meaningful ways. With respect to the sociology of science, both existential psychology and ecological psychology grew out of dissatisfaction with the pointedly meaningless behaviorism and the ontologically reductionistic cognitivism that dominated most of the 20th century in psychology (see e.g., Maslow, 1968; May, 1983; Reed & Jones, 1979, 1982; Shaw et al., 1982). More fundamentally, with respect to the philosophy of science, both ecological psychology and existential psychology take the radical turn of rejecting Cartesian dualism in favor of a monistic ontology that avoids problems created by the false dichotomy of subject and object and by confusing an epistemological commitment with an ontological commitment (see e.g., May, 1983; J. Gibson, 1979).

The fundamental tenet of ecological psychology and existential psychology is that individuals are perceptually in developmental trajectories that inform and derive from their engagement with reality (see e.g., May 1983; E. Gibson, 1991). As an empirical tradition, ecological psychology has concentrated more on experimental psychology and the rigorous description of behavioral couplings between an individual and the environment. The focus of existential psychology has been on the clinical psychology that addresses causes and experiential consequences of an individual's lack of acumen in engagements with reality or in frank disengagement with reality. In spite of the deep philosophical commonality between these two lines of scholarship, the sociological obstacles between clinical and experimental psychology have kept them from realizing their potential complementarity. The most promising nexus of ecological psychology and existential psychology is in weaving together rich descriptions of behavior and experience in a coherent philosophical framework that captures more fully what it means to be human, and thus that facilitates crystallization of scientific perspectives and other perspectives on engagements of individuals with the physical and social aspects of the world around them. This is both critical and practically relevant to any endeavor that seeks to describe the wisdom of Soldiers or any other group of experts involved in preparing individuals to engage meaningfully and responsibly with their surroundings and situations.

There also is an interesting juxtaposition of existential psychology and positive psychology given that the historicity of both lines of scholarship is in clinical psychology of what goes wrong with people. The powerful contribution in the paradigmatic shift of positive psychology is that there is an untapped wealth of information to be uncovered about what goes right with people (Peterson & Seligman, 2004; Seligman et al., 2005). In doing so, positive psychology explicitly and strategically avoids an assumption that one can improve the health and well-being of others with the same interventions that make people less unhealthy or less miserable. It assumes that interventions can be designed on a solid foundation of millenia of scholarship on values and strength of character (e.g., Aristotle, trans. 1925). In this assumption, and in the research it motivates, we believe positive psychology wanders into the realm of education and leadership.

The intent of positive psychology is to avoid focusing merely on cheerfulness or narrow interpretations of pleasantness that the word “positive” implies. As yet, however, it has not produced a body of work that reveals a gravitas commensurate with the context and impact of Army training and education, although it is making some progress (see e.g., Lopez & Snyder, 2009). This may be because of sociological pressures in the scientific community for positive psychology to differentiate itself from its clinical psychological foundations and the attendant focus on the negative. We believe existential psychology can help positive psychology emerge from this dilemma and, more specifically, become more relevant to Army training and education.

The shortfalls and opportunities in the early stages of positive psychology are reminiscent of the existential assessments in the psychology of Carl Rogers (May, 1983; Maslow, 1968). Essentially, Rogerian theory appeared to be too optimistic or not sufficiently deep existentially to illuminate the most profound influences on the growth and development of an individual’s values and identity. In a manner of speaking, existential psychology views the negative as a positive. To be a bit more precise, the assumption is that the occurrences in which one experiences the strongest and most immediate challenges to one’s identity and existence have the greatest influence on one’s ability to transcend the moment while remaining grounded in the moment, to grasp one’s potential while understanding one’s limits, to make choices with a sense of responsibility for the outcomes, and to make a commitment to a particular kind of engaged existence.

May (1983) distinguishes between three modes of existence or “being in the world.” One mode is engagement with the surroundings reminiscent of the mutuality between the animal and environment that is central to ecological psychology (J. Gibson, 1979). This is the domain in which natural law applies (e.g., Kugler & Turvey, 1987; Shaw et al., 1982) and is accepted as valid in existentialism (May, 1993; Solomon, 2004a). Like ecological psychology, existential psychology considers an individual’s relationship with the surroundings to be fundamental ontologically. Reductionistic inquiry that separates subject from object is considered to be marginal at best. Empirical inquiry must have ecological validity to yield an understanding of human cognition and behavior that is existentially authentic and trustworthy. The predominance of natural law in this mode of existence might suggest to some that it has a lower status relative to modes that more directly address the social and cultural concerns of human beings. It is important to note, however, that the modes of existence are simultaneous and constitute an existential gestalt. Even the virtues are enhanced by one’s engagement with the physical environment, most notably through the development of coordination, control, and skill and the attendant pursuit of mastery (cf., Aristotle, trans. 1925). Thus, in this mode of existence, there is an interesting connection between the contributions of ecological psychology and related approaches to human movement science (see e.g., Bernstein, Latash, & Turvey, 1996; Hancock, Flach, Caird, & Vicente, 1995; Sternad, 2008) and positive psychology’s homage to nicomachean ethics (Peterson & Seligman, 2004).

