The Role of Context in Learning and Instructional Design

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Context is a pervasive and potent force in any learning event. Yet instructional design models contain little guidance about how to accommodate contextual elements to improve learning and transfer. This paper defines context, outlines its levels and types, specifies some pertinent contextual factors within these types, suggests methods for conducting a contextual analysis and utilizing its results for instructional design, and outlines future issues for context-based instructional design. The incorporation of a contextual approach to instruction will make our design models systemic as well as systematic.

☐ This paper examines the role of context in learning and proposes a way of addressing context in the instructional design process. Essentially, we will describe a new design phase we are calling contextual analysis. Our premise is that context has a complex and powerful influence upon successful performance-based learning, and yet is largely ignored (or at the least deemphasized) in most current instructional design models. We posit that this situation is one of the main reasons that design models tend to be more systematic than systemic and that the effects of many instructional interventions are not maintained over time. Our views have been formed not only as a result of our own research and development activities (Richey, 1992; Richey & Tessmer, 1995; Tessmer, 1990), but also from an examination of research and theory from a variety of fields.

The recognition of the influence of context is, of course, not new, even though current thinking tends to have rediscovered its impact (Anderson, Reder, & Simon, 1997; Richey, 1995a; 1995b). However, the general orientation to context over the years has changed. Historically, designers and behavioral scientists adopted a *minimalist* view in which it was assumed that context played a minimal role in facilitating the attainment of instructional goals. This view was especially dominant in the late 1960s and early 1970s (Stokols, 1990). During this period the fundamental structure of our instructional design models was established and most models were based upon the fundamental premise that designed interventions are environmentally neutral and are applicable to all settings.

There are other views of the role of context, however. Some have embraced an *instrumentalist* position in which context is seen as an instrument for promoting the achievement of cognitive or behavioral goals. Thus, learning environments or microworlds can be designed to facilitate the acquisition of problem solving or self-regulation skills. Stokols (1990) suggests a third orientation in which learning environments can be designed more from a *spiritualist* than instrumentalist view. In these cases the environment becomes an end in itself. Classrooms are conceived as resources that guide exploration; microworlds are designed to facilitate intellectual play. Such diverse contextual orientations for instructional design continue given the current, and sometimes conflicting, influence of notions such as situated learning, constructivism, performance technology, and the quality movement.

Many designers intuitively support beliefs about the instrumentalist or spiritualist roles that context plays in learning, motivation, and transfer. In many respects our proposal for a contextual analysis design phase can be viewed as support for these intuitive notions. However, in spite of the informal recognition of contextual forces there is little formal consideration of it in design procedural models. Surveys of instructional design (ID) models (Andrews & Goodson, 1980; Edmonds, Branch, & Muhkerjee, 1994) have indicated that no ID models have a specific task or stage for contextual analysis or planning. Yet as Jonassen notes, "context is everything" to instructional design (1992).

Typically, variations in instructional strategies have been primarily dependent upon the nature of the learning task (Gagné, 1985; Leshin, Pollack, & Reigeluth, 1992), and to a lesser extent, upon the nature of the learner (Keller, 1987). Context is a largely unrecognized influence, although Smith and Ragan (1993) outline some learning environment considerations, and the new Dick and Carey model (1996) considers some performance context elements. These contextual additions are in part based upon Richey's (1992) identification of critical preinstructional and postinstructional contextual factors that influence training transfer and attitude change, as well as Tessmer's (1990) and Tessmer and Harris's (1992) models for analyzing instructional context factors.

Nonetheless, the need for a comprehensive explication of contextual analysis prompted us to develop a more complete theoretical model that provides direction for this design phase. This model includes:

- a comprehensive definition of context;
- the historical role of context in ID;
- contextual levels and factors that should be considered in ID;
- a design process for utilizing contextual analysis information; and
- contextual analysis data-gathering tools.

The theoretical paradigm encompasses the entire contextual range—prelearning, learning, and performance contexts. It is also composed of two more specific models, a conceptual model and a procedural one. This comprehensive model should help readers conceptualize contest, conduct a contextual analysis, utilize its information for instructional design, and identify future context research and development directions (Table 1). This comprehensive model does not specifically cover context-based instructional strategies such as situated learning, problem-based learning, or cognitive apprenticeships (e.g., Wilson, 1996). It does indicate how designers can engineer contextual elements to facilitate learning and performance, in conjunction with the instructional strategy employed.

