Spring 2007

Utilizing Environmental Factors and Basic Principles of Pragmaticism to Establish a Theoretical Framework for Integrating Learning Object Based Instruction (LOBI) into K-12 Instructional Practice

Alex Stone

UTILIZING ENVIRONMENTAL FACTORS AND BASIC PRINCIPLES OF PRAGMATICISM TO ESTABLISH A THEORETICAL FRAMEWORK FOR INTEGRATING LEARNING OBJECT BASED INSTRUCTION (LOBI) INTO K-12 INSTRUCTIONAL PRACTICE

by

Alex Stone

Submitted in partial fulfillment of

the requirements for the degree

Doctor of Education

The Instructional Technology Program

School of Education

Duquesne University

March 2007

DUQUESNE UNIVERSITY

SCHOOL OF EDUCATION

Dissertation

Submitted in Partial Fulfillment of the Requirements
For the Degree of Doctor of Education (Ed.D.)
EdDIT Doctoral Program

Presented by:

ALEX STONE
M.S., Bloomsburg University, 1991
B.A., Franklin and Marshall College, 1989

March 1, 2007

UTILIZING ENVIRONMENTAL FACTORS AND BASIC PRINCIPLES OF PRAGMATICISM TO ESTABLISH A THEORETICAL FRAMEWORK FOR INTEGRATING LEARNING OBJECT BASED INSTRUCTION (LOBI) INTO K-12 INSTRUCTIONAL PRACTICE

Approved by:

_____, Chair
Gary D. Shank, Ph.D.
Associate Professor, Department of Foundations and Leadership
Duquesne University

_____, Chair
Peter Miller, Ph.D.
Assistant Professor, Department of Foundations and Leadership
Duquesne University

_____, Chair
Lou Nagy, Ed.D.
Teacher
Seneca Valley School District
Harmony, PA

Abstract

This study is a critical theoretical analysis. Its basic premise is that several seemingly intractable issues exist that interfere with the implementation of learning object based instruction (LOBI) in the K-12 online learning environment. The purpose of this study is to identify these issues, and then critique each one individually in order to initiate a discourse that will ultimately facilitate the implementation of LOBI into K-12 public schools. Twelve issues are identified and then individually critiqued. The overriding philosophical influence that drives this study is pragmaticism as presented by C.S. Peirce and basic principles of that particular philosophy are utilized to present critiques of each of the twelve assumptions that are identified. There is a consistent emphasis upon environmental factors throughout the study. The findings are best described as a contextual contribution to, and/or an initiation of, a critical theoretical discourse that addresses the issues that interfere with the implementation of this form of instructional technology into K-12 public schools.

TABLE OF CONTENTS

LIST OF FIGURES

FIGURE

CHAPTER 1

INTRODUCTION

> When I heard the learn'd astronomer,
> When the proofs, the figures, were ranged in columns before me,
> When I was shown the charts and diagrams, to add, divide, and measure them,
> When I sitting heard the astronomer where he lectured with much applause in the lecture room,
> How soon unaccountable I became sick and tired,
> Till rising and gliding out I wander'd off by myself,
> In the mystical moist night air, and from time to time,
> Look'd up in perfect silence at the stars.
> (Whitman, 1865)

Imagine a vast repository of digital materials that includes an unlimited supply of high quality instructional videos, interactive multimedia exercises, links to web sites, reading exercises, recorded interviews with experts, interactive graphs, charts, and maps - and nearly any other form of digital instruction - all organized in a giant library according to academic standards and specific topics addressed. By typing a simple search string you could instantly access hundreds of pertinent and self-contained instructional sequences that could be used to enhance teaching practices in both the traditional "bricks and mortar" classroom and in the virtual learning environment. Not only could you access

these materials, but you could rest assured that the content retrieved meets some standards for quality and relevance. This vision has been the driving force behind a form of instructional technology called learning objects (LOs) – and it is becoming an increasingly important topic within the field of instructional technology.

Learning Object Visionaries and Object Oriented Programming

Learning objects are not new. The term "learning object" appears in the vernacular of the field of instructional technology sometime around 1994 and Wayne Hodgins is often credited for coining the phrase (Wiley, 2001), but the basic concept of re-reusing digital resources to streamline computing practices for programmers and to introduce uniformity of experience for end-users can be traced back to the work of Ole-Johan Dahl and Kristen Nygaard from the Norwegian Computing Center, Oslo, Norway in the mid 1960s with their work on a programming language called SIMULA. Dahl and Nygaard's work led to a form of computing called object oriented programming that has had a profound impact upon the field of computer science and information technology. Object oriented programming gained momentum in the 1970s with the work of Alan Kay and became increasingly popular as a result of the work conducted in the 1970s and in the early 1980s by Bjorn Stroustrup with his efforts to apply the basic concepts of object oriented programming to the C computer language to create the commercially successful and widely accepted C++ computer language. Soon after that, a group at Sun led by James Gosling introduced a derivative of C++ called Java that has gained increasing popularity with the expansion of the Internet.

Metadata Referencing Models

Since the early 1990s, several efforts have been underway to establish a way of accessing stored digital materials that will enable different educational publishers to create LOs that are interoperable within a common learning management system (LMS). The term that has emerged to categorize this type of classification of stored media is *metadata* and over the past decade several organizations have attempted to devise a set of metadata standards that content publishers can follow when creating learning objects. In recent years, two such efforts have gained the widest amount of attention and acceptance. These efforts are The Learning Technology Standards Committee of the Institute of Electrical and Electronics Engineers' standard (a.k.a. LOM) and the US Department of Defense's Advanced Distributed Learning Division's standard (a.k.a. SCORM). Each of these standards is the result of a great deal of collaboration and "bundling" of specifications adapted from multiple sources to provide a comprehensive suite of e-learning capabilities that enable interoperability, accessibility and reusability of web-based learning content and the collective move toward attempting to enable this type of access for stored digital learning materials introduces many exciting possibilities for the field of instructional technology.

The introduction of, and further refinements to, standards like SCORM and LOM are a critical step that must be taken to allow different content publishers to create digital materials (LOs) that can interoperate within different learning management systems. Once a referencing standard is accepted and refined, the general assumption within the educational community is that producers of digital content will use it to guide their

development efforts so learners and teachers can easily access and use LOs in their learning space – regardless of who created them or which learning management system they are using.

The simplest analogy for a metadata referencing standards is that they are a lot like the Dewey Decimal System used in your local public library. They are referencing systems only – they offer few guidelines and impose few restrictions upon the content to which they refer. Put simply, metadata referencing standards introduce a standard way to refer to learning objects, but they do not address how to populate them with instructional material. Just like the Dewey Decimal System refers to any number of media in the local library ranging from microfiche, to encyclopedias to classic novels, to DVDs, and so on, metadata standards are concerned with brief descriptions and access – they have little-to-nothing to do with the quality and/or the quantity of the referred material. Several leading learning object theorists acknowledge the fundamental need to address and clarify the relation between learning object metadata and content (Friesen, 2001; Brown, 2002; Merrill, 2002; McCormick & Scrimshaw, 2003; Verbert & Duval, 2004).

Another pressing need that is often overlooked as instructional designers and technologists struggle to define the nature of LOs is the theoretical framework that needs to be in place for their successful implementation. LOs can only work within a specified environment that includes not only shared technical standards for metadata, but also guidelines for publishing instructional materials, directions for using LOs to support an instructional interchange, and review processes that ensure the quality and usefulness of the LOs themselves. Furthermore, I would like to submit, that LOs will only reach their full potential in the K-12 online learning when they are used in an overall blended

learning environment that accommodates support from a “live” instructor and some type of selection/delivery process that enables educators to tie them to existing classroom practices (Voos, 2003; Wiley, 2003).

To date, the discussion surrounding LOs has primarily focused upon defining tagging schemes and metadata standards and there has been little emphasis placed upon analyzing the pedagogical function of LOs within the teaching and learning process - because no venue has yet emerged (or has yet been designated) as an environment where learning object based instruction (LOBI) can take place. In effect, conversations regarding LOs are once-removed from the formative point of contact where learners, teachers and content publishers interact with new concepts to make meaning.

The “missing link” that has been absent from conversations regarding LOs and LOBI to date is context. In other words, there has been very little focus upon environmental factors that in the research devoted to learning objects to date. The primary goal of this study is to enable researchers to more effectively consider context in their inquiry regarding LOS and LOBI by identifying the barriers that interfere with the creation of an environment that facilitates LOBI and then providing some helpful suggestions that can be used to overcome those barriers.

Ultimately, this study will utilize basic principles of C.S. Peirce’s *pragmaticism* and critical theory to outline a learning environment that will enable the field of instructional technology and the educational publishing industry to move toward a shared, and contextual, understanding of the nature of learning objects that will guide the implementation of LOBI in the future. More specifically, this study is intended to begin what Jürgen Habermas calls a *discourse* regarding learning objects that will harness the

environmental realities in the delivery environment in order to overcome several key obstacles that interfere with the implementation of LOBI in the K-12 online learning environment.

Learning Object Content Models

The idea that instructional content can be systematically encapsulated, retrieved, transmitted to others, and then reused is the driving force behind the LO movement in the field of instructional technology today. David Wiley claims that this technology currently leads other candidates for the position of "technology of choice" for the next generation of instructional design, development, and delivery due to its potential for reusability, generativity, adaptability, and scalability (Wiley, 2002). Many other leading researchers agree that LOs have an enormous amount of potential in the online learning environment (Downes, 2001, McCormick & Scrimshaw, 2004; McGreal, 2004; Gibbons, 2003; Hodgins, 2000). Yet, in the face of such potential, the field has made little progress when it comes to defining a practical and widely accepted method for developing and distributing LOs to enhance learning - and research that addresses the pedagogical effectiveness of using LOs in the K-12 learning environment is scarce. While there is a general acceptance, and even excitement, within the field of instructional technology surrounding the impact that that learning object-based instruction (LOBI) can have upon online education, there is a great deal of confusion surrounding this technology – even to the point where it is unclear what exactly a learning object *is* (Merrill, 2000; Friesen, 2001; McGreal, 2003). As yet, no practicable model for implementing this technology in

a “real world” setting exists. The fact that there is no widely accepted content model, or set of publishing standards that educational publishers can use to guide their efforts when they produce instructional materials that will be delivered within an LO in the overall practice of LOBI has halted the natural evolution of this form of instructional technology. Put simply, nobody is exactly sure what to “put into” a learning object, and the collective indecision has caused a great deal of confusion in the field of instructional technology.

The first attempts to introduce a content model for LOs are typically attributed to the work of M. David Merrill from Utah State University in his work in the 1990s. Other early pioneers in the collective effort to devise a content model for LOs include L’Allier and his efforts with the NETg Learning Object Model (1997) and Barit and others from CISCO who introduced the RLO/RIO content models (1999). These early efforts made brief inroads into the mainstream of instructional authoring systems with the introduction of the “knowledge object” functionality into Macromedia’s Authorware Version 6.0 in 2001, but this technology did not gain a wide acceptance in the instructional authoring systems community – mainly because confusion remained about whether LOS are concerned with form (the characteristics of a learning object in its final deliverable state) versus function (the potential capability of this technology to somehow automate the content creation and retrieval process). This confusion is perhaps best characterized by the sense of uncertainty that surrounded (and continues to surround) metadata referencing standards and the amount of influence they have upon the content production and/or retrieval process.

To help clear some of this confusion, Macromedia released a white paper in 2002 that clearly identifies SCORM as a referencing standard only and acknowledges the fact that

> The intent of SCORM is not to promote uniform content, but to enable conformant content to work better in a technical level. What content goes into the Learning Object (LO) is determined by the learning designer and not governed by SCORM.
>
> (Brown, 2002).

Other efforts at around the same time, like The Masie Center's white paper (Masie, 2002), the Learnativity content model (Duval & Hodgins, 2003), the SCORM content aggregation model (Dodds, 2001) and McCormick's report on the CELEBRATE project (2003) all acknowledged the need to keep instructional media contained within a LO conceptually separate from the metadata referencing standards that are used to facilitate access. Despite these early efforts, the confusion between the function of SCORM and how it does (or more appropriately, does NOT) influence the content of a LO remained – and it is still present today.

Learning Object Repositories

Soon after this flurry of activity, the collective attention of the field of instructional technology moved toward the formation of LO repositories and the issue of how best to populate LOs with instructional content still needs to be addressed in a

practicable way. Much of the recent activity in the LO community has been devoted to building LO repositories like MERLOT, Wisc-Online, EduSource in Canada, CELIBRATE in Europe, and the newly introduced commercial product from Discovery Learning, Inc. called Cosmeo; but, again, there has been surprisingly little research and discussion surrounding the use of learning objects within the learning environment (Haugley, 2005). While these repositories represent a great deal of progress and they are, indeed, a critical accomplishment; they are only a first step toward widespread implementation of LOBI in the K-12 online learning environment, and ultimately into every day learning and teaching practices in public schools across America.

The table provided below includes some of the more prominent learning object repositories that are available today.

Table 1

Partial List of Existing Learning Object Repositories

Organization(s)	LO Repository Name	URL
California State University	Multimedia Educational Resource for Learning and Online Teaching (MERLOT)	http://www.merlot.org/Home.po
The Université du Québec à Montréal	The Co-operative Learning Object Exchange (CLOE)	http://cloe.on.ca/
Discovery Education	Cosmeo	http://www.cosmeo.com
EduSource Canada	Canadian Network of LO Repositories	http://www.edusource.ca/
European SchoolNet	Celebrate	http://www.eun.org/eun.org2/eun/fr/Celebrate_LearningObjects/entry_page.cfm?id_area=1008
The Remediation Training Institute, Inc.	ExtraLearning	http://www.extralearning.net
The Monterey Institute for Technology and Education	The National Repository of Online Course	http://www.montereyinstitute.org/nroc/nrocworking.html
	Hippo Campus	http://www.hippocampus.org/
Utah State University	Instructional Architect	http://ia.usu.edu/
Commonwealth of Australia	The VET Learning Object Repository Network (VLORN)	http://www.flexiblelearning.net.au/flx/go
Wisconsin Technical College System	Wisconsin-Online (a.k.a. GEODE)	http://www.wisc-online.com/

While these repository projects are necessary, they are only effective if they lead to the implementation of LOs in an actual learning environment. Ultimately, there are two conditions that must exist before LOs can be successfully implemented in to the K-12 learning environment. First, LOs must be accumulated into repositories that follow a standardized tagging scheme like SCORM and second, a learning environment must exist that accommodates the delivery of LOBI. Again, the main purpose of this study is to identify and critique the obstacles that can be addressed to make the establishment of just such a learning environment possible.