A second and simultaneous mode of existence is in relationships with other individuals. Here too, the whole is greater (and different) from the sum of the parts but not in the sense that one surrenders one’s identity to a collective (cf., Lewin, 1951). The sense of choice and responsibility that is the hallmark of existentialism requires that this social field is a ubiquitous context with respect to which one experiences the world and comes to understand the potential impact of one’s personal agency. To date, there has been relatively little work in ecological psychology on interpersonal engagements but such modes of existence fit comfortably with ecological notions of information-based coupling with the surroundings (e.g., J. Gibson, 1979; Riccio, 1993b; Stoffregen & Bardi, 2001; Stoffregen & Riccio, 1988; Turvey et al., 1981). Neisser (1996) summarizes some of the early research into the implications of ecological psychology for

interpersonal interactions. More generally, this mode of existence is addressed with great depth and breadth in the theories related to social learning that we suggest for the scientific infrastructure of OBTE (e.g., situated learning theory, self-efficacy theory, and self-determination theory).

The third simultaneous mode of existence presumably is uniquely human in the sense that it refers to one's ability to transcend one's own experience, to reflect on it, and to find meaning in it. It is the mode in which, through engagement with the reality, individuals observe manifestations of values and exemplify values in one's own behavior. It also is the mode in which individuals appreciate the causal potency of the past, of the consequences of one's own actions and the actions of others; and it is the mode in which one comes to appreciate the cascading implications of one's own actions which inform choices and illuminate one's responsibility. It is the mode of existence that ostensibly is the *raison d'être* for positive psychology. The difference is that existential psychology has utilized a large and diverse body of work outside the sciences that, in essence, provides a natural history of existentially significant engagements of human beings with their surroundings and situations (see Solomon, 2004a). While it philosophically is not limited to engagements that seem negative, it has such a focus because of the significance it gives to one's capability to reflect on one's own mortality and morbidity as well as that of others. In practice, it has the opposite problem of positive psychology. It seems that there would be mutual benefit to a dialog between positive psychology and existential psychology in which, for example, there is collaborative inquiry into the effects of existentially challenging events on the development of virtues (cf., Greenberg, Koole, & Pyszczynski, 2004; Hoffman, et al., 2009; Lopez & Snyder, 2009) and the behavioral manifestations of virtues in communities of practice (cf., Riccio et al., 2004).

The application of existential psychology to education can benefit from lessons learned in its application to clinical practice. In particular, existential therapy is not a set of techniques. It is a framework for understanding human existence. Techniques logically follow this approach to understanding; understanding does not follow merely from the application of techniques that define how to do existential therapy. Thus, an existential approach allows for variability in the techniques of therapy but the choice and disciplined use of a technique must make sense for the situation at hand, it must find meaning in the engagement with the concrete reality of the moment. Any exploration of the meaning of some historical or future occurrence must be grounded in the concrete reality of the present, not the other way around. One cannot find meaning in the present by attempting to ground it by remembering (i.e., a process as opposed to an occurrence) or by imagining (i.e., mentally constructing or knowing "about" some hypothetical future occurrence). Details matter, and one can engage with the details of reality only in the present. The present always influences one's relentless march into the future whether one chooses to engage or not; one's choices in the present are what one carries into the future.

A technique for interaction between a therapist and a patient is appropriate to the extent that it helps ground one's modes of existence in the reality of the present without unnaturally limiting one's experience to the present. If it doesn't, if it looks for meaning in the wrong places, it is inappropriate and potentially counterproductive. The same principle applies to the instructor-student interactions that are central to the principles and practices of OBTE. It is important to note again that this is not simply an argument for experiential learning as commonly conceived. A patient or a student is affected by experience *of* the situation more than merely by the amount of time in the situation. In fact, these are existentially inseparable. Nevertheless they can be separated pedagogically in a misguided implementation and misinterpretation of experiential learning. One of the reasons that OBTE focuses on the instructor as mentor, advisor, and facilitator is that students (as with patients) can benefit from inter-subjective guidance in

collaborative engagements with the reality of the present. In existential psychology, this requires that instructors become participants in the student's reality. While this creates all sorts of tricky problems for therapists and their patients, it is much less problematic in an instructional setting.