Table 1 ☐ A Comprehensive Theoretical Model of Context for Instructional Design

Conceptual Model			*Analysis Model*		*Examples & Issues*	
Context Definition	Role of Context	Levels & Factors	Processes & Principles	Datagathering Tools	Case Study Example	Concerns & Directions

A DEFINITION OF CONTEXT

What is context? *Webster*'s dictionary defines it as "the whole situation, background or environment relevant to a particular event (1972, p. 307). Phrases like "the whole situation" indicate that context is a complex set of factors. People often speak of objects or events being *in* a context, such as learners being in a social context or teachers in a political context. In this sense context is an element that surrounds it members as a continuous presence. This is what Gordon, DeStefano, and Shipman (1985) refer to as the "environmental press." Context is complex, multifarious, and enveloping.

A given context may have different *aspects*, such as a social or a political aspect. An aspect is determined by the particular situational factors that are studied and the way these elements are interpreted. For example, sociologists who study classroom communications to identify interaction patterns are studying a social context; anthropologists may study the tools, language and mores of this same classroom to establish a cultural context, while symbolists study the meanings attached to environmental objects to describe a context with social, cultural, and political elements (Stokols, 1990).

In this article we examine the elements of the learning system context, those situational elements that affect both the acquisition and application of newly acquired knowledge, skills, or attitudes. To do this we will identify factors of the social, physical, and political aspects of a situation that impact learning and performance.

A contextual *factor* may have different types of contextual impacts that differentially mirror the types of contexts that exist in a situation. Seating arrangements, for example, have both social and political impacts, as well as physical effects (Tessmer & Harris, 1992). A knowledge exploration strategy has the political context implications of student empowerment and teacher role change as well as cognitive ones of self-regulated learning activities. In summary, a specific context or event actually is comprised of a number of contextual factors that can be studied from different contextual aspects, each aspect describing that factor's influence from a particular point of view.

Context is composed of *levels* as well as factors. These levels are defined by both spatial and temporal qualities. Tessmer and Harris (1992) distinguish between the immediate learning environment (the classroom or workplace) and its surrounding support environment (the larger institution or organization). Brown and Duguid (1994) refer to the border and periphery aspects of a context, as distinguished from its center. Richey and Tessmer (1995) distinguish three temporal levels of context: the pretraining, training and posttraining contexts. These levels each contain a variety of contextual factors, such as the political and physical factors of the support environment level (Tessmer & Harris, 1992).

Context is then *a multilevel body of factors in which learning and performance are embedded.* Referring to context as a body of factors assumes a more organismic than mechanistic conception of context. Context is not the additive influence of discrete entities but rather the simultaneous interaction of a number of mutually influential factors. These factors' physical, social, and instructional aspects interplay to influence learning. Similarly, the multi-level nature of context means that different spatial and temporal levels of contexts need to be considered, such as the immediate and surrounding contexts.

Following a gardening metaphor suggested by Schneider (1978) and Peters, O'Connor, and Eulberg (1985), learners with their individual differences and abilities are seeds; instructors and designers are the gardeners who help the seeds grow; and context is the soil in which the seed is embedded. Successful gardeners consider both seeds and soil in their gardening.

Context has often been construed as a set of constraints upon an individual (Tessmer, 1990). For example, behavioral research has predominantly focused upon inhibiting contextual factors such as lack of information, support, or supplies (Peters et al., 1985). From this obstructionist perspective, contextual factors such as time, money and resources are obstacles that must be neutralized or minimized. However, a more complete view of context

also incorporates the contextual factors that facilitate learning, motivation and performance (Peters, O'Connor, & Rudolf, 1980). This creates what Noe (1986) calls *environmental favorability*, a condition where context facilitates learning enterprises. Context contains resources to be exploited, not only obstacles to be overcome; context may facilitate or inhibit human enterprises.