A Suggested Shift in Focus

In his book *World Hypotheses, a Study in Evidence* (1961) Stephen Pepper introduces two key ideas that can have a profound impact upon the field of instructional technology as it struggles to come to a practical understanding of LOS and LOBI. First, he explains a method that people commonly use to orient themselves to their environment and to better understand their experiences in the world called the "root metaphor method." His ideas surrounding the use of metaphor are somewhat similar to those presented by Lakoff & Johnson (1980) in that he emphasizes the importance of foundational metaphors and he explains how they can have upon the way that people think and act in the world. Pepper then goes on to describe four workable and coexistent world hypotheses that each have their own root metaphor. He labels these hypotheses formism, mechanism, contextualism (pragmatacism), and organicism and he then

proceeds to explain the nuances of each world hypothesis and how they interrelate in the world today.

While nearly all of Pepper's ideas are fascinating, his explanation of the interrelations between the mechanistic and the contextual world views are particularly relevant for the field of instructional technology today as we collectively struggle to understand the role and nature of learning objects in the K-12 online learning environment. More specifically, the root metaphor that has been driving the conversation regarding LOs and LOBI until recently has been that of the machine – the root metaphor that Pepper associates with the mechanistic world view. Using this root metaphor as a starting point, instructional technologists and content producers utilize systematic instructional design models and standardized development processes to create instructional products that fit into a larger system in much the way that a cog fits into the larger whole of an elaborate machine. One of the key assertions of this study is that the root metaphor of the machine, and this mechanistic approach to the design, development and delivery of learning objects (and perhaps, on a grander scale, computer-assisted learning in general) has come to dominate the process of helping people to make meaning in target delivery environments. Rather than focusing upon the needs of learners and teachers in the classroom, the vast majority of instructional content producers who create learning objects for use in the K-12 online learning environment are beholden to an inflexible world view that compromises the effectiveness of their finished products when they are introduced into the daily learning and teaching activities in today's schools.

Immediately after the chapter on mechanism, Pepper describes a world view that he calls contextualism. He explains that contextualism is very much akin to the

philosophy of pragmatacism that emerged in America in the late 1800s and early 1900s with the work of C.S. Peirce, William James, and John Dewey. In keeping with his technique of explicating root metaphors to epitomize various world views, Pepper describes the root metaphor for contextualism as "the historic event… alive in its present" (p.232). He then proceeds to explain how contextalists (pragmaticists) use this root metaphor as a foundation for orienting themselves to their experiences and the world around them.

This all may be interesting in a conversation about philosophy, but you may be asking "just what does this have to do with instructuctional technology?" These ideas are important because they can be used to challenge the field of instructional technology to collectively consider a shift in focus from a mechanistic world view to a pragmatistic world view when considering learning objects in the K-12 online learning environment. When these ideas are applied to the design, development and delivery of learning objects, a collective shift in focus away from thinking of learning objects as "cogs in a machine" toward a more pragmatistic world view that focuses upon the current historical events that occur in classrooms could quite possibly enable the field of instructional technology to integrate LOs and LOBI into target learning environments more effectively. Put very simply, the problem – and, I would submit, the solution - lies in the implementation; and to effectively address the problem, the best place to focus our collective attention is the learning environment itself.

Since the mid 1990s the general conversation within the field of instructional technology has focused upon the question of "WHAT is a learning object?", and this conversation has produced many artifacts that fit into one mechanical framework or

another, but have very few practical benefits for teachers and students in today's public schools. This study will ask a different foundational question. Rather than focusing upon the WHAT of learning objects, it will examine the WHERE of LOBI in an attempt to help the field better understand HOW this technology can be used to help educators and students embrace instructional technology in their daily learning and teaching activities. This study adopts a pragmatistic approach for using learning objects in the K-12 environment that, by necessity, considers the entire instructional framework into which they are introduced and uses the interplay between environment and implementation to shape and refine the very nature of learning objects themselves. The primary considerations that will drive this study are the pedagogical functions of artifacts (LOs) presented within a learning environment rather than the technical processes involved in delivering information to learners. Rather than attempting to define the true nature of LOs, this study focuses upon describing the parameters and constraints of the target learning environment itself and relies upon these "native" forces to help focus the general discussion surrounding the establishment of a shared understanding of the content contained within LOs. Hopefully, this shift in focus, and the ideas presented in this study will initiate a formal discourse about this technology that will facilitate the implementation of LOBI in public schools across America.

Three Fields of Inquiry and Three Vantage Points

Regardless of how you choose to view this technology, every LO represents a great deal of cooperation between three (admittedly) broad fields of inquiry –

instructional technology, information technology, and education - and each field brings a unique perspective to the learning space where LOBI can take place. Spector underlines the importance of the need for a collaborative perspective by suggesting that the key to successful reuse (of LOs) is not a particular tagging scheme or a particular technology, but rather, the key to successful reuse is in getting people with relevant interests, expertise and motivation to collaborate in ways that obviously extend and enhance what they might accomplish individually (Spector, 2002).

Until recently, the conversations within the field of instructional technology surrounding the creation and reuse of learning objects have been dominated by instructional designers who place an undue emphasis upon curriculum planning (Baruque & Menlo, 2003) and this perspective lends itself to a relatively narrow view of teaching and learning and how learning environments are created (McCormick, 2003). Ultimately, this myopic view of learning in the K-12 online learning environment interferes with the effective integration of LOBI because it isolates the field of instructional design from other fields of inquiry that are required to collaborate if this form of instructional experience is to be made possible.

Information technologists have also been involved in the learning object movement and they lend a perspective that focuses primarily upon metadata and the issues surrounding storage, access, interoperability, and reusability while placing little emphasis upon the educational effectiveness of the content presented within a learning object itself (Welsch, 2002). While these considerations are, indeed, critical hurdles to overcome in the move toward the successful implementation of LOBI in the K-12 online learning environment, many of these syntactical considerations – for instance, the

differences between various forms of metadata - are tangential to the central focus of this study. While it is quite possible that issues may come to the surface as people begin to teach and learn within the proposed learning space that may help to refine metadata standardization efforts, these information tagging schemes will have little influence upon the primary design considerations that will influence the creation of the learning space itself.

The third field that must join the formative conversation concerning the practice of LOBI in K-12 public schools across America is the field of education and it is significant to note that this field has had little influence in the formative conversation to date. While it seems like an obvious topic for public school educators to investigate, until recently there has been little incentive for K-12 educators to explore learning and teaching with LOs. Recent advances in communication technologies available to classroom teachers (personal computers for students, broadband Internet access, and open technologies) coupled with the increasing pressure imposed by the No Child Left Behind Act of 2000, are motivating many public school educators to the pay more attention to LOs and LOBI.

Haughley contends that “learning objects do not have value or utility outside of instructional contexts and that their value is in their application to classroom settings and to online learning environments where teachers may or may not be present” (Haughley, 2005, p.2). The most obvious problem is that, as yet, no such instructional setting or environment exists. Currently, teachers in the traditional classroom setting follow a model for presenting information that simply does not accommodate LOBI. The very nature of how information is presented in the ideal delivery environment for LOBI differs

so dramatically from the widely accepted lecture-based model for instruction, that introducing LOBI into a traditional classroom setting requires a complete re-thinking of the role of the teacher and the way that information should be presented in the target delivery environment.

The apparent benefits of de-coupling reusable digital content and the technical mechanisms that are used for retrieval and delivery is a fundamental aspect of LOBI (and computer mediated instruction in general) that not only opens the door to many exciting opportunities for educating K-12 students, it also poses fundamental challenges to existing instructional practices. The somewhat overused phrase that can be used to describe the need for educators to assume more of a facilitative role in the computer mediated instructional process is the "guide at the side" as opposed to the "sage on the stage." More specifically, if facilitators in a learning space that accommodates LOBI can rely upon stored and reusable instructional content to convey the instructional message to their students, it becomes possible for them to devote their energies to other critical aspects of the teaching and learning process like behavior support and individualized instruction. It is precisely this new type of dual role that teachers can adopt while they and their students engage in LOBI that necessitates some new thinking regarding the role of the teacher in the learning space.

Simply put, the fields of information technology, instructional technology and education have failed to answer the question "What is a Learning Object?" and it has become an intractable issue – a type of modern day Gordian knot - that interferes with the natural evolution of this technology. Despite early efforts to define a practicable content model and that educators and content publishers can use to guide their efforts to

implement LOBI, this fundamental question still remains unanswered. Rather than venturing down the same well-worn paths of relying upon nominalism and/or relativitism to define the "true" nature of learning objects, this study will use a few basic principles of pragmatacism, experientialism and critical theory to help eliminate some of the barriers that are obstructing the natural evolution of LOBI.

Further investigation of the relationship between LOBI, pragmaticism, experiential learning, and the field of semiotics will undoubtedly lead to many exciting discoveries in the future because LOBI is naturally *contextual*. It stands apart from other forms of instruction because it introduces the ability to re-use, or recreate learning experiences and tie them to the meaning making process for others *in situ*. This ability to digitally produce an instructional experience, combine it with other instructional experiences and then deliver it as part of an overall instructional message is one of the key attributes of this technology that makes LOBI so intriguing for educators today. The idea that the educator who is well versed in LOBI can use search technologies to hunt through vast repositories and then gather the found artifacts (LOs) into prescriptive (and self-paced) exercises that are then presented to learners is relevant for the field today because it enables educators to "tap into" the instinctual meaning making process in learners that is essential for learning (Shank, 1993). Put simply, the driving forces behind the adoption of LOBI will be the archetypal need for humans to learn and teach coupled with a deep and profound need to make sense of our environment using a type of reasoning that C.S. Peirce refers to as *abduction* (Shank, G. personal communication, May 27, 2006).

Abduction and Learning Objects

The shift in emphasis away from the mechanistic tendency to describe learning objects in the language of storage and retrieval systems toward the contextual tendency to emphasize the meaning-making process that learners perform (or experience) in the target learning environment is an important first step toward understanding the essence of LOBI and the impact that this form of learning and teaching can have upon the field of education. It is, however, only a first step in a potentially long and fruitful journey that could possibly lead to many fascinating revelations about learning and teaching. Ideally, this shift in focus will draw the collective attention of researchers more directly to the experience of learners as they use learning objects to "make meaning." The pragmatistic term that is often used to describe this meaning making process is *abduction*. According to Shank:

> Abduction is the basic logic of reasoning to a hypothetical meaning. It allows us to reason from the experience at hand, so as to understand that experience as not a unique phenomenon, but as a meaningful case of some hypothetical rule or principle.
> (Shank, 1993).

In the world of learning objects, abduction is especially important because it is so evidently necessary for learners to use it to "tie" learning objects together in an instructional experience. Without this capability, learners would be unable to "see

beyond" the jots and tittles of individual pieces of media presented to gain an understanding of the underlying organizing principles that make them relevant in the present instructional context. To sufficiently explore the role of abduction in learning object based instruction is beyond the scope of this study. It is my sincere desire, however, that other researchers recognize the potential that further investigation in this area holds and join in a discussion that will examine this relationship more thoroughly.

The Formative Crucible

Revolutionary changes in the field of instructional technology do not take place without widespread adoption of common standards (Hodgins & Connor, 2000), but ultimately, those standardization efforts have to address a common need in a delivery environment. Norm Friesen agrees that an emphasis should be placed upon existing practices and issues of adoption if LOBI is to reach its full potential (Friesen, 2003) and this emphasis upon environmental factors, as opposed to a focus upon theoretical considerations, profoundly influences this study.

Consider how various forms of recorded media are interwoven into our daily lives. It can be argued that stored media like movies, songs and television shows adhere to at least three types of guidelines that make them meaningful for us. First, they meet the technical requirements of the delivery mechanism (technical standards) – they must be recorded in a way that can be broadcast so we can experience them. Second, they fit within the publishing norms for their respective medium (production standards), and third, they must meet an intrinsic need in the target audience (adoption standards).

History has shown that it is the fusion of technical, publishing, and adoption standards that work together to make widespread adoption of any form of stored digital media possible.

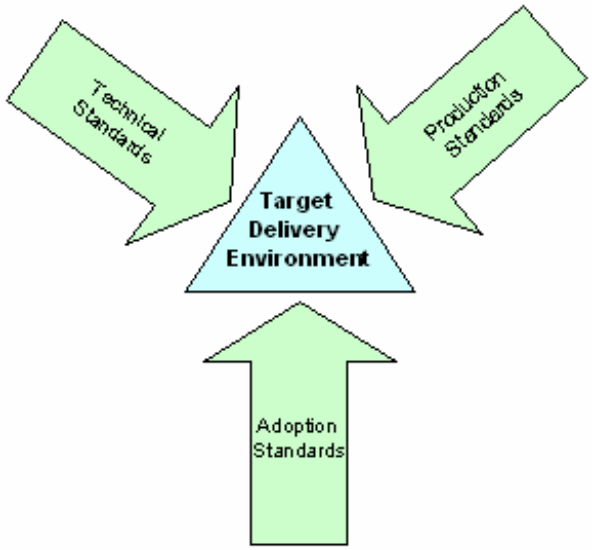

Figure 1. Standardization processes that affect the effective implementation of computer-assisted instruction.

To adhere to the first set of standards, technology producers and distributors follow elaborate technical processes that result in the creation of recording and distribution equipment like projectors, CD players, and/or TV broadcast equipment. To adhere to the second set of guidelines, media producers use standardized production processes and media publishing technologies to produce materials that "speak" to inherent needs and preferences in the target audience. The materials they produce conform to established standards for publishing content in that particular medium (it is rare to come across a 12 hour movie, a song that is so high-pitched that only your dog

could hear it, or a TV production without characters or a plot line). Finally, to adhere to the third set of guidelines, media implementers follow rules for integration. Movies are delivered in theaters or on DVDs, songs are pressed to CDs or delivered as MP3s over the Internet, and many books eventually become paperbacks. While each of these sets of standards governs the way we use the technology of stored media and make it convenient for us to use it in our daily lives, they all are guided by one overriding principle – they only have value if the benefits of the message that is being conveyed outweigh the difficulties involved with its access. Put very simply, standards must consider how technology is used in the target delivery environment to simplify access and adoption.

The iterative interplay between content production and adoption within a target delivery environment has the largest impact upon whether or not a particular form of instructional technology (in this case, recorded media) has value for a society – and this interplay has the greatest impact upon the formative process of developing technical and production standards themselves. To date, the field of instructional technology has (perhaps necessarily) focused its attention upon the interplay between technical standards and production standards in the effort to implement LOs and LOBI into the K-12 learning environment. But like any other form of recorded media, it will be the interplay between content production efforts and adoption in the target delivery environment that will have the greatest impact upon the widespread implementation and acceptance of LOBI.