The link between existential therapy and education is striking in the following passage by Rollo May: "The therapist is what Socrates named the 'midwife'—completely real in 'being there,' but being there with the specific purpose of helping the other person to bring forth something from within himself" (May, 1983, p. 161). Existential psychology thus requires authentic participation of the instructor, not as a character in a scripted play nor, worse, as a narrator. Collaborative reflection with the student avoids the hollowness of a subject-object distinction and a subjective-objective dichotomy when there is true engagement of the instructor. The content of collaborative reflection is not, however, a reliable indicator of collaborative engagement. Mere descriptions of the principles and concepts of existentialism are so resonant, for example, especially in an existentially poignant context such as Army training and education, that one can delude oneself about the authenticity of one's engagement (May, 1983). The interpersonal mode of existence implies that all participants in a relationship are changed by the relationship. Awareness of this proposition will help instructors notice an otherwise subtle drift into detachment.

To the extent that the student is aware that the instructor is a participant in the struggle, they will be less inclined to assume that they must find meaning in their engagements though a process of introjection in which they merely take on the values of the instructor. Existential commitment requires that one choose how to engage with the world and find meaning in one's actions, to take responsibility for one's choices (May, 1983; Solomon, 2004a). Instructors can exemplify values-based behavior but it is for the student to be moved and to choose to internalize such values or to come to understand how to translate shared values into action. This need not and should not be the result of an almost paralyzing analysis or protracted deliberation. It can have the immediacy of direct perception if presented in a salient context or in a significant emotional event. It can be attended by a sense of engaged vitality rather than the hangover of an event with high mental workload (cf., Ryan & Deci, 2008; see also, Chapter 11).

The directness of the connections between one's choices, one's actions, and shared values is enabled by one's understanding of one's place in a community of practice within which meaning, in a sense, is negotiated (Wenger, 1998). Such negotiation should not be viewed as a compromise among different perceptions of a shared reality and certainly not as accommodation of an indiscriminant cultural relativity. Instead, it is more akin to a crystallization of different perspectives; complementary perspectives that help one negotiate the boundaries between the known and unknown and that provide principled reasons to momentarily and partially cede power to someone or something else (see section 3.2.1). Without such negotiation and the responsibility that this implies, one's choices simply connote marginality and, even without ceding power, one's powerlessness. This subtle yet profound realization is the core of the Army's established practice of task organization.

4.4 Building on the Scientific Infrastructure for OBTE

4.4.1 Triadic Frameworks

Table 2 summarizes the relationship between the various lines of scholarship in the scientific infrastructure for OBTE in terms of the triadic causal framework of OBTE (e.g., the intangibles of confidence, initiative, and accountability). The correspondence among these triadic frameworks is more like a projective transformation than a one-to-one mapping (cf., Wyszecki & Stiles, 1982). The relationships thus are a useful guide to the ways in which the lines of

scholarship complement one another as opposed to an attempt to reduce them to a lowest common denominator. It also should be noted that there is not a one-to-one relationship between the triadic causal framework of OBTE and the three pillars of the scientific infrastructure for OBTE. In fact, they are categories that are different in kind. The triadic causal framework is about personal epistemology while the three pillars are about scientific epistemology. This is why a table is used to describe the relationship.

Table 2: Triadic relationships among pillars of a scientific foundation for OBTE

OBTE Intangibles	Confidence	Initiative	Accountability
Positive Psychology	Pleasantness	Engagement	Meaning
Self Determination Theory	Competence	Autonomy	Relatedness
Self-Efficacy Theory	Person	Behavior	Environment
Situated Learning Theory	Identity	Participation	Community
Ecological Psychology	Nested Self	Perception-Action	Affordances
Existential Psychology	Existence	Choice	Responsibility

One might ask why we describe three pillars to the scientific foundation for OBTE instead of six or more. The reason is that we believe there are only three fundamentally independent components to the object of an integrated scientific inquiry with relevance to OBTE. They correspond roughly to the three simultaneous modes of existence (ontological categories) in existential psychology: (a) reciprocal relationships with the surroundings dominated by natural law, (b) reciprocal interpersonal relationships that are directly perceivable, (c) and transcendent meaning. In principle, an experimental existential psychology ultimately could address all the scientific pillars of OBTE. In practice, we must rely on the historical body of theory and observations from existing lines of the scholarship that collectively have addressed the three basic ontological categories and that heretofore have not been integrated.