THE ROLE OF CONTEXT IN INSTRUCTIONAL DESIGN

Assumptions of the Role of Context in Instructional Design

Given the different orientations to contexts (minimalist, instrumentalist, spiritualist), it seems apparent that there are a variety of underlying assumptions framing prevalent positions on context's role. Consequently, it seems appropriate to highlight those that shape our contextual model. They are:

- *We are condemned to context.* We do not learn in a vacuum. Context is an influential and inevitable part of every learning experience. We cannot choose to be separated from or avoid the context in which we operate, all cognition and reasoning is situated (Greeno, 1989). We can choose to ignore context, but are nonetheless influenced by it. People adapt to unfavorable contextual elements, but this adaptation often comes at the cost of reduced effort, attention, self-control or participation (Bonnes & Secchiaroli, 1995; Smith & Kearney, 1994).
- *Context is a medley of factors that inhibit or facilitate to varying degrees.* At worst, contextual factors inhibit learning or performance, such as a crowded room inhibits concentration, or peer criticism inhibits transfer. Conversely, seating arrangements can facilitate cooperative learning, and supervisor support can facilitate trainee transfer. Adequate levels of a contextual factor may be the background for learning and performance, and neither inhibit nor facilitate to any great degree. For example, adequate acoustic and temperature conditions allow for learning and instruction but do not markedly improve it.
- *There may be multiple contexts for a given learning or performance.* Complex analyses of a given context emphasize multiple types of context, as well as interacting factors and levels. As such, a learning event may take place in multiple contexts (lab, field, classroom) and may be applied in multiple settings (workplace, classroom, home). All these contexts impact the nature of learning and performance.
- *Instructional designers are responsible for the successful application as well as acquisition of learning, and therefore must respond to orienting and performance contexts as well as instructional contexts.* Successful learning is correctly applied in its intended environment, such as math skills applied in shopping or banking situations. Consequently, expert designers will discover and address those factors that impact both preparation for and acquisition of content, as well as its long-term retention and employment.
- *Instructional designs can accommodate context, but cannot control it.* "Accommodation" connotes a mutually adjusted fit between instruction and context. Designers may sometimes adjust contextual factors to facilitate instructional needs but other times may adjust instruction to fit the context. Effective designers have the obligation to carry out both types of accommodation through a wide variety of macro- and micro-design interventions (e.g., altering learning schedules, increasing learner support).
- *The impact of context varies with the nature of the learner, the content, and the intensity of the contextual elements.* While contextual influences are ubiquitous and powerful, each influence's nature and extent varies with the elements of the instructional setting. For example, highly motivated learners are less susceptible to influences of physical comfort conditions, but learners engaged in problem-solving tasks are more susceptible to noise (Tessmer & Harris, 1992). Likewise organizational climate effects will vary with the nature of learning content (Richey, 1992).
- *Successful instructional designs must be, to some extent, situation-specific.* Effective

instruction is context-rich. It addresses critical elements of a given situation by using strategies that accommodate both the micro- and macro-contexts of learners. Such strategies account for learners' immediate and learning or work environments and their supportive organizational structures, as well as future environments that learners will likely encounter. This instruction adjusts to context by deliberate design, rather than by evolving from unanticipated learner-controlled activities.

- *Systemic orientations to instructional design are, on the whole, more effective than systematic orientations.* By definition, a systemic approach to instructional design must address a broad range of contextual elements. It considers contextual elements that inevitably affect learning and performance. Such systemic procedures are compatible with traditional systematic design procedures, and in most cases involve expanding these traditional methods.

The Theoretical Rationale for the Role of Context in Instructional Design

The preceding assumptions of context's impact on the teaching-learning process are logical extensions of the theories that provide a substantial foundation for the instructional design knowledge base. This common theoretical core includes general systems, communications, and psychological theory, all of which suggest the importance of context in teaching and learning environments. A brief summary of this research-based support follows.

General Systems Theory. Systems, whether natural or contrived, consist of related objects existing within an environment. Open systems interact with and adjust to their external environments. The system's environment serves a variety of functions. It serves as a source of system inputs, and in this way greatly influences the quality of the system's operation. The environment can set up the constraints under which the system operates. Finally, the products of the system typically move out of the system back into the environment (Hall & Fagen, 1975; Miller, 1978). The environment, then, is integrally involved in and a part of the system.

Systems theory applications have been made in many disciplines, and all involve processes of identifying and analyzing the many elements that interact to achieve a particular purpose. Instructional Systems Design (ISD) models are themselves applications of general systems principles. Predesign analysis phases, the creation of products and programs that function as elements of total system, the extensive use of feedback—all are examples of systems processes. Current design theory continues to provide even further application, as evidenced by performance technology and quality approaches to instructional design. In both orientations the instruction is designed to address organizational improvement goals in addition to changes in individual learners. Moreover, the concerns with "systemic" approaches to school reform recognize the futility of addressing only one part of integrated systems. In effect, systems theory emphasizes the role of a broad scope of contextual elements. ISD models have provided some direction for addressing these many elements in an organized fashion.

Communications Theory. Further support for the role of contextual elements in the design process is provided by traditional communications theory which explains the process of message formation, transmission, and reception. Olson (1985) reminds us of the importance of environment in his model of message comprehension which views the speaker's intended meaning, the message, and the receiver's understanding as occurring in and influenced by a given context. Context shapes the intended meaning of a message via the nature of the speaker's background and understanding of the world, but also through the speaker's perception and interpretation of the current context. On the other hand, reception is likewise influenced by one's background and understanding of the contextual elements. These factors influence written and oral communication, but instructional design has also been historically influenced by visual communication as well. In this respect cultural and social contexts play an even more commanding role.

Psychological Theory. Context-specific solutions to teaching-learning problems (as in situated learning or constructivist environments) indicate that cognition is defined and shaped by its relation to a given context. In other words, we not only learn in context, but by context (Kaplan & Kaplan, 1982; Snow, 1994). While this interpretation of learning is currently prominent, other contextual elements have long been recognized for their part in the teaching-learning process. Behaviorist explanations of learning highlighted the force of external events. In the behaviorist orientation events primarily trigger reinforcing situations (Streibel, 1991); they are seldom causes of behavior.

In cognitive explanations of learning, context influences a learner's abilities to recall prior learning and to demonstrate those cognitive strategies appropriate for a given learning task. The ability to recall prior learning is a function, in part, of whether the material to be recalled was originally presented within a meaningful contextual framework. One role of context is exemplified by Gagné and Merrill (1990) in their discussion of the enterprise and enterprise schema. An enterprise is a complex instructional goal that combines several objectives. It is represented in one's memory by a schema that relates these larger goals (typically presented as a realistic application task) to their prerequisite skills and knowledge. The schema is a mental model that serves as the basis for both retention and retrieval, as well as transfer. This contextual anchoring of past instruction in a variety of novel problem-solving tasks cannot only enhance meaning, but can also develop cognitive strategies used in problem solving and transfer of training. However, from a cognitive vantage point, many feel that the use of multiple examples of context in both the initial presentation of content and for learner practice activities tends to facilitate transfer more than when one emphasizes the dimension of only one environment.

Currently, constructivist orientations to teaching-learning processes are gaining widespread support. Here contextual factors play an even more dominant role than in behavioral or cognitive interpretations. Learners, as key elements of the context, construct their perspectives of knowledge based upon their unique experiential backgrounds and schema. Moreover, learners are active and constantly restructuring their views of the surrounding environments.

There is broad theoretical support for emphasizing contextual factors in instructional design. Contextualizing instruction makes abstract concepts more concrete, promotes understanding and retention, as well as facilitates reinforcement and transfer of training. Context variables are addressed in widely divergent theories, including those pertaining to organizational development, adult learning, and school-based instruction.

