Introduction

The central thrust of this thesis is the presentation of a new strategy for educational intervention. The approach to the design of the educational intervention I describe here resembles that of architecture, not only in the diversity of the sources of knowledge it uses but in another aspect as well – the practice of letting the design emerge from an interaction with the client. The outcome is determined by the interplay between the understanding and goals of the client, the expertise, experience, and aesthetics of the architect, and the environmental and situational constraints of the design space. Unlike architecture where the outcome is complete with the artifact, the design of educational interventions is strengthened when it is applied iteratively. The basis for action and outcome is through the construction of understanding by the participants. I call this process *Emergent Design*.

It is not for me to judge whether there are circumstances in which it is appropriate for an architect to design a building in the isolation of an office without interaction with the people who will use it and be affected by it. It is not even necessary for me in order to make my point here to argue that there are no circumstances in which it might be appropriate for a new educational system to be designed by specialists in their offices and laboratories. My point is that there is another way. And the way to make such a point is by providing what mathematicians would call an existence proof: by showing one example.

The intellectual roots of this thesis are in two soils: one that is traditional for educators and one that ought to be. The less traditional area, the design and implementation of technologically-enabled organizational change, has not played a significant role in guiding educational thinking. The more traditional area, design by specialists in educational theory, has played a significant role in thinking about educational change, but is used here in an unusual way, that of being subordinated to the guidance of emergent forms.

The traditional soil is the set of theories about learning. In this respect my proclivity is for the role of activity emphasized by Jean Piaget, the role of dialog emphasized by Lev Vygotksy, the role of intentionality and social consciousness emphasized by Paulo Freire, the role of context emphasized by Jean Lave, and the role of construction emphasized by Seymour Papert. My own work is presented as a “theory in action” through which these sources are seen not as rival theories but as complementary themes.

The feature that might strike a reader most forcefully is that I cross many of the lines of theoretical division. There is a narrow would-be rigorously "scientific" approach that sees Piaget and Vygostky, for example, as defenders of rival theories. In this perspective endless debate can be generated about who is "right." From the point of view of a designer, the appropriate questions are more pragmatic: how can their ideas be used? From the point of view of Emergent Design the possibility of both of these approaches being useful is particularly large: an emergent process may well veer more in a Piagetian

or more in a Vygostkian direction. These great thinkers take on the role of beacons that guide navigation in many directions rather than single destinations.

This does not mean that my approach is eclectic. It is far from meaning "anything goes." Emergent Design does have direction. It requires discipline. However, its holistic and pragmatic nature allows it to find a place for a variety of insights without having to decide which is "fundamentally right."

To make the point let us look more closely three views of the mind: Piaget's structuralism, Vygotsky's functionalism, and Freire's activism. Given any manifestation of intelligence, the three look at different aspects: Piaget at the "deep structures" that underlie it and make it possible; Vygotsky at the process of the thinking; and Freire at the larger social view that gives it meaning.

Piaget was among the first to demonstrate that learning was not simply a matter of layering new information onto a blank slate. Rather, Piaget believed that people construct new knowledge as a function of their unique experience and ways of knowing. In the context of this work, the Piagetian influence entails delving down into what people know in order to facilitate connection to and construction of new knowledge.

Vygotsky emphasized the role of language and social collaboration in the construction of knowledge. In the context of this work, this appears in the design of the learning environments, the interactions, the tools, and the activities. Rather than working in

traditional schools, a large portion of the work described in this thesis took place in rural technology centers. This liberated us to work in different ways. For example, children were not grouped by age but rather we worked with everyone, children and adults alike, who chose to participate. We used technology in a constructionist, expressive manner. People with expertise in and passion for various knowledge domains worked closely on projects with the local participants and through their discourse and interactions each developed new relationships with each other and with the fields of study.

Freire emphasized the role of critical engagement with one's world. He disparaged the "banking view" of knowledge where learners are made to store facts away for possible later use as though it were money in a bank [Freire, 1972]. Rather, he advocated engagement with the issues of primary importance to the learners, determined by group discussion. Addressing these issues became the basis not merely for study but also for action. In this way people could learn about these issues, their causes, and their potential remedies. More importantly, this critical engagement could bring about a change of agency among the participants, where they develop into knowing and capable actors on their environment. Development along the lines of agency, critical questioning, collaboration, and the integration of knowing and learning into interaction with one's environment take precedence over the banking of facts.

This work employs the above and other influences in the emergent design and implementation of new learning environments. We use Piaget to dig for the *roots* of knowledge. We use Vygotsky and Freire to create *shoots* of meaningful projects in the

domains of interest to the participants. The *fruits* appear as the knowledge gained and the agency changed.

In this thesis I have adopted a certain style of writing which is closer to a narrative than to the style followed by many writers in the field of education theory, which consists of formulating a theoretical statement and then providing evidence to verify it. My choice is not simply a literary preference. In fact the style itself is an assertion of one aspect of the underlying theory. I believe (and others such as David Tyack and Larry Cuban have shown) that effective educational reform cannot come about though the incremental application, one by one, of principles each of which can be verified by experiments in which the relevant factor is changed while everything else is kept constant [Tyack and Cuban, 1995].

The work of an educational innovator is more like that of the designer of a complex entity, for example an architect designing a building who draws on knowledge of different kinds ranging from quantitatively precise principles of structural engineering to holistic considerations of quality of life, impact on community and visual integrity. The advantage of one architect over another cannot be reduced to a verifiable proposition in any of these specific kinds of knowledge. Although the architect needs to draw correctly on all of them his skill lies in being able to put them together. The work described in this thesis also draws on many different areas of relevant knowledge and in return offers some contribution to several of them. But what is most unique about it is a style of design.

Since what I want to exemplify is a process of design through interactions, telling the story of that process seems to me to be the proper style of exposition. The point is strengthened by giving it a name and I have chosen the label *Emergent Design*. It is also strengthened by relating it to other similar processes. Architecture could have been a choice. But I have preferred another field in which I have worked myself and which has particularly close analogies with education. This is the field of restructuring organizations and in particular the restructuring of business organizations precipitated by the opportunities offered by the advent of digital technology. The example I shall use is a reorganization of a health service for which I was given responsibility. I will devote the second chapter of this thesis to describing my experience and providing pointers to considerable body of literature on the remarkable evolution in the past few decades of thinking about management of businesses and other organizations and specifically about the management of change in organizations. Some readers, impatient to get to the "educational meat," might see the chapter as a digression. They are invited to skip it; the later chapters will still be readable. However I see the chapter as an assertion of a principle: the general study of design for change, including organizational change, should be as important a part of the education of an educator as the study of such topics as child development and cognitive psychology. My own career has woven between work directed at helping young people learn and work directed at helping organizations change. But even on the most superficial level, the two kinds of activity have never felt to me as different as they might appear from the outside. In education one is constantly up against the organization of schools and in managing organizational change one is constantly up against processes of learning.

Chapter one provides a description of the initial conditions and some activities in an engagement for educational intervention in order to provide a basis for the discussion on design that follows. Chapter two looks closely at the commonality of the activities of organizational and educational change. Chapters three and four go deeply into activities within the intervention. Chapters five and six draw the conclusions from this work.