A fascinating phenomenon that the interplay between production and adoption standards typifies is the almost symbiotic bridge between humans using tools to shape the environment and the reciprocal effect that the act using tools has upon human consciousness. In other words, “in the labor process, what changes is not only the nature

worked upon but the nature of the laboring subjects themselves" (McCarthy, 1991 p. 81). Or, as Walter Ong puts it, "writing restructures consciousness" (Ong, 1982). But this restructuring of consciousness takes place not only on an individual level, but also on a societal level.

The collective activity involved in developing and delivering learning objects into the K-12 delivery environment is so complex that it would be impossible for any individual field of study to master all of the processes required. A great deal of highly specialized knowledge is required in the fields of information technology, digital publishing, instructional technology and education to simply create an artifact that can realistically qualify as a learning object and deliver it to a learning environment. This necessary cooperation leads to the idea that learning objects can be viewed as a socially constructed form of technology. Much like many other forms of technology that have become part of our daily lives, the successful creation and implementation of learning objects will require a great deal of collaboration among people from different fields of study. At this point in the evolution of learning objects and LOBI, each of the fields that must collaborate is mired in a state of mechanistic self-sufficiency that, in effect, isolates key actors from each other and prohibits the necessary, and inevitable move toward Durkheim's social interdependence, or *organicism* (Durkheim, 1893).

Again, I submit, that this problem of isolationism can be attributed to the basic fact that many of the actors involved in the creation of learning objects and their delivery into the K-12 learning environment need to embrace a new root metaphor that will enable them to more effectively use this technology to meet the needs of learners and teachers in the delivery environment. This simple shift in focus can enable all parties to develop a

viable theoretical framework that can accommodate LOBI. The proposed theoretical framework must not only accommodate the interplay between published artifacts (LOs) and the intrinsic needs of learners in the target delivery environment, it must also serve to catalyze the move toward a type of social organicism that must occur if LOBI is to be successful.

The simple fact that LOBI is still in its very infancy introduces enormous opportunities for the future of K-12 online education. The field of instructional technology and the educational publishing industry are at a point in their parallel evolutions where they can introduce a theoretical framework for presenting stored media in the online learning environment that can have a profound impact upon the future of education. Despite the fact that several relatively recent developments make the implementation of LOBI more likely in the K-12 online learning environment in America, many important challenges remain. More specifically, several vital misconceptions, or assumptions currently held by administrators, teachers, parents and students regarding distance education in general, and LOBI in particular interfere with the successful implementation of LOBI in the K-12 online learning environment in America.

Deeply held paradigms about instructional practice, misconceptions about the role of LOs in teaching and learning practice, environmental variables, and a simple lack of awareness all inhibit the effective use of learning objects in the classroom. A large part of this study will be dedicated to identifying the underlying assumptions that fuel these misconceptions and then presenting critiques of each in an effort to facilitate the implementation of LOBI.

Pragmaticism

In his paper titled “The Fixation of Belief” that was published in Popular Science Monthly in 1877, C.S. Peirce outlines four common ways that people fix and/or refine their beliefs regarding the world around them in order to address, or avoid, the phenomenon that he calls *genuine doubt*. In other words, Peirce outlines four methods of inquiry. The methods detailed are tenacity, authority, the a-priori method, and the method of scientific investigation. Peirce’s goal in this particular paper was to underline the efficacy of the scientific method of investigation and contrast it to the other forms of inquiry listed. He describes the scientific method as the only one of the four methods listed which provides any distinction of a right and a wrong way. His reverential respect for genuine doubt as the catalyst for mental action and the stance that the integrity of beliefs is essential (Peirce, 1877) serve as guideposts that direct our collective attention in this study to the delivery environment and the instinctual activities, predilections, prejudices, false assumptions, natural tendencies, and even whimsical preferences of the actors within that environment. In other words, this study will adopt a phenomenological (or as Peirce calls it *phaneroscopic*) view of the learning environment that will nurture genuine doubt and use it as a fuel for ongoing scientific inquiry that will ultimately mould learning objects to meet the needs of the learning environment (Peirce, 1955b). Rather than approaching the task of creating a target learning environment from a nominalistic perspective and applying a systematic mindset – a commonly used approach that has generated few practical results in numerous attempts to integrate instructional technology into the K-12 public school environment in the past – this study will address

the task of integration with a solid faith in realism, a strong predilection toward pragmaticism, an admitted bias toward the social construction of technology (Bijker, Pinch & Hughes, 1987), and a firm confidence in the human ability to perform what C.S. Peirce calls abduction to create a structure in which observation makes sense within a semiotic "ecology" (Lotman, as cited in Chandler, 2002). Instead of attempting to an ill-suited, relativistic, and artificial structure into which LOBI must fit, this study outlines a framework for learning and teaching that will facilitate the creation of what Jürgen Habermas calls an *ideal speech situation* within a naturally existing social framework and focuses upon the use of learning objects as semiotic performance support tools within that context. In such a context the skill of abductive reasoning will be of great value because it is not concerned with ultimate truth, rather, it is the logic of signs that enables inquirers to extract meaning from their environment and adjust their inquiry as new information unfolds (Ryder, 1997). Furthermore, it can house an abductively based semiotic model of inquiry where issues of meaning and understanding come to the forefront (Shank, 1993).

By rolling up our sleeves and immersing ourselves in the environment that we hope to understand and applying some of the basic principles of pragmaticism, we stand to not only make the way clear for the adoption of LOs and LOBI, we also introduce a voice and a form of inquiry that has long been missing within the field of instructional technology. This simple shift in perspective, from a sacrosanct respect for what is true in men's minds and a reverence for the mechanistic worldview in order to "crank out" instructional materials, to an active curiosity in what is meaningful in God's creation (an external reality) and a contextual view of learning and teaching is not only well suited for

this study; it is also a perspective that can yield many harvests long into the future within the field of instructional technology.

Several scholars have provided great inspiration for this study. Shank's open invitation that educational research is a systematic empirical inquiry into the meaning of all these manifold and complex human interactions that we have come to call education has had great influence upon this research (Shank, 2002). Walter Ong's basic assertion that the technology known as writing has a profound effect upon individual and collective human consciousness has greatly influenced the thinking that went into this research as well (Ong, 1982).

Of course, the three great pragmatists - Charles Sanders Peirce, William James, and John Dewey have all helped with the foundational thinking in this study. James' ideas on the metaphysics of experience, Dewey's ideas on instrumentalism, and Peirce's reverence for scientific investigation, his idea that all inquiry is the struggle to remove doubt, and his ideas on abduction have guided a great deal of the thinking that has gone into this work. Also, Stephen Pepper's root metaphor theory had a profound effect upon this study. Some of the ideas of Kant have influenced this line of thinking as well.

From the fields of critical theory, linguistics, semiotics and futurism Habermas, Lakoff & Johnson, Levi-Strauss, Mcluan, and Toffler have all played a role in helping with the ideas that have fueled this study. Some instructional technology visionaries like Hodgins (2000) and Wiggins & McTighe (2005) who advocate the backward design approach as a practicable way to achieve results in a learning space have influenced this work. Also, the work of Brent Wilson (1995) and his ideas on situated instructional design

and the basic assertion that instructional design and implementation are ultimately inseparable are important in this study.

To conclude this opening section on pragmaticism, three direct quotes have been selected from pragmatic thinkers who have each had a great deal of influence upon this study.

From Dewey:

> The life of all thought is to effect a junction at some point of the new and the old, of deep-sunk customs and unconscious dispositions, that are brought to the light of attention by some conflict with newly emerging directions of activity. Philosophies which emerge at distinctive periods define the larger patterns of continuity which are woven in effecting the enduring junctions of a stubborn past and an insistent future.
>
> (Dewey, 1927)

From James:

> To attain perfect clearness in our thoughts of an object, then, we need only consider what effects of a conceivably practical kind the object may involve – what sensations we are to expect from it, and what reactions we must prepare. Our conception of these effects, then, is for us the whole of our conception of the object, so far as that conception has positive significance at all.
>
> (James, 1907)

… and from Peirce: "Let the action of natural preferences be unimpeded, then, and under their influence let men, conversing together and regarding matters in different lights, gradually develop beliefs in harmony with natural causes." (Peirce, 1877).

Discourse and Critical Theory

The goal of this study is to begin what Jürgen Habermas calls *discourse* regarding learning objects and LOBI. From a Habermasian perspective, there currently is a good amount of communicative action in the field of instructional technology regarding learning objects in which information is assumed to be valid in order to exchange information. While this communicative action does, indeed stimulate activity regarding this technology, it lacks the required additional scrutiny that is often associated with discourse. According to Habermas "In discourse, validity claims that have been problematized become explicit topics of discussion, but no information is exchanged. In discourses we attempt to reestablish or replace an agreement that had existed in communicative action and became problematized." (Habermas, 2001). Problematized validity claims provide the texture for this study. More specifically, 12 key validity claims, or assumptions are isolated and critiqued in an effort to begin a type of formal discourse that will serve to mold learning objects to more accurately "fit into" learning environments that use them.

Critical theory also makes sense as a research paradigm in the target learning environment because of the emancipatory potential that LOBI introduces for both individual students and educators. From the perspective of individual students and

parents, LOBI offers access the high quality learning materials in a “neutral” or “auxiliary” environment that is not necessarily controlled by school administrators and public consensus regarding such issues as religion in the classroom, rules regarding discipline, or other compromises that are accepted in order to participate in the traditional “bricks and mortar” public school experience. In other words, LOBI offers a new freedom to personalize the learning experience to more accurately reflect individual values in an environment other than the public school classroom. This feature makes it especially appealing to the home school population and other student populations that are not present in the traditional classroom.

From the perspective of educators, LOBI makes it possible to break from the curricular dominance that textbook publishers have exercised over public schools throughout the 20th century. Furthermore, it enables educators to more effectively customize, or differentiate instruction to meet the individual needs of students – thereby freeing them from the forced position of authoritarianism and information control that is currently an inextricable part of the traditional classroom lecture-based format that is so prevalent in public schools today.

CHAPTER 2

THE GORDIAN KNOT

Perhaps the most appropriate image that comes to mind that can be used to describe the activity surrounding the numerous attempts to standardize and streamline the production, storage, retrieval and re-use of learning objects in order to introduce them into learning environments today is that of the Gordian Knot. Although well intentioned, nearly all efforts to explain and describe learning objects tend to be tainted with the local accent that comes from an often necessarily provincial point of view. Furthermore, these efforts tend to address only the aspects of this technology that are most important to the field of instructional technology in a language that often seems foreign to the other fields of inquiry that are required to cooperate if LOBI is to be implemented successfully. This tendency to use the systematic native drawl of the field of instructional technology to describe LOBI is perhaps unavoidable, because as yet, there is no common point, or delivery environment upon which interested parties can focus their attention in order to begin a productive conversation that can include other forms of inquiry.

More often than not, efforts to describe this almost anachronistic technology in the native tongue of instructional technology wind up causing a great deal of confusion by adding another voice to a cacophony of voices that are all attempting to make their own self-interested claims at the same time. The somewhat cliché phrase that is often overused in corporate environments is “If all you have is a hammer, everything looks like a nail” – and the majority of research that has been conducted surrounding LOBI has, to follow the metaphor, continually hammered at the problem of describing LOs and LOBI using traditional language and educational research techniques. The volume of research is

significant and as yet, despite all of these efforts, a great deal of confusion remains. In many cases these various attempts to make learning objects meaningful for educators in the field have neglected to adopt a necessarily pragmatistic view of adoption in the delivery environment – and that is precisely where the focus needs to be if LOBI is to achieve its deserved level of legitimacy in the K-12 online learning environment.

While the eventual creation of a delivery environment that facilitates what Habermas calls an *ideal speech situation* (Crossley, 2005) is perhaps the most important element in an overall strategy that will help educators take advantage of LOBI in their daily practice, it is only one aspect of an implementation and integration plan that should be considered more rigorously. Indeed, creating a target delivery environment is critical, but efforts to create such an environment must also be coupled with a form of invitation that makes LOBI appealing to researchers, teachers and students. Everyone who enters the learning space must feel a sense of comfort, and ultimately, educators and learners must be inspired to use this technology to create meaning for themselves. The communicative action that takes place will continue to fuel the discourse surrounding the effective implementation of LOBI into the K-12 learning environment, and ultimately it will help the field of instructional technology to begin to develop theories concerning implementation of LOBI that more accurately reflect the contextual nuances of the target delivery environment. But before any of this activity can take place, several obstacles must be overcome.

This chapter lists several key assumptions that are prevalent in the educational community today that interfere with the successful implementation of LOBI in K-12 learning environments. These assumptions have, in effect, formed a type of Gordian Knot

that must be addressed if LOBI is to reach its full potential and the point of this study is to begin a discourse that can help the field of instructional technology to effectively address the barriers that interfere with the natural evolution of learning objects in the K-12 online learning environment.

The Unique Nature of Learning Objects and LOBI

Assumption # 1 - The existing body of research that addresses LOs and LOBI is relevant for K-12 educators in public schools today.

Any attempts to sift through the existing body of research in order to find a clear explanation of how LOs can be used in the K-12 classroom can be perilous. When any well intentioned inquirer who is considering using LOs begins a research effort, he or she will soon discover that there is no single voice within the field of instructional technology, education in general, or even information technology that can provide even so much as a definitive answer as to what a learning object *is* (Merrill, 2002; Friesen, 2003; McGreal, 2003). This stark reality alone will undoubtedly cause many to re-consider using learning objects in their daily practice. Adopting new technologies can be a risky venture for K-12 educators for any number of reasons, but it is made exponentially more risky when even the greatest minds in the field of instructional technology (the very field that holds authority over such matters) are uncertain about the technology that is being considered. Ultimately, this cacophony of voices and opinions in the very field that is responsible for defining LOs and devising practicable methods for conducting LOBI leads us to the first assumption that interferes with the successful implementation of LOBI in the K-12 learning environment. Educators assume that there is a legitimate body of research that addresses the use of LOs in the K-12 learning environment, and this is simply not the case. Ultimately, anyone who is considering adopting LOBI must be able to conduct research on the subject and they must be able to appease their own legitimate sense of *genuine doubt* if this form of computer assisted

instruction is to be successfully implemented in the K-12 learning environment. Currently, the general confusion in the existing body of research not only does not help the typical inquirer to eliminate his or her genuine doubt, it tends to only increase the confusion surrounding LOs and LOBI.

Assumption # 2 - LOs and LOBI Will Replace Classroom Teachers

Ever since the first computer based training (CBT) courses were developed there have been concerns among educators, parents and students that computer assisted instruction will replace classroom teachers and that students who engage in this form of instruction will be deprived of the human interaction that is so critical for students in the K-12 learning environment (Hodas, 1993; Hannafin & Savenye, 1993; Mumtaz, 2000). These concerns are still prevalent today and they affect the successful implementation of LOBI in the K-12 environment (Finley & Hartman 2004). Before the introduction of LOs and LOBI, educators who are opposed to computer assisted instruction could cite the basic fact that the majority of computer-based training courses available to K-12 students are self-sustaining and, to some extent, relativistic (like PLATO, Apex, NovaNet, and A+) in that they present an instructional message and the user interacts primarily with the computer to acknowledge successful transfer of that instructional message.

Furthermore, these “off-the-shelf” learning programs have little-to-nothing to do with the actual instruction that is presented in the classroom on a day-by-day basis. Granted, they are often based upon the same academic standards that drive classroom instruction (scope), but when it boils down to presenting stored instruction in a way that actually augments classroom instructional practices (sequence), these programs begin to fail. The key problem is that they are presented in contexts that are simply not compatible with classroom instructional practices and it is extremely difficult to customize these programs to match the sequence of the instruction presented in the traditional classroom environment. The end result is that these programs do, indeed, compete with classroom instruction for the attention of learners.

Another critical aspect of the learning and teaching process that educators fear will be eliminated when computer assisted instruction is introduced into the K-12 learning environment is that of behavior support. There is a general assumption that a reliance upon stored instruction from experts and high quality interactive media exercises will mitigate the need for qualified on-site educators who can guide the instruction. The misconception is that the use of LOs and the practice of LOBI will create an environment in which the only role of the facilitator is that of an on site task master whose sole purpose is to ensure that students access their lessons – thereby eliminating the need for a highly qualified (and certified) educator in the delivery environment. Ultimately, the concern is that LOBI will de-stabilize the public education system as we know it and put teachers out of jobs.

The basic assumption that LOBI and traditional classroom instruction are in some way competing for the attention of the same audience is one of the biggest hurdles that interferes with implementation. Public school administrators may realize the potential of LOBI and the educational benefits that it can offer their students, but they simply are unable to embrace it because of a lack of a shared theoretical framework, teacher resistance, a perceived lack of manpower, or a need for the required technical infrastructure. So, even if LOBI advocates can convince adopters in the public school environment of its utility, they are confronted with the commonly held belief that implementing LOBI will be too expensive, it will require an extra amount of effort from public school teachers, and/or it will ultimately replace classroom teachers.

Public schools are obligated to be cognizant of both the educational effectiveness and the financial viability of any new form of instructional technology that comes along.

But in the age of accountability and school choice that has been sparked by the No Child Left Behind (NCLB) legislation of 2001, public school districts have been forced to take a different view of instructional technology. Rather than viewing stored digital media as a passive vehicle for the conveyance of instructional messages to their students (i.e. filmstrips, overheads, and educational movies), administrators are starting to understand the need to view digital media in much the same way that the business sector views information technology. In other words, public school administrators are beginning to view digital media as a form of performance support (Geary, 1991). Digital media is not only viewed as a product, it is also viewed as a tool – and it can be used to increase the effectiveness of teachers in the existing infrastructure to increase their productivity. The problem arises when actual, practical methods for implementation are considered or, perhaps more appropriately, not considered. While there is a general understanding of the value of LOs and how they can provide benefits for both learners and teachers, and many public school districts in America have already have learning environments that can accommodate LOBI, few have actually made the leap into this exciting new form of learning and teaching.

Assumption # 3 - LOBI is just another form of computer-based training (CBT) that will have little impact upon learners and teachers in the K-12 environment

One of the more prevalent assumptions that interferes with the successful implementation of LOBI is the idea that it is just another form of computer-based training and it can easily be "lumped together" with other computer-based training programs that have been available since the days of the Apple II computer in the late 1980s. Despite Seymore Papert's claim in 1984 that computers will be a catalyst of a very deep and radical change in the educational system (Papert, 1984) and the availability of a great many different forms of computer-based learning materials ranging from HyperCard-based interactive video-discs, to interactive learning games created using authoring systems like Quest, Tool Book or Authorware, to the educational multimedia & websites available today, the computer has yet to have the deep impact upon education that many visionaries have predicted. Because so many different forms of instructional technology have been presented to educators over the past two decades – each promising wondrous results, and very often not delivering on their promises, educators have not only been inundated with unfamiliar resources, they have also developed what C.S. Peirce might term a communal sense of *tenacity* that manifests itself as a resistance to all forms of computer assisted instruction (Peirce, 1877). In order to make the way clear for the resumption of inquiry, it will be a great challenge for LOBI advocates to distinguish this particular form of computer-assisted instruction from the various other forms of computer-based learning that have been so prevalent (and ineffective) since the days of Seymore Papert and LOGO.

Perhaps comparisons to other forms of computer-mediated instruction point to a deeper assumption, or fixed belief, that interferes with the implementation of LOBI. More specifically, the root assumption that obstructs the implementation of LOBI might be more accurately identified as a collective aversion to genuine doubt in the educational community on the whole regarding instructional technology. Rather than viewing the phenomenon of doubt as the catalyst for mental action required to formulate beliefs about our environment, many key decision makers in the K-12 public school environment view doubt (be it genuine, or otherwise) as a justification for resisting any form of inquiry regarding computer-mediated instruction in general and LOBI in particular. This perspective causes them to overlook the enormous potential that LOBI offers.

Assumption # 4 - Instructional technology is a sub-set of the field of instructional design, and therefore must adhere to a systematic paradigm when designing content for learning objects.

One of the most influential thinkers in the field of instructional design is Robert Gagne. His seminal work called *Principles of Instructional Design* (Gagne, Briggs, and Wager, 1992) is standard reading for nearly all aspiring instructional technologists and it has had a great many positive effects upon the educational community, and ultimately upon society as a whole. In this work he acknowledges a basic assumption that the field of instructional design should utilize a systems approach in the arrangement of resources and procedures used to promote learning. He goes on to acknowledge that instructional systems design *is a sub-set* of a broader field of inquiry called instructional technology that may be defined as the systematic application of theory and other organized knowledge to the task of instructional design and development. Instructional technology also includes the quest for new knowledge about how people learn and how best to design instructional systems or materials (Gagne, Briggs, and Wager, 1992).

Although Gagne clearly acknowledges the distinction between the field of instructional systems design and instructional technology, a widespread misunderstanding of the relationship between the two fields has ensued and caused an inordinate amount of confusion that interferes with the successful design and implementation of LOBI. The problems range from a basic identity crisis (Reiser, 2001) to more practical concerns with how best to facilitate learning using technology. By no

means am I attempting to refute the validity of the work done by instructional designers who adhere to a systematic mindset; I am suggesting, however, that this mindset has come to assume an inappropriate role of dominance in the computer assisted learning spaces of today. The systems approach to instruction is a method only, and it has come to impose its mechanistic worldview upon the more inclusive field of instructional technology that surrounds and subsumes it. In other words, in the field of instructional technology, the systematic mindset has trespassed upon the very human phenomenon of making meaning that has come to be called learning. While there must be some allowance for a formalized approach to the personal act of learning, (Polyanyi, 1962) it simply has gone too far in the case of learning objects. This shared misunderstanding of the relationship between the fields of instructional design and instructional technology, and the hegemonic misapplication of a systems approach to the creation of instructional materials (namely, learning objects themselves) has had a profoundly negative effect upon the learning object movement and it has introduced a barrier to implementation that must be addressed in order to introduce the wonders of LOBI into the K-12 online learning environment.

The very best that the field of instructional technology can do is to support the naturally occurring meaning making process that we call learning. To dogmatically apply a systematic framework or mechanistic rules in an attempt to control the mystery of learning simply breaks down because such approaches, by their very nature, neglect to embrace what C.S. Peirce calls *fallabilism* (Peirce, 1868) Rather than imposing a man-made structure upon the phenomenon of learning and teaching with learning objects, it may be more beneficial if the field of instructional technology adopts an approach that

relies upon naturally occurring tendency of learners and teachers to make meaning in the learning space, and their archetypal ability to perform abductive reasoning.

Assumption # 5 - Detailed content publishing standards MUST be developed and accepted if LOs and LOBI are to be successful.

One of the biggest obstacles to the successful implementation of LOBI is the commonly voiced concern that nobody knows what, exactly, a learning object *is* (Merrill, 2002; Friesen, 2001; McGreal, 2003). This is certainly a legitimate concern, yet it rests upon an assumption that educators must understand a great deal about the tools they use in their instructional practice in order to teach effectively. The somewhat nominalistic position that LOs must be clearly defined *before* they can be used in a particular learning environment has been supported by many in the instructional design community who have spent a great deal of time and effort defining various content models that work in tandem with referencing schemes like SCORM and LOM (Verbert & Duval, 2004).

It is precisely this insistence upon an absolute, objective truth regarding LOs before implementation rather than searching for ways that they can have meaning in the learning environment that interferes with the successful implementation of LOBI - a technology that nearly all educators can easily envision as having a great amount of utility for their students. The key underlying assumption that fuels this particular form of resistance to implementation is the fact that educators are asking the wrong questions. Rather than insisting upon a concrete answer to the question "what is a learning object?" and creating content diagrams that answer that question – perhaps it will be best if the discussion shifts to answering the question "how can learning objects be useful in a particular learning environment?" At the risk of sounding a bit cheeky, the field of instructional technology is, for the most part, currently bickering about carts and horses

when they should be thinking about roads, transportation and where we are collectively going.

The field of instructional technology is at an impasse. Deeply held tendencies to tightly control the content presented within a closed learning environment are being challenged by new technologies that provide the ability to contextualize learning more effectively. Clearly, the educational benefits will be great if these technologies can be used to efficiently meet the needs of agents in the learning environment, but until a learning space that capitalizes upon these new abilities emerges, the closed, mechanistic approach to presenting content online continues to prevail – even in the online learning environment where a nearly endless amount of information is available. Unfortunately, the field of instructional technology has spent a great deal of effort attempting to define a universal content model for LOs using nominalistic and systematic instructional design techniques that are only truly effective within a restricted delivery environment. When these techniques are applied to an environment as vast and dynamic as the World Wide Web, they become ineffectual. The result is a quagmire of theory and opinion that tends to cause more confusion than clarity among educators in the field who attempt to harness the power of stored media to educate their students online (Welsch, 2002 & Godwin-Jones, 2004).

Assumption # 6 - Existing CBT Courses and Recorded Classroom Lectures Can be Broken into Learning Objects and Used to Drive Instruction in the K-12 Online Learning Environment

Another commonly held misconception that threatens the successful implementation of LOBI in the K-12 environment is the idea that existing stored instruction – be it recorded video or computer-based training courses - can be broken into LOs and seamlessly delivered in a learning management system (LMS) like Blackboard, WebCT, or Moodle. This assumption does not pose real problems for technology producers or media publishers because the required tools exist and the development processes involved in such a venture are relatively straightforward. It does, however, pose a grave threat the implementation and adoption of LOBI because it threatens the quality and the instructional effectiveness of the final artifacts that are delivered in the learning environment. The assumption that the process of "chopping up" existing video and CBT courses will be relatively simple activity and that the extracted LOs will be educationally effective is currently under serious consideration by publishing companies with large libraries of whole CBT courses (like Thompson Learning's Netg, K-12, Apex and Class.com). The financial motivation is great because these vendors have already invested large amounts of money into the design and development of whole libraries of courses and, if it were possible to simply extract meaningful learning objects from existing courses, these vendors could take advantage of the interoperability and the reusability that the fundamental concept of LOBI employs.

As well intentioned and conceptually feasible as such efforts to quickly produce LOs may be, they invariably break down within the context of the learning environment.

An excellent example of a vendor that is currently wrestling with these issues is BlendedSchools in Pennsylvania (www.blendedschools.com). One of the more popular forms of distance education that gained some popularity in 2004 and 2005 in Pennsylvania was a type of digitally recorded classroom lecture that is presented within a learning management system like Blackboard. In the preceding years BlendedSchools formed relationships with several school districts across the state and they convinced classroom teachers to allow them to record their classroom lectures in order to create a vast library of digital materials that could be manipulated. They collected a great many recordings of classroom lectures that are readily available to all online learners who purchase their service. While conceptually, this meets the initial demand for distance education because students can (in the very best of cases) log into an LMS and view the lecture component of the instruction that is presented in a classroom, it begins to break down when the interplay between delivery environment and instructional materials is scrutinized.

The basic assumption that needs to be underlined is the idea that recorded classroom lectures or CBT lessons can simply be broken into topic-sized chunks and used as learning objects. The dangers of this assumption become especially evident when you consider applying it to existing computer based training courses from different vendors. The basic fact that very few computer based training courses share the same general user interface, navigation scheme and general “look and feel” makes this an especially difficult proposition. Vendors have actually deliberately avoided using a common presentation standard in the past for any number of reasons ranging from copyright infringement concerns, to differing approaches to online pedagogy, to an attempt to build

a reliance upon their presentation interface. For instance, one vendor may take a more behavioral approach to presenting information online that includes a great deal of drill and practice while another vendor may take a more cognitive inquiry based approach that includes more exploratory learning. Both vendors address the same subject matter – and they create digital lessons that do so, but when you attempt to break these lessons into topic sized-learning objects and mix them together in a target learning environment, the end result is that learners spend an inordinate amount of time struggling to learn the nuances of the interfaces associated with each product rather that learning the content itself.

Assumption # 7 - A Clear Definition of Metadata Referencing Standards Alone Will Make LOs Ubiquitous

Clearly, the metadata referencing initiative that has received the greatest amount of attention in the K-12 online learning environment in America is ADL's Shareable Content Object Reference Model (SCORM) standard. SCORM is the by-product of a consortium of government, business and academics called the Advanced Distributed Learning (ADL) initiative that was assembled by the US Department of Defense in 1997. While it has experienced some support from the digital publishing industry, SCORM, and its potential for introducing a degree of interoperability among finished products, has gone largely unrealized in the K-12 learning environment. Some scholars note that this may be partially due to the fact that SCORM is a primarily technical standard for delivering materials that places little emphasis upon the pedagogical soundness of the materials themselves (Merrill, 2002). SCORM focuses upon introducing uniformity in the realm of metadata – the informational "tags" that surround each learning object so that their instructional contents can be delivered in Learning Management Systems (LMS) and utilize their performance monitoring capabilities. While more tools and utilities are being developed to impose the SCORM standard upon existing digital materials, concerns surrounding the technical complexity involved in actually publishing content that truly takes advantage of the SCORM standard introduce a steep barrier for individual publishers. Thus far, the move toward adopting a standard like SCORM has largely been ignored by "native" publishers like classroom teachers within the K-12 learning

environment because they lack the technical expertise required to create materials that fit within the standard (Godwin-Jones, 2004).

The underlying assumption that drives this move toward the standard use of a metadata referencing scheme like SCORM is that once all of the technical nuances are ironed out regarding interoperability, reusability and access, people in the delivery environment will automatically embrace LOBI. In fact, the K-12 public school delivery environment has been largely ignored in the development of the SCORM metadata standard. Surprisingly little consideration has been given to students and teachers who may or may not use LOs and, just like any other form of digital media, it is the end-users and the delivery environment who will have the greatest impact upon whether or not LOBI will be implemented. While these efforts to create a universal retrieval standard will undoubtedly simplify the implementation process, they are only a first step toward successful adoption of LOBI.

Assumption # 8 - Once a Metadata Standard is Established, Vendors will Cooperate and Interoperability will be Maintained

One of the most pressing assumptions surrounding the implementation of LOBI is the commonly held belief that the development of a metadata standard and/or a content model will result in the establishment of a set of guidelines that will actually be followed by publishers of digital media. In fact, there is little to no guarantee that differing vendors will create SCORM compliant LOs. Historically, educational publishing firms have been reluctant to share content and they have traditionally followed a version-based proprietary ownership model for their intellectual property that they protect with copyrights and other methods of legal protection. The fact that it is technically and operationally possible to use the LO paradigm coupled with various forms of instructional technologies that make interoperability possible does not guarantee that educational publishers will create digital content that will, in fact, be interoperable. The fact is that LOBI poses fundamental threats educational publishing firms' existing financial, legal and social infrastructures that are all geared toward the production (and re-production) of copyrighted textbooks – or in some cases in the digital learning environment - the content is produced for delivery within their own isolated and proprietary delivery system. The key assumption that needs to be underlined is the shared belief that if a set of publishing standards and a technical delivery framework that enables content developers to directly meet the demand for engaging instructional content are developed, then content publishers will create LOs that fit within that framework. In other words, the field is acting upon the basic assumption that "if we build it, they will come" and a surprisingly small amount of attention has been paid to the delivery

environment and the pedagogy that takes place when people use learning objects within that environment (Verbert & Duvall, 2004; Friesen, 2003).

Implementation Issues

Assumption # 9 - LOBI will only be effective if it accommodates a data driven student performance tracking function.

One of the most difficult issues surrounding the successful implementation of LOBI is the question of how best to utilize the processing capabilities of the computer to track student performance as students take lessons online. This assumption is especially prevalent in today's public school environment that must accommodate "high stakes" testing because it accommodates a quantitative view of assessment that is the basic "language" of standardized tests. Ultimately, this performance tracking issue places an enormous obstacle in the way of implementing LOBI into the K-12 online learning environment because there is a general assumption within the educational community that it is possible to craft a method for tracking student performance and verifying that learning has taken place that is almost exclusively based upon the data collection capabilities of the computer. The assumption is that if a computer assisted learning lesson is designed properly, administrators will be able to review reports based upon student performance in order to determine whether or not a student learned the material presented (Wade, 2001; Salpeter, 2004; Dickinson, 2005). In other words, the assumption that online learning can, or should, be designed to exclude the active qualitative assessment efforts of an on-site facilitator inhibits the successful implementation of LOBI because it ignores the possibility of a blended learning environment that utilizes both technology and "live" instruction to offer the best possible experience for learners.

In a practical sense, this reliance upon a technology solution alone to track student performance creates literal and metaphoric barriers between agents in the delivery

environment (LMS providers, publishing tool providers, publishers, and educators) who must cooperate if LOBI is to be successfully implemented in K-12 learning environments across America and around the world. Not only do production difficulties arise when attempting to convince different vendors to create interactive question-based learning objects that have the same user interface and that generate the same type of performance data, but there are many other critical issues that can invalidate quantitative assessment measures in the online learning environment like academic dishonesty, test bias, and simple technical difficulties such as connectivity issues that may compromise the validity of a student's test score. If LOBI is to become a viable learning alternative in today's public schools, a practical model for tracking student performance and assessment must be created that addresses these issues.

Assumption # 10 - Models for Implementing Distance Education in Higher Education are Transferable to the K-12 Online Learning Environment

Distance education has exploded in higher education institutions across America in recent years. Nearly every university in the United States offers some form of online learning and many offer fully accredited courses that are delivered via the Internet. Undoubtedly, this form of learning and teaching for this particular target audience will continue to have a profound impact upon the field of instructional technology long into the future as experts devise new and exciting techniques for educating adults online. But the question remains as to whether or not this form of distance education – or rather, the specific techniques and instructional practices that are used in the higher education realm, are really transferable to the K-12 online learning environment.

In the vast majority of cases, K-12 administrators and key decision makers have only the higher education models to use as a reference, and they assume that these methods of learning and teaching are applicable in the K-12 online learning environment.

More specifically, nearly all online learning programs for higher education rely upon four or five key teaching techniques that take advantage of the Internet and bundled communication technologies delivered via a learning management system like BlackBoard, WebCT, or Moodle. They are:

1. synchronous chat, audio, or videoconferencing
2. asynchronous discussion boards
3. asynchronous learning exercises that rely upon stored media (textbook reading exercises, recorded lectures, websites, PowerPoint slideshows, etc…)
4. group exercises or collaborative projects

5. individual feedback from instructors based upon analysis of student performance data, online interactions and assignments

In the higher education environment, these instructional techniques can be combined to create an online learning experience that is quite effective for self-motivated adults (White & Weight, 2000). But, because of fundamental differences between target audiences, there is no guarantee that these instructional methods are applicable in the K-12 online learning environment.

Assumption # 11 - Synchronous Distance Education Techniques like Videoconferencing are the Best Way to Teach the Target Audience (K-12 Online Learners)

One of the more troubling developments in the K-12 online learning environment lately has been the push toward two-way videoconferencing as a method for presenting instruction to students in auxiliary learning environments. While the K-12 educational community struggles to overcome the technical barriers that interfere with the implementation of videoconferencing technology, several basic questions about the pedagogical effectiveness of this form of teaching K-12 students in general, and students who tend to be in distance education situations in particular, need to be addressed.

The current assumption that is driving this move toward videoconferencing and the use of all synchronous technologies like videoconferencing, voice over IP, and chat in the K-12 online environment is that it is best to simulate the classroom learning experience as closely as possible in the online learning environment. In other words, there is a general misconception that online pedagogy should be as closely related to traditional classroom pedagogy as possible – and that it is an appropriate use of instructional technology to make this happen (Cavanaugh, 2001). Educators assume that it would be pedagogically advantageous to "broadcast" interactive lessons online that utilize the same lecture-based learning and teaching model that is currently used in the vast majority of classrooms across America. In this way, teachers can effectively take full advantage of instructional technology to extend their reach to students who are unable to attend class for any reason.

Assumption # 12 - Copyright restrictions will prevent educators from utilizing LOBI in their instructional practice

Many K-12 educators are reluctant to utilize copyrighted digital materials in their instructional practices because they are concerned about breaking the law by infringing upon copyright restrictions (McGreal, 2003). There is a pervasive sense of concern for legal exposure and personal risk among teachers and administrators in public schools today – and the fact that the Fair Use laws do not explicitly allow classroom teachers to utilize a specific technology called learning objects in a particular setting (the online learning environment) prohibits many educators from fully embracing LOBI. In fact, these concerns are heightened with LOBI because it so heavily relies upon a mixture of stored and reusable digital learning materials - that may or may not be copyrighted – from several different publishers all at once.

Even though many educators have some sense that Fair Use Laws enable them to use copyrighted, recorded media in their classrooms (what teacher would refuse to play a copyrighted song that is stored on a CD in a traditional classroom environment if it is educationally appropriate?), the confusion surrounding copyrights, piracy, peer-to-peer swapping technologies and other issues surrounding stored digital materials accessed via the Internet make the same teachers reluctant to access and utilize copyrighted material if it is downloaded from the World Wide Web.

CHAPTER 3

EXPERIENCE

"The major advances in civilization are processes that all but wreck the societies in which they occur."

(A.N. Whitehead, as cited in Wall, 1997)

This section was originally titled "The Sword" in keeping with the Gordian Knot image presented in the previous chapter because it presents individual critiques of each assumption presented in an effort to open the way to the many wonderful opportunities that LOBI can offer learners and teachers in the K-12 environment. The reason that the title was changed is relevant because, in a way, it demonstrates a personal shift in perspective from a nominalistic view of learning objects to a pragmatistic view. Hopefully, as you read on, you will experience a similar shift in perspective (if you are so inclined) and this experience will serve as a call to action for you to implement LOBI in a K-12 learning environment. While the suggestions that follow are intended to help the field of instructional technology more effectively realize the potential of LOBI, they are merely suggestions on a piece of paper (or a computer screen). Although it may seem obvious at the current moment, the following critiques are ideas only and they will only have value if they actually inspire action within an actual learning environment. One of the important actions that this study is intended to inspire is abductive reasoning – a form of inference that this largely missing in the discussion surrounding LOBI. So, there you have it. You've been warned.

For LOBI to be successful, a paradigm shift must occur. Rather than viewing LOs and LOBI from a mechanistic, and subsequently, epiphenomenalistic world view, educators can adopt an experiential, contextual and phenomenalistic view of this exciting new form of online learning. This shift in emphasis will enable inquirers to harness environmental factors and apply qualitative research techniques that accommodate abductive reasoning to "make sense" of these fascinating (and, I would add, irreducible) artifacts and actually use them as tools that will support learning and teaching. Luckily for us, learning objects are very well suited for inducing just such a paradigm shift if they are used properly, or *in context*. Perhaps an example is in order.

There is a wonderful scene in the movie *The Black Robe* (Lantos, Milliken, Norlen & Reichel, 1991) that demonstrates the power of using LOs as a means of generating a Gestalt type of "ah-ha" experience for learners and teachers. In the scene, a Native American Indian chief and his companion encounter a Jesuit Missionary who is writing in his journal on a sunny afternoon. The chief inquires about the priest's activities and the priest proceeds to give a demonstration by asking the chief to provide a piece of information that he (the priest) does not know. The chief tells him that his mother-in-law died in the snow last winter. The priest then proceeds to write this information on a piece of paper and asks the chief and his companion to accompany him as he proceeds to give the paper to a fellow missionary who is on the other side of the village. When the fellow missionary reads the writing on the piece of paper and the message it contains, namely that the chief's mother-in law died in the snow last winter, the group of Native Americans who have gathered are astonished. They had never seen this form of communication before and they are struck with a sense of awe and wonder at the missionaries who held

this “magical” power. The priest then proceeds to tell the chief and the gathered entourage “I have still other greater things that I can teach you.”

This scene from the movie *The Black Robe* is an excellent example of a very important idea that LOs and LOBI introduce into the world today. That idea is that LOs are naturally very well suited for experiential learning in an instructional context – and the experience of using learning objects to learn and teach will ultimately be more inspirational than any words on paper. Consider the scene from the movie “The Black Robe” again. Would it not have been more effective, for you, the reader to actually view the particular clip from the movie during the same space of time that you spent reading the words on the page describing the scene? Of course, actually engaging in the experience of viewing the movie clip would have been a much more effective form of communication because it would enable you, the reader, to create your own internal meaning structure through actual experience of viewing the movie clip in question rather than relying upon a my (admittedly faulty) description of the movie. Furthermore, by embedding just such a video clip in this very document - that is essentially a text-based form of communication - adds yet another level of meaning that comes from the combination of the reading and the viewing experiences taken together, or *blended* into one single lesson. In Peircean terms, the juxtaposition of a link to a video clip and text on this page would inspire you to perform abductive inference of the open iconic type that would have enabled you (or perhaps compelled you) to make meaning (Shank, 1996).

If you happened to be reading this document in an electronic format, embedding a hyperlink to the actual movie clip directly into the very sentence that you are currently reading is a relatively simple technical process. That combination of link and movie clip

would serve as a mediating artificial exterior aid that affects an interior transformation of consciousness in much the same way that the written language affects an interior transformation of consciousness (Ong, 1982).

LOBI can provide such transformative experiences through the arrangement of stored media because it thrives in the world of personal metaphor that Pepper (1961) and Lakoff & Johnson (1980) use to describe the contextual world view. Meaning is the mortar that ties experiences together and LOBI can catalyze the meaning making process for learners by compelling learners to make sense of what they encounter. Making meaning in our environment is as natural and critical for humans as breathing and it is just as necessary for our existence (Shank, G, personal communication, July 12, 2006). At the risk of sounding a bit brash, I think that focusing upon this personal meaning making process will bring us closer to the essence of the mystery of this phenomenon that we call "learning" than other methods because it clearly shifts the focus from transmitters to receivers, from external processes to internal transformations, from teachers to students, and from theory to experience.

In other words, *experience* is the sword that will cut the Gordian Knot and that experience can take place primarily on the level of a formal discourse, but it can also occur in an actual learning environment where the power of contextual learning will influence and restructure peoples' ideas and opinions about learning objects. This study is not an attempt to do a full systematic analysis of learning and teaching with stored media, nor is it an attempt to explore the particular technical attributes of learning objects. It is an attempt to tap into key ideas from several influential thinkers in an eclectic way in order to further the discussion concerning learning objects. Great care has been taken to

avoid contradictions and remain consistent with the spirit of the ideas that are being conveyed. The following diagram shows the thinkers who have influenced this study, please refer to Appendix 1 for more information about how their ideas have helped me to form the opinions expressed.

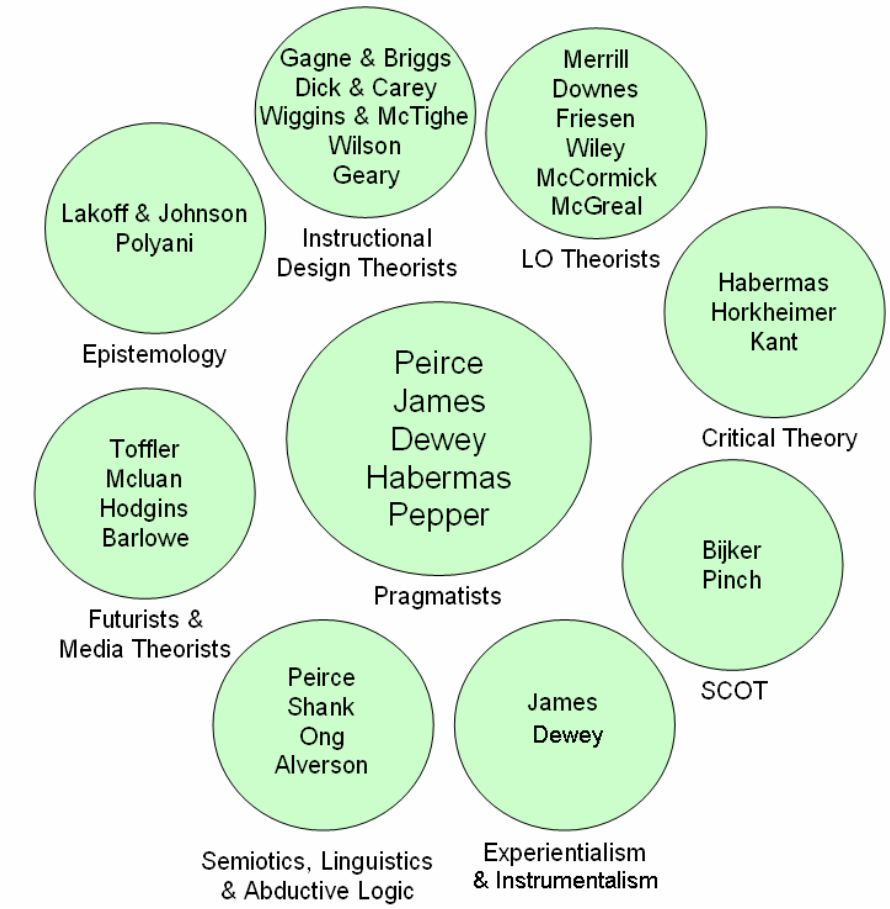

Figure 2. Thinkers who have influenced this study

The Unique Nature of Learning Objects and LOBI

Critique of Assumption # 1 – The existing body of research that addresses LOs and LOBI is relevant for K-12 educators in public schools today.

In his description of radical empiricism, William James wrote "the relations that connect experiences must themselves be experienced as relations; any kind of relation experienced must be accounted as "real" as anything else in the system" (James, as cited in Smith, 1967). Obviously, the collective lack of experience with LOs in an actual K-12 delivery environment has made implementation difficult, but the very nature of this form of learning and teaching makes William James' pragmatic perspective especially appropriate. Learning objects are discrete pieces of instruction that are most effective if they are fused together into organized "clusters" as part of a qualitative present within an environment that accommodates their access and reuse. This delivery method enables learners to experience learning contextually because they encounter both the discrete information contained within each LO and the inter-relations (or juxtapositions) among LOs within a specific grouping. Furthermore, LOs are most effective when they are viewed from an instrumentalist perspective in that they function as guides to action for both learners and teachers in the delivery environment. In other words, LOs can be viewed as performance support tools that help learners and teachers in a blended learning environment (Geary, 1991; Voos, 2003; Carman, 2002) and only when they are experienced as such, will educators begin to understand the true potential of this technology.

Like many other terms in the field of instructional technology, the terms “blended learning” and “blended learning environment” have come to have different meanings (Bonk & Graham, 2007). In the case of LOs & LOBI, a blended learning environment is a learning space where students receive personal support from a human facilitator while they access learning objects via the computer.

LOBI is one of the first models for distance education that is entirely conceived with the concept of a blended delivery environment in mind. This interplay between the computer as a delivery mechanism for discrete and interoperable “chunks” of digital content and the facilitator as a guide and a behavior support provider is a key aspect of LOBI that sets it apart from other computer assisted learning models. Unfortunately, few educators in the field have experienced LOBI within a blended delivery environment and had the opportunity to experience the transformative experience of learning and teaching using LOs. Granted, those LO theorists who have had such experiences have made enormous strides toward helping the educational community as a whole understand the potential of LOBI. But because LOBI is so different from other forms of computer assisted learning, and because it is so reliant upon an overall delivery environment that accommodates it, nearly all efforts to describe LOBI have failed to accurately capture its essence.

The field of instructional technology has traditionally held a great deal of respect for a systematic approach to designing instruction. Nearly every graduate course in instructional technology in America builds upon a foundation of systematic design principles that follow a predefined, mechanistic structure. Instructional technologists are all familiar with acronyms like ADDIE, flowcharts, taxonomies, and other methodical

approaches to “mapping out” a sequence for presenting instruction within a framework. Some may argue that this approach is quite appropriate for an existing learning environment like the classroom. By categorizing the events that occur in the instructional process (Gagne, 1965), and systematizing processes that can streamline the production of materials that help learners and teachers experience those events (Dick & Carey, 2001), educational content producers can efficiently create viable instructional materials that can facilitate learning. This process-oriented thinking has had a profound influence upon the development and delivery of technology-based instructional materials in the classroom since the field of instructional technology emerged in the 1960s.

The core underlying assumption that drove nearly all of these efforts was; however, that a closed and predefined learning environment exists in which activities can be categorized and that designers of materials that are to be presented in that environment know the best way to present instruction within that realm. The idea of a predefined space that can be mastered if educators can only efficiently control the activities within it is a basic premise of the modern American education system and it is evident in the field of education in the work of such greats as Bloom (1956), Mager (1962), up to and including more contemporary designers like Gardner (1999), and Wiggins & Mctighe (2005). The very emphasis upon learning objectives, academic standards and standards based testing are all born from this approach.

History will show whether or not the systematic approach for designing instruction is truly as effective as its proponents claim – perhaps sooner rather than later because of the very real pressures that are an intrinsic part of the NCLB legislation of 2001. Determining whether or not this approach has been effective in the classroom

environment is beyond the scope of this study. The point that this study more appropriately focuses upon is whether or not this approach is even feasible for the online learning environment. How can the mechanistic, systematic view of the processes involved in learning and teaching – a view that first "marks its territory," defines outcomes and then creates materials to reach those outcomes - have any plausible value in an environment that is as naturally boundless as the online learning environment? Should proponents of the systematic approach to learning and teaching continue their dominance of the learning space in the wondrous new world of instantaneous and ubiquitous information that is available to students and teachers in the online learning environment of today?

The pragmatic method is especially well suited for the online learning environment because it is a method only. It thrives in the realm of meaning. To a pragmatic instructional technologist who is creating or selecting learning materials to be delivered in the online learning environment, the emphasis is upon inquiry rather than truth. This is not to say that truth doesn't exist, it just suggests that our working conceptions of truths are very often relative to our conceptual systems (Lakoff & Johnson, 1980). This core acknowledgment, difficult as it is for some to make, is the gateway to a world of possibilities for the field of instructional technology. This simple shift in focus frees the savvy instructional technologist from the cumbersome role of "knower of truth" and "master architect" and it allows him to use the wonders of technology in a more experiential or contextual manner. Function in the delivery environment becomes the primary purpose for learning technology rather than some once removed factory-like process that churns out artifacts that fit into a predefined framework

that may or may not be compatible with existing instructional practice or a learner's present reality.

To date, nearly all efforts that attempt to describe LOBI have been unsuccessful because they have, perhaps necessarily, adopted a type of myopic view of this form of learning and teaching that neglects to emphasize its value for learners and teachers in the delivery environment. In effect, the attempts to describe the value of LOs using traditional quantitative methods have yielded little fruit because the results of these studies have been so obviously once-removed from classroom teaching practices that they have little meaning for educators in the field. Granted, there are many self-contained computer learning programs that can generate statistical results for learners, but without a model that blends the educational power of the computer with everyday teaching practices in a real, functioning learning space with "live" students and teachers, in-service teachers dismiss these programs – and their statistical results – as irrelevant.

While it is certainly possible to set up whole environments that utilize some form of learning object-based instruction in order to conduct a quantitative study and such efforts have taken place in Europe and Canada, these projects have had little impact upon the adoption of LOs & LOBI in the K-12 public school environment to date. Even the most elaborate and well funded efforts to empirically and objectively demonstrate the benefits of LOBI to greater educational community that have, indeed, included an environmental component have had little impact upon the widespread adoption of LOBI. The failure is not because the studies themselves were in some way bad or faulty, but because they relied upon a systems approach for the creation of instructional content used

in the study – an approach that neglected to emphasize a contextual view of learning and teaching with learning objects.

Furthermore, any new form of instructional technology in the K-12 learning environment that relies upon strictly quantitative research methods runs the risk of being subsumed by the myriad other studies currently underway that claim to demonstrate dramatic improvements in student performance. When faced with so many choices, many K-12 administrators encounter what Alvin Toffler terms “overchoice” (Toffler, 1970) and this is a very real obstacle that stands in the way of implementing any form of instructional technology into public schools today. The simple fact of the matter is that not all options are relevant, but nevertheless they are being presented to educators as viable applications of technology that meet their needs. The experience of disappointment that comes with the repeated realization that nearly all technology based educational initiatives, in fact, have critical flaws that make them obsolete in the current educational setting has fomented a sense of utter skepticism (Pepper, 1961) among educators regarding educational technologies in general.

To describe the specific details of the ideal learning environment for LOBI is beyond the scope of this study. It is my sincere desire; however, that the next generation of instructional technologists will embrace this need and establish a body of research that describes such a learning space.

Critique of Assumption #2 - LOs and LOBI Will Replace Classroom Teachers

Learning object based instruction (LOBI) is very different from traditional forms of self-contained computer-based training and the successful implementation of LOBI will require establishing a blended learning environment that fosters cooperation between the traditional classroom and an auxiliary learning space that accommodates LOBI. While the act of establishing auxiliary learning environments where students may engage in LOBI may be a relatively simple task from an organizational point of view – nearly all modern public schools have computer classrooms where students have access to PCs with high-speed Internet connections – there are still very significant concerns about negative reactions to LOBI from in-service teachers. The primary motive for teacher concern is that a learning environment that uses LOBI essentially competes with the traditional classroom for students; and that ultimately, the LOBI compatible classroom will replace the traditional classroom. While theoretically, this seems to be a viable concern, in actual practice, it becomes unreasonable.

By no means will LOBI replace traditional classroom practices. In fact, it depends upon classroom instruction for direction. LOBI thrives in auxiliary learning environments that can (and should) be set up to mimic the flow of instruction in the traditional classroom. For LOBI to be most effective, curriculum directors (or classroom teachers performing the role of the curriculum director), must be able to analyze existing classroom practices as they select the appropriate LOs from repositories and piece them together in an LMS for access in a LOBI-compatible auxiliary learning space. This simple idea of using the instructional topics presented in the classroom to guide the manual selection process for LOs and, subsequently, the sequence of the instruction

presented online, could prove to be an enormous breakthrough for the K-12 online learning environment. If learners in an auxiliary learning environment can access online lessons that address the same subject matter that is being presented in the traditional classroom in the same sequence that it is being presented, the need for remediation will be minimized if they transition back into the traditional classroom. Online lessons will mirror classroom instruction. The potential effect that this method can have upon the alternative education and at-risk student populations is truly exciting because it can enable educators to directly address the cycle of *removal and remediation* that plagues students who are temporarily absent from the classroom for any reason.

Consider the typical disruptive student who is removed from the classroom for a short period of time for disciplinary infractions. In the current state of affairs, these students are placed into educationally sparse learning environments where they receive little-to-no behavioral support (in-school suspension) or they are asked to leave school completely for a period of time (out-of school suspension). In both situations, these same disruptive students are cycled back into the student population after a certain period of time. The result of this exercise is that the underlying causes of the disruptive behavior have most likely not been addressed and the same disruptive students are re-introduced into the classroom with the same disruptive tendencies, but now they are several days behind their classmates in their studies. Very often, this leads to frustration, which leads to more disruptive behavior, which leads to a repetition of the removal process for disciplinary infractions. This cycle often repeats itself until students become so alienated from their peers and frustrated with their studies that dropping out of school becomes a viable alternative. The simple fact that LOBI can be configured in a manner that mirrors

the lessons presented in a student's home classroom and presented in blended auxiliary learning environments where behavior support is part of the educational experience can eliminate the cycle of removal and remediation because students in these environments can "keep up" with their classmates while they receive targeted assistance from an on-site facilitator. Ultimately, auxiliary learning environments that use LOBI can have a profound impact upon drop out rates in America.

A secondary aspect of LOBI that makes it appealing for classroom teachers is the fact that the LOs that are selected for delivery in auxiliary environments can also be used to augment classroom instruction. By simply logging into the online lessons and using a projector, teachers in the traditional classroom environment can use some of the individual learning objects that are selected based upon their lessons to supplement their classroom instruction. While it is entirely possible for teachers to participate in the creation of online lessons by simply allowing curriculum directors to use lesson plans as a guide, and then neglect to use the selected (or created) LOs in their classroom teaching practices, this form of dual use can have a significant impact upon widespread acceptance of this form of learning and teaching because it provides tangible benefits for classroom teachers that may entice them to consider LOBI.

Critique of Assumption #3 – LOBI is just another form of computer-based training (CBT) that will have little impact upon learners and teachers in the K-12 environment

Because of so many failed attempts to integrate instructional technology into their teaching practices, many educators in the field today fail to see how yet another form of digital instruction can have meaning for them in their current environments. If they have had experiences with instructional technology, (or even learning objects, for that matter) they have often not necessarily been positive ones. Thus, the field of instructional technology is faced with a dilemma, how can we effectively describe the wonders of learning objects to an educational community that has so many misconceptions about, and negative experiences with, instructional technology?

The riddle, or koan that can be best used to shed light on the current state of affairs is "learning objects have no meaning for teachers because teachers have no experience with learning objects" - and herein lies the root of one of the key problems that interferes with the implementation of LOBI. The problem is not so much that educators hold misconceptions about LOBI that interfere with implementation, the problem is that they hold no accurate conceptions at all concerning using this technology and they often rely upon deductive reasoning to come to a conclusion regarding LOBI. The current reasoning goes something like this:

- Computer Based Training (CBT) is inappropriate for the K-12 learning environment
- LOBI is a form of CBT
- LOBI is inappropriate for the K-12 learning environment

The problem with this reasoning is not only that it relies upon a false assumption (LOBI is a form of CBT), it also utilizes deductive reasoning (i.e. the conclusion is necessitated by the premises).

Perhaps a better way to address learning objects would be to employ abductive reasoning that would go something like this:

- Learning objects have great value for learners and teachers in the K-12 environment
- Computer Based Training (CBT) is inappropriate for the K-12 environment
- LOBI must have characteristics that make it something other than CBT

Granted, the first impulse of many educators is to compare LOBI to the computer or web based training of the past, or other forms of distance education that are currently in use today, and these mistaken associations cause significant obstacles to implementation. But rather than attempting to address the various (and almost infinite) number of misconceptions that educators in the field hold regarding LOBI, would it not be much more effective to let them experience it for themselves? Put very simply, educators need to *experience* LOBI within a delivery environment that accommodates it if they are to build a body of knowledge that demonstrates the potential of this technology to the greater educational community. If implementation is the desired outcome, the questions then become how do you entice educators to enter into the learning space and how do you encourage them to participate in LOBI as researchers, producers of instructional content, learners and teachers. In other words, how do LOBI

advocates help educators to “speak to” the naturally occurring abductive process in learners to help them to teach more effectively?

Ultimately, it may be practically possible and effectively beneficial to think of learning objects a words in a type of metaphoric language that can be used to express the value of computer assisted learning and teaching. This symbolic language could be metaphorical and experiential in nature and it could appeal to what Lakoff & Johnson (1980) call our collective imaginative reality. By relying upon the fact that human beings are compelled to render juxtapositions meaningful, this new language could leverage the open/iconic mode of abduction in receivers as a generative mechanism for rules of order (Shank, 1996). It could not only be used to describe the technology of LOs to educators in such a way that enables them to recognize the vast potential that this form of learning and teaching has, it could also serve as general form of human expression that can be used in other fields and endeavors.

In an interview conducted by Robin Good in 2004, Steven Downes refers to learning objects as “Words in a new vocabulary of a multimedia language and we need to learn to become fluent with that language. We need to learn not only how to create words, but also to have conversations… to use these resources as a way of making our point.” (Downes, 2004). This experiential language must be explicit and universal enough so that it can be used to explain LOBI to an audience that has little-to-no experience with computer assisted instruction in a way that they can easily comprehend. It must also be productive in that it produces artifacts that are interesting enough to be appealing for receivers (learners) while it speaks to their innate desire to embark on a quest for the meaning in an attempt to understand the organizing principles that drive the phenomenon

of learning in a LO based lesson. This new language must also be flexible enough to enable speakers to weave LOs together as a form of expression to convey a desired message while it demonstrates their effectiveness in the realm of learning and teaching. Finally, for this new language to have the most impact, it must not only describe learning objects within the traditional constructs of the prevailing research paradigms that drive educational research today, it must (or at least, with the help of stored digital multimedia it *can*) enable inquirers to actually *experience* learning objects as a form of communication and human expression in a learning environment.

Critique of Assumption #4 – Instructional technology is a sub-set of the field of instructional design, and therefore must adhere to a systematic paradigm when designing content for learning objects.

The field of instructional technology must deal with the exponential rate of change that is a basic reality of the information age (Toffler, 1970). If we consider the work of such visionaries as Pappert, Atkins & Suppes in the 1960s as the beginning of the computer assisted learning movement, it is safe to say that few innovations that attempt to blend the processing capabilities of the computer with actual educational practice in the K-12 learning environment have been successful. Using 1960s as the starting point for the field of instructional technology, it is easy to trace the repetitive cycle of innovation, implementation, and obsolescence of several computer assisted learning technologies such as instructional television, videodiscs, and computer-based training. Indeed, this history of almost instantaneous obsolescence makes it difficult for educators to commit to any one form of media-based instructional technology in today's schools because it will most likely be replaced by another solution in the very near future.

Each of these failed attempts to harness technology for education has a common association with a systems approach to learning and teaching – an association that, I submit, has had a largely negative impact upon the instruction that is delivered via these technologies. On the surface, the marriage between systematic instructional design and information technology seems to be a good fit because both disciplines have their roots in a mechanistic world view (Pepper, 1961). Problems arise, however, with implementation. In other words, the educational products of this marriage are inherently self-contained

and relativistic, and difficulties arise when placing them in context. The simple fact that public schools are one of the last sectors in the American economic landscape to embrace technology underlines this difficulty. From a Peircean point of view, a key problem is that the field of instructional technology has become increasingly nominalistic, and there is a need to adopt a stance that embraces realism and environmental factors in order to successfully implement LOBI (or any other form of computer assisted instruction, for that matter).

Although a thorough explanation of influence that realism and nominalism have had upon the field of instructional technology and learning objects is beyond the scope of this study, a brief note describing my tendency toward realism may be in order. When I use the term realism, I am referring to a philosophical worldview that holds that reality exists independently of the human capacity to understand or perceive it. Things happen in the world around us that are completely out of human control and there are many things in our environment that are beyond our understanding at this point in our evolution. One of the key aspects of the pragmatistic philosophy that makes it so appealing to me is the idea that it acknowledges realism and it provides the tools needed to constantly orient the inquirer to the world around him. In very broad terms, pragmatacism enables inquirers to consistently apply the scientific method to address the recurring sense of genuine doubt that very often goes hand in hand with fixed beliefs (Peirce, 1877).

The theme of human beings interacting with environmental realities to replace deeply held fixed beliefs is constant throughout human history. Undoubtedly, the founders of the instructional TV movement were just as certain about their efforts as followers of the Ptolemaic worldview were; or at least, they had to operate upon the same

basic principles of scientific positivism. Who is to say that field of instructional technology is not currently following the same path as early map-makers who charted their surroundings and assumed that the world was something other than a globe, or the early physicians who spent an inordinate amount of time administering leeches and dealing with pesky homunculi. Upon further reflection, it seems much more likely that we are just as limited in our worldview as the earliest mapmakers, the ancient Egyptians, or the early hunter-gatherer cave dwellers. The only difference is temporal.

By no means am I suggesting that a systematic view be abandoned for a purely contextual worldview. This study is not intended to be an accusation of the people involved in the fields of instructional technology, computer science, or information technology. It is, however, intended to question the basic assumption that it is possible for humans, in our current condition, to systematically encapsulate any objective truths about such mysteries as learning, evolution and innovation. At the very heart of scientific positivism is a basic assertion that it is possible to prove things to be objectively true or false, and that assertion is simply not applicable in many realms of human experience. Furthermore, the avowed purpose to the "exact sciences" is to establish complete intellectual control over experience in terms of precise rules which can be formally set out and empirically tested (Polanyi, 1962). This stance neglects several phenomena that are at the very core of our human experience like agape, love, compassion, inspiration – *and learning*.

Pragmatistic instructional technologists not only reject the notion that an absolute, objective truth is directly knowable for individuals in our current state of existence (before applying the methods of scientific investigation) they also reject the need for

ongoing systematic structural control over the experience of learning and teaching. Much like the systems approach, pragmatism is a method only, a method that orients people to their environments in a practical way (James, 1907). Rather than focusing on arriving once and for all upon an absolute and objective *truth*, pragmatists start with the concept of *meaning* and they use the term freely to describe their environment. Using the phrase 'I don't know' and abandoning a priori methods can be incredibly powerful and practical tools when designing instruction because the designer who uses them acknowledges a respect for the mysteries of learning, opens the door to abductive reasoning, and harnesses the pure energy of genuine doubt.

Furthermore this approach to learning and teaching does not align itself with any one school of learning theory. On the surface, LOBI and pragmatistic instructional technology may appear to be similar to constructivism (Piaget, 1955) because of their common emphasis upon learners in situ, but upon further examination the differences become quite clear. The primary difference is that the pragmatistic approach to delivering stored media does not align itself with any one learning theory. In this sense, it is categorically similar to instructional systems design because it can meet the needs of learning theorists from various different schools. It is quite possible for a two curriculum directors to create learning object based lessons that represent dramatically different ideas about learning and teaching.

Pragmaticism makes no claims to be a learning theory at all! It is a method of orientation and inquiry only as opposed to a grand attempt to understand and map out all of the mysterious nuances of learning and teaching. One key aspect of pragmatacism that sets it apart from some learning theories like constructivism is the idea that pragmatacism

emphasizes an external, ontological reality exists whether or not learners recognize or perceive it. The focus is outward rather than inward. Ideas are extracted rather than constructed. Learning has been an archetypal part of the human experience long before any modern theory of learning has emerged to explain it, and more revelations are bound to emerge that will likely refute many of the deeply held ideas of today. Pragmaticism is more like a catalyst. Its devotion to external ontological realities and genuine doubt can make it an important tool for the field of instructional technology as we collectively address the great mysteries of learning and teaching.

More specifically, the basic acknowledgement that we are very limited and flawed in our attempts to understand learning and innovation can be incredibly liberating for the field of instructional technology because it can free us from fixing our beliefs upon educational delivery systems and technical standards that content producers, learners and teachers are beholden to as they engage in the creative meaning-making process that is learning and teaching. Furthermore, this shift in emphasis away from the "hollow environmental shell" to the act of making meaning enables us to focus more efficiently upon the very texture of the environment where learning actually happens.

What about structure then? There seems to be an inherent need for some kind of organizational structure for shared experiences in our society and the educational space is no exception. Without it, our life experiences would be chaos. A pragmatic instructional technologist acknowledges this need, but the very next question that they might pose is "exactly who creates this structure" – or perhaps more appropriately from a pragmatic point of view – "how can we best align ourselves to an existing structure that is ultimately out of our control?" This stance is often quite difficult for instructional

designers who advocate a systems approach to assume because it cuts to the very core of "knowing." Rather than a rigid, inflexible assertion that a certain structure or process should (or even *can*, realistically) be imposed upon the phenomenon of learning and teaching, the pragmatic instructional designer begins with what currently exists in the learning environment and works from there. There is an emphasis upon diagnosis rather than prescription. Rather than a once-removed, single-minded practice of designing structures and then producing (or locating) instructional materials that fit within those structures, the pragmatic instructional designer focuses upon needs and functions within the learning environment. The result is that changes, especially changes brought about by the use of instructional technology, will be much more closely aligned to the everyday learning and teaching practices of students and teachers.

Critique of Assumption #5 – Detailed content publishing standards MUST be developed and refined if LOs and LOBI are to be successful.

One example of the unsuccessful application of a systematic approach to design the content of learning objects can be seen in the early work of M. David Merrill at Utah State University and his efforts with the ID2 Group in the 1990s. Their seminal work laid the foundation for much of the thinking that has gone into the modern day learning object movement, but their insistence upon applying a systematic mindset to the development of instructional content contained within LOs has, in effect, stunted the growth of LOBI. One of the tantalizing capabilities (from an ease-of-use and economic point of view) that Merrill and his contemporaries investigated was the idea that once the metadata referencing process is perfected and all LOs are created and stored in a uniform and consistent manner, LO based lessons can be automatically generated with little-to-no help from instructional designers. This is a tempting concept because, from the point of view of those who are devising SCORM and other metadata referencing standards, it would be quite possible to assume that once everyone adopts their metadata tagging scheme and any one content creation (or aggregation) model, it would be a relatively simple process to create or modify search engine technologies to automatically piece together LOs to create lessons. This concept was one of the driving forces behind M. David Merrill's ID Expert™ system that failed to gain acceptance in the late 1990's (Merrill, 1998). Nevertheless, the idea that the systematic design process involved in creating computer-based learning sequences can be automated using search technologies remains appealing for educators with little knowledge of computer assisted instruction and administrators who are concerned with financial issues.

These early efforts to take advantage of the benefits afforded by a systems approach and a mechanistic worldview failed, not because this perspective is altogether inappropriate in the realm of learning objects, but because it crossed the boundary between form (instructional content) and function (access & delivery mechanisms) that must be maintained when dealing with learning objects. Surely, systematic and mechanistic search technologies offer many advantages to curriculum directors who assemble lessons based upon learning objects. The problem arises, however, when this mindset is applied to the creation of learning objects themselves. In other words, there have been several efforts to systematically define content models, or "templates" for learning objects and these efforts have met with limited success (Verbert & Duval, 2004; Liber, 2005).

Metadata standards like SCORM fit well with self-paced, individualized instruction, and they emerged in the 1990s to *retroactively* regulate a form of digital instruction called computer based training (CBT) that is best suited for adult learners in industry, government and the military (Godwin-Jones, 2004). The fact that SCORM emerged long after the introduction and actual practice of computer based training is an interesting fact that should not be overlooked. In order to create a content model for learning objects that is more suited for learners in the K-12 online learning environment, some scholars argue that it will be more beneficial to consider existing practice in classrooms rather than focusing upon inherited restrictions and mindsets imposed by existing programs and systems engineering processes (Wiley, 2002; Friesen, 2003).

Metadata referencing standardization projects are a vital conceptual step toward unlocking the potential of LOBI because they underline the need for a metadata standard

that simplifies access, but the practice of LOBI will only reach its full potential when the field of instructional technology as a whole begins to view learning objects as separate from the metadata referencing standards that are used to access them.

Learning objects contain meaning. But several somewhat tongue –in-cheek questions that inevitably follow such a statement are: "Just how much meaning should each learning object contain?" and "What does that meaning look like?" One of the key aspirations of this study is to indirectly address this issue by emphasizing the importance of the compulsive, and formative, call to meaning that is an indubitable ingredient in all learning and is a vital force in any learning environment that uses LOBI. Hopefully, this new emphasis upon meaning in the learning environment will help to shed a new light on the situation and help solve (or eliminate) the problem of coming up with strict guidelines for populating learning objects with instructional content.

LOs are formative tools that can shape the target delivery environment. But the largely overlooked fact in the evolution of this technology is that the target delivery environment also shapes LOs. In other words, the enormous potential of this form of computer assisted instruction will go largely unrecognized until the field of instructional technology begins to consider context more carefully when addressing content. Such a shift in emphasis from current efforts to systematically define the content of learning objects within a framework to an emphasis upon needed activities in a learning environment will enable the field, as a whole, to shift its collective attention to the *function* of LOs in the target delivery environment instead of the *form* of the instructional material contained within a LO. Ultimately, the need to address instructional functions of LOs within the learning space can, and should, be the primary concern of any content

publishing efforts rather than adherence to an arbitrary content model, or zealous belief in technological determinism.

By focusing upon the activities of a curriculum director who selects and assembles learning objects according to his or her needs, the field of instructional technology can side-step many of the concerns about which content model is best. This type of situated instructional design (Wilson, 1995) coupled with rapid prototyping techniques (Tripp & Bichelmeyer, 1990), will not only enable students and teachers to participate in LOBI in the near term, it will also enable the instructional technology community as a whole to perform a collective formative evaluation and conduct more formal types of inquiry that will help to refine an ongoing process.

Furthermore, this exposed demand of curriculum directors who are immersed in a continual selection process with all of the instant fulfillment capabilities of the Internet at their fingertips make them powerful consumers who will undoubtedly attract the attention of content publishers who will create LOs that meet their demand. Ultimately, this selection process, conducted over time; rather than a once-removed and one-time design process, will have the most profound impact upon the content that goes into a learning object. How will interested parties know which learning objects "work?" They will simply observe which learning objects are *used*.

Several instructional technologists recognize the value of a tool oriented perspective of learning objects in the learning environment. Haughley contends that "learning objects do not have value or utility outside of instructional contexts and that their value is in their application to classroom setting and to online learning environments where teachers may or may not be present" (Haughley, 2005). Wiley suggests that it is

possible to utilize learning objects as semiotic tools to shape learner experiences (Wiley, 2002), but few theorists have gone so far as to advocate the use of learning objects to evoke what Dewey terms “productive pragmatism” or “instrumentalism” (Hickman, 2001).

At this juncture, it may help to clarify the use of the term instrumentalism as it pertains to the use of learning objects. Typically, instrumentalism is viewed as a methodological viewpoint akin to pragmaticism that assumes a type of “black box” view of ideas (Latour, 1987), refuses to engage in arguments about “truth” and instead looks at how ideas can be used to explain phenomena. With specific application in the realm of LOBI, instrumentalism is valuable because it can be used as a justification for the idea that LOs are whole, indivisible entities that are used to support learning and teaching.

From an instrumentalist point of view, LOs not only have value in terms of their ability to contain instructional content that is reusable and interoperable with a learning environment, they are most effective when they are viewed as tools, that can shape the very environment in which they are used. While they certainly have meaning in and of themselves, when juxtaposed with other learning objects and blended with on-site facilitation from a “live” person, learning objects become extremely powerful teaching tools. This contextual view of LOs and LOBI has been long absent from the conversation surrounding this technology and only when it is sincerely embraced will LOS and LOBI have any real impact upon learning and teaching practices in today’s public schools.

Oftentimes, when considering context, instructional technologists and educators in general, tend to focus solely upon the technical or educational influences in a target delivery environment. While few would argue that educational concerns should lose their

position of primary importance in any learning environment, other concerns that have a profound impact upon the quality of the learning experience must be considered. To put it quite plainly, for learning objects to be successful in America, they must fit into an economic and social context that is consistent with the greater market forces that drive capitalistic societies. Any thorough contextual view of the K-12 public school learning environment in America cannot ignore such environmental realities.

For the first time in its brief history, the field of instructional technology is poised to take advantage of the economic realities that govern capitalistic societies by leveraging mastery of the processing power of the personal computer and peer-to-peer technologies to vastly improve the quality of online education in America's public schools. This can all be achieved by a simple shift in focus. For LOBI to be most successful in a market economy, the real target audience for learning object production efforts must be students in the field – and this must remain true regardless of how a learning object's content is produced or how it is presented to a learner in the target delivery environment.

Perhaps the best way to envision the proposed instrumentalistic view of learning objects is to think of a person who is immersed in the educational delivery process called a curriculum director who performs what David Wiley calls the non automatic, or "by hand" method for creating learning object based lessons (Wiley, 2000). Much like a radio disc jockey searches through libraries of compact discs or MP3 files and selects songs according to the desires of the listening public, a curriculum director selects learning objects from web-based repositories and presents them to learners online. The curriculum director's function is to analyze classroom activities in order to isolate key topics addressed, search through repositories to select relevant LOs that address the same

content, consolidate those LOs into a learning management system shell, and then use the learning management system's assignment feature to initiate the administrative tracking capability for each student who logs in to take lessons. This cycle can happen for each student on a weekly basis so the online lessons are, to some degree, aligned with the instruction presented in the classroom.

In such a practical scenario, the curriculum director need not have the ability to create digital materials – much like a radio disc jockey need not have the ability to make music. He or she deals in completed works. The learning objects that will be used are the ones that require no assembly, giving new meaning to the phrase "plug and play." All the curriculum director needs is access to repositories of self-contained, free-standing instructional materials organized by topic that can be accessed and delivered together simultaneously in the same learning management system. It is this very primitive process of analyzing classroom instructional activities, hunting through repositories and gathering relevant LOs - that will provide a very real and practical conceptual (and contextual) framework for the implementation of LOBI in public schools across America.

The key to understanding the best way to organize content within a learning object is to focus upon the manual assembly process performed by curriculum directors. The introduction of this person into the delivery process and the collective focus upon his or her needs in the emerging marketplace of digital materials may just be the liberating next step that will pull the field of instructional technology out of the quagmire of debate surrounding the question of "what is a learning object?" From the perspective of a curriculum director, digital materials that do not clearly, in and of themselves, address an instructional topic have little use because they require some production and/or labeling

process that interferes with his or her primary role of reviewing and selecting materials. In other words, learning objects delivered in such an environment must adhere to two key design principles of *experiential wholeness* and *spatial coexistence*. Each of these guidelines is explained in some detail.

The guideline of experiential wholeness is an attempt to remove the onus of producing digital learning materials from curriculum directors and actors in the delivery environment and place it squarely upon the content publishers who create learning objects and profit from their use in the target delivery environment. By establishing this guideline, educators are exonerated from labor intensive development processes as well as the design and technical complications that commonly arise when creating digital learning materials. Educators leverage their uniquely human capability to make meaning in the field - an ability that cannot be emulated by computers (Wiley, 2001) - to become consumers of learning objects, in much the same way that they are currently consumers of textbooks, and they can leverage their buying power to inspire content publishers to produce quality learning objects that meet their needs. By no means am I suggesting that only commercial publishing firms should create LOs for use in the online learning space. What I am suggesting is that this creative process meets a bare minimum standard for quality and that the publishing process is clearly distinguished from existing responsibilities of classroom teachers, on site facilitators, and curriculum directors. Furthermore, this approach is designed to place educators in the field at the heart of the learning object creative process by exposing their demand in a way that has never been possible in the K-12 education market before.

Learning objects that adhere to the principle of experiential wholeness are ideal for K-12 online learners because they are the result of creative processes that are very often labor intensive. In the majority of the literature that addresses the subject, the fact that it takes a good amount of effort and skill to create a high quality LO is often presented in a negative light, but I propose that this required intensity of labor will ultimately produce artifacts that are more beneficial for learners. Of course, low quality learning objects that meet the requirement of experiential wholeness with undoubtedly emerge, but high quality learning objects will also emerge that will spark a type of competition among commercial publishing firms to present their materials within the learning space. This surprisingly simple guideline of ensuring that every learning object clearly and distinctly represents an instructional topic, or guiding principle – *per se* – can open a new economy of learning objects that will be driven the needs of learners in the delivery environment.

The second key design principle of spatial coexistence addresses the tendency of some digital publishing firms to use a deliberately provincial and isolationistic approach to presenting their learning materials in an attempt to dominate the online instructional delivery environment. The spatial coexistence guideline is an extension of the interoperability guideline that is often addressed when discussing LOs because it "makes room" for several types of media-based instruction from different vendors within the same cluster of amalgamated learning objects assembled around one central instructional theme, or guiding principle. But unlike the interoperability guideline that ensures that LOs can be delivered in different learning management systems, spatial coexistence deals

with basic assumption that learning objects must be able to be juxtaposed within a single lesson in order to facilitate abductive reasoning.

Consider a typical 10th grade Earth/Space Science class that is addressing Copernicus and his theory of heliocentrism. The classroom teacher prepares a weekly lesson plan that spells out the key instructional objectives and classroom activities for the week and a curriculum director uses that plan to guide the assembly of a learning object based lesson that addresses the same topics. To build the online lesson, the curriculum director turns to several repositories of learning objects - organized by media type, instructional topics, and learning function - and selects videos, flash movies, web sites, reading exercises, interactive multimedia exercises, and assessment activities that all address the Copernican revolution. He or she then creates links to these objects and assembles them in a weekly learning plan that can be assigned to any 10th grader who wishes to log in and access the lesson. If each of these learning objects, regardless of their media type, adheres to the concept of spatial coexistence, the end result will be a fully engaging, multimedia rich learning experience that can be self-paced for each individual learner who logs into the LMS.

If, on the other hand, an instructional video takes 4 hours to view, an interactive sequence relies upon generating student data files that are only readable by certain learning management systems, or flash movies include a nested menu and access structure that makes access difficult, the basic principle of spatial coexistence will break down and the assembled lesson will become tedious for learners and ultimately ineffectual.

Just how specific must the guidelines for experiential wholeness and spatial coexistence be? The answer is, quite plainly, nobody knows for sure. But rather than imposing a strict guideline upon the creative process, the pragmatistic stance is to let the practical needs of a curriculum director and learners in a blended delivery environment decide. Over time, an iterative. social constructivist process will emerge that will regulate the interchange between the development of learning objects and their use in the delivery environment that will be far more elegant than any preconceived content model that can be developed.

A great historical example of this formative, social and abductive evaluation process for technology is evident in the evolution of the modern day feature films that are currently playing at your local theater. Certainly, when Thomas Edison first patented motion pictures and created his Kinetescope in the 1890's, he and his contemporaries had no way of knowing that a 1½ to 3½ hour time slot was going to emerge as the "best" length for a feature film. At the time, it may have been quite preposterous to suggest that the choppy images projected on a wall would eventually be encapsulated into units of meaning that have a surprisingly similar structure in terms of duration and even internal structure. What Edison and his contemporaries did know was that they had discovered a new way to express meaning via technology, and they worked from there. These discoveries initiated a collective abductive process akin to Pinch and Bjiker's SCOT process (Bijker, Pinch & Hughes, 1987) that, over time, gave to the motion picture industry of today. The fact is that the vast majority of movies shown in your local theater follow a similar format – not because of some externally devised and imposed content publishing standard that governs the creative process of conveying meaning via film, but

rather because of a resonance with the needs and demands of the general viewing public that places this form of entertainment conveniently, and comfortably within the context of their daily lives.

In the current state of affairs in the online learning environment, (an environment that is in the very earliest stages of its evolutionary development), it is entirely possible to tap into these same social forces of choice and preference in order to solve many of the debates concerning learning object content models.

To put it quite plainly, there is no need to precisely define the content of a learning object – any more than there is a need to mandate a certain key for music, a specific brush stroke for paintings, a basic geometric form for all sculpture, a precise meter for all poetry, an exact combination of spices for all Mexican food, a prescribed number of acts for a theater production, etc... The act of creating instructional content is an art that plays upon the architectonic stage of human reason (Kant & Meiklejohn, 1897) and to interfere with that process with external rules would interfere with a very important, naturally occurring evolutionary process. In the specific case of LOs & LOBI, the content creation process is an art of expression contained within a mechanistic shell that simplifies access and reuse. To allow the mechanism of the delivery environment to place too many restrictions upon the content development process runs the risk of interfering with the natural tendency of both content producers and learners to construct their own systems of understanding when engaged in the creation and use of learning objects.

A key point that needs to be made surrounding the use of LOs in the online learning environment is the fact that a current emphasis upon syntactical attributes, rather

than pedagogical use is driving the conversation (McCormick, 2003). Most of the progress made toward the development of a content model for LOs has been the result of theoretical debates between the fields of information technology and instructional design, and both fields adopt a view of the problem that has yet to capture the potential that LOBI offers. According to the Institute of Electrical and Electronics Engineers (IEEE), the governing body that is currently working to define a standard for learning object metadata (LOM), the purpose of their standards project is to:

> …enable education, training and learning organizations, both government, public and private, to express educational content and performance standards in a standardized format that is independent of the content itself… The Learning Object Metadata standards will focus on the minimal set of attributes needed to allow these Learning Objects to be managed, located, and evaluated. (IEEE, 2002)

The idea that LOs can contain various forms of instructional data is a basic value proposition in nearly every popular content model for LOs. But again, the problem arises when educators assume that a universal agreement upon the metadata "shell" that contains the instructional content within a learning object will automatically make learning happen (Welsch, 2002).

To further deconstruct the instructional effectiveness of placing too many restrictions upon the content contained within a learning object, consider how several attempts to create learning object content models have made a common mistake of attempting to identify time and space with the second basic formistic category of

particulars. This is a source of categorical confusion because the relational structures of time and space must be converted into ties among particulars, which unnecessarily aggravates the problem of ties between particulars and threatens to plunge formism into mechanism and thereby wreck the whole categorical structure of formism (Pepper, 1961, p. 174).

For LOBI to be effective in the K-12 online learning environment, the shared understanding of the term "learning object" must include an emphasis upon functional pedagogy in the context of a delivery environment while allowing for, and even catalyzing, the innovative process involved in creating and arranging instructional materials to facilitate the meaning making phenomenon that we call learning. Current efforts to somehow formulate a shared and practical conception of LOs from a strictly theoretical perspective continue to fail not because they are entirely incorrect or inappropriate, but because they only begin to address the needs of learners and teachers in the target delivery environment. The key issue that the field of instructional technology can "sink its teeth into" is the establishment of a target delivery environment in which learners and teachers can practice the use of LOBI to help the debate become more focused upon practical issues.

Throughout his essays John Dewey challenges the basic assumption that technology is chronologically later than, and even ontologically inferior to science based upon the notion that science is theoretical and technology is "merely" practical (Hickman, 2001). For Dewey the term "technology" refers to "…all the intelligent techniques by which the energies of nature and man are directed and used in satisfaction of human needs; it can not be limited to a few outer and comparatively mechanical

forms." (Dewey, 1981). Surely, Dewey's sentiment more effectively captures the essence of instructional technology's attempts to understand the best way to present LOBI than a mechanistic and/or scientific world view can.

The current dilemma surrounding the implementation of LOs in the online learning environment epitomizes the rift between the practicalities of a technologically deterministic approach to the creation of instructional content as opposed to a social constructionist approach. When attempting to define the nature of learning objects in a way that meets the needs of learners and teachers within the target delivery environments, a pragmatist would adopt a much less prescriptive stance in favor of a more diagnostic position. Dewey advocated the use of tools as "the expression of the man/environment interaction; by the way means and consequences of action are adapted to each other" (Dewey, 1926 as cited in Hickman, 2001, p. 46) and it is precisely this symbiotic interchange between man using tools and environmental factors shaping both tools and man that is missing from current efforts to understand learning objects. It is precisely this interchange that has shaped every other form of stored media that we use in our daily lives today. Learning objects will not be an exception.

Efforts to come up with a universal content model that streamlines the process of creating learning objects are beneficial for educational publishing firms for primarily economic reasons, but they are no guarantee that the end products will be beneficial for learners and teachers in the delivery environment because, in the current state of affairs, learners and teachers are