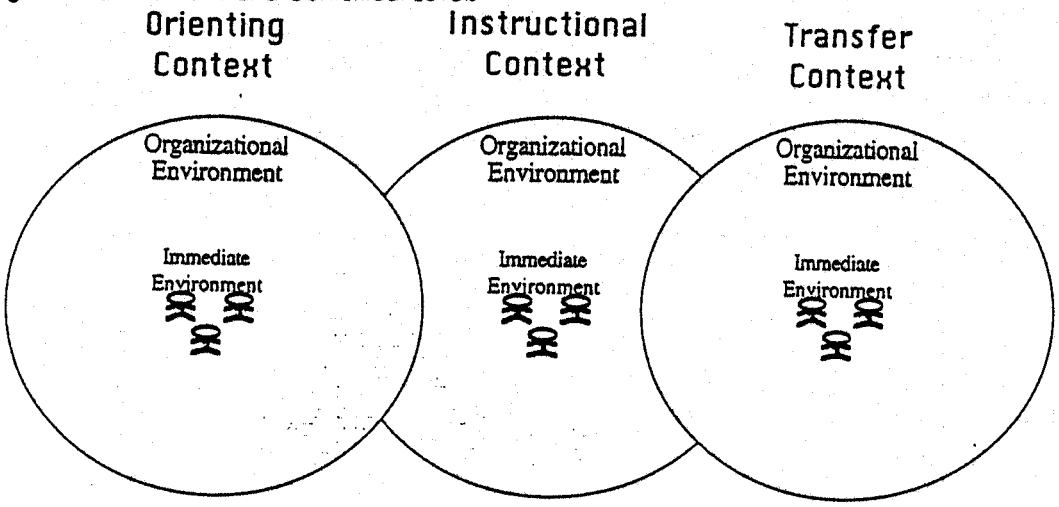
The Dimensions of Context in Instructional Design: A General Model

We propose a three-part view of context as it influences learning and performance—the orienting context, the instructional context, and the transfer context. This general model of the learning system context is presented in Figure 1. These contexts are temporally distinguished from each other as contexts that occur before, during, and after learning. Each of these contexts also has at least three organizational subcontexts within it: the learner, immediate, and organizational environment.

Three contextual types. The *orienting context* precedes the learning event and contains factors that influence the prospective student's motivation and cognitive preparation to learn. For example, a teacher or supervisor's comments about an upcoming class can determine the level of motivation a student brings to it even though it may occur days or weeks before the instruction. It also affects students' transfer of learning in the postinstructional context.

The orienting context precedes the motivation and recall of prior knowledge activities that occur in the instructional context, which are a preparation-for-learning event of instruction (cf. Gagné, Briggs, & Wager, 1993). Thus, instructional activities such as advance organizers or epitomes are part of the learning, not orienting context. On the other hand, learner goal setting is an activity that affects learning in the instructional context but often precedes it. While the temporal "borders" of the orient-

Figure 1 ☐ Contexts and Contextual Levels



ing context are often difficult to determine, it is comprised of those factors that directly influence the specific instruction in question. The orienting context factors in part determine the cognitive and affective "set" the learner brings to the instructional context.

In the past the *instructional context* has merited the most consideration from instructional designers, trainers, and educators (cf. Knirk, 1979; Tessmer & Harris, 1992). This context comprises the factors and environments that are directly involved in the delivery of instruction, the immediate physical, social and symbolic resources outside the person (Perkins, 1992).

The instructional context borders are clearer than those of the orienting context since they are often determined by the initiation and termination of a specific learning event such as a particular program, workshop, or multimedia lesson. The instructional context usually relates to a discrete time period—a day for a workshop, a semester for a course, an hour for a lesson. The borders are determined by the beginning and end of a series of instructional activities for a given topic. It may include learner preparation activities completed days before for a particular class as well as extended practice activities a week after a workshop.

The *transfer context* refers to the environment in which the learning will be applied. It is the "payoff" context, since it is often the application environment for which learning is ultimately justified. For example, a manager's department is the transfer context for her newly acquired conflict resolution skills. A fifth grader's science class may be the transfer context for the self-regulation skills he learned a month ago in a math class. Both transfer contexts are "workplace" contexts for their respective students.

In some cases the distinction between the instructional and transfer contexts may be blurred. In on-the-job training these two contexts may be physically identical, although the transfer context can be distinguished chronologically as the point after instruction has been completed and application is expected. Like the orienting context, the transfer border may be difficult to identify. For our purposes, it is the immediate situation(s) in which the target learning is to be applied.

Three contextual levels. There are levels embedded within each of these three temporal contexts. At the center of each is the *learner.* Learners are often regarded as a context in themselves; here contextual factors and learner characteristics are merged. In turn, learners are surrounded by one or more *immediate environments.* This context can be identified as a physical place or event—an office department, a workshop, a traffic intersection—although attitude and climate factors are also relevant. Finally, the broadest level is that of the *organi-*