As “pillars,” we chose lines of scholarship with the most extensive bodies of theoretical and empirical evidence that are relevant to the claims of OBTE. Much more important than the converging evidence that this provides for the claims of OBTE, however, is the guidance it provides for the further development of OBTE and an integrated approach to leadership, education, training, and service (see Epilogue). The scientific infrastructure for OBTE suggests concrete topics of conversation about the integration of leadership, education, training, and service. It provides guidance on what should be observed and what can be observed in rigorous ways and that have actionable implications that are both valid and verifiable. In this respect, it is noteworthy that the three pillars also relate to the triad of situated behavior, situated experience, and situated meaning (epistemological categories that are inseparable ontologically), although again, not in one-to-one mapping. These categories help us identify how to observe or measure engagements that matter in learning and development.

Positive psychology focuses on self-reports but with an interest in the deep meaning of an individual’s circumstances or state of mind. It does not address cause-effect relationships with a depth and breadth sufficient to craft effective settings for training and education. In this respect, self-determination theory and self-efficacy theory complement positive psychology and they also complement each other. Self-efficacy theory has more to say about the broad range of environmental characteristics that are conducive to learning and development, especially the collaborative learning and development that is central to OBTE. Self-determination theory provides more of an appreciation of intervening variables, the proximate motivational influences on learning and development, and their potential link to values (see e.g., Lopez & Snyder, 2009). Self-efficacy theory, self-determination theory, and positive psychology together can help in

coming to a better understanding of best practices in training and education that foster development of the intangibles, their employment as sources of motivation, and achievement of the nested outcomes that they enable (see section 3.2).

Self-determination theory and self-efficacy theory also focus on experience that can be described in self-reports. Fundamental to our multifaceted approach to inquiry into OBTE is the proposition that scientific methods must balance experience and behavior. Experience underscores the meaning of situated behavior, that is, engagements with the environment. Situated behavior grounds the description of experience in reality. Reliable observation of behavior is important for a scientific appraisal of the credibility and trustworthiness of self-reports but it also is valuable for collaborative reflection and inter-subjective engagements with the environment. Self-determination theory and self-efficacy theory thus are balanced by behavioral observations conducted with an ecological sensibility, that is, with an eye toward reciprocal influence in an individual's engagement with the physical and social environment. Behavioral observations can come to play a similarly important role in positive psychology because, existentially, values or virtues have meaning only to the extent that they translate into action (cf., Riccio, et al., 2004). Methodologically, the whole is greater than the sum of the parts if there is a coherent theoretical framework to guide the selection, employment, and interpretation of observations and measurements.

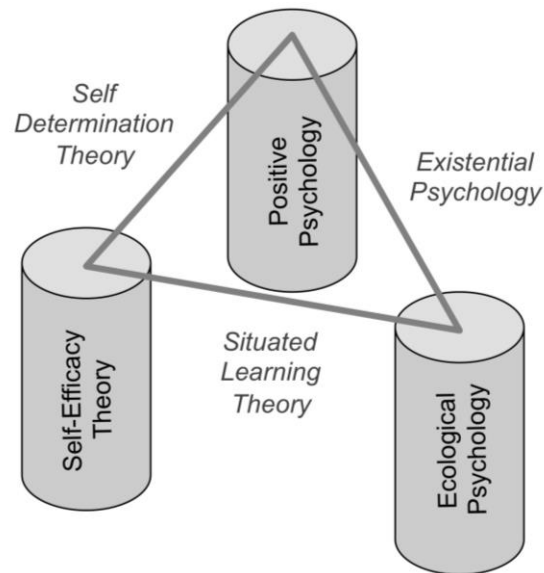


Figure 9. Three pillars of a strong theoretical and empirical foundation for continuing development of outcomes-based training and education. Links in the superstructure (triangle) represent other important lines of research that can help make connections among the pillars that heretofore have evolved independently of each other.

4.4.2 Further Development

Our initial identification of scientific foundations for OBTE in this chapter has focused on observable interactions with the physical and social surroundings and on the meaning they have for an individual. The three pillars and connecting lines of research begin to establish a balance among the lines of scholarship that address behavior and those that address conscious experience. To come to a better understanding of micro-experiences that are so important in OBTE, we need to delve more deeply into conscious experience, and we need to do so in a way that is grounded in behavior and interactions with the surroundings. We need to push forward into lines of scholarship that address the details of emotion, thinking, and decision-making. More specifically, we need to reveal scientific underpinnings for the interplay of passion and reason (see Chapter 3, section 3.2). Relevant lines of scholarship are discussed in Chapter 5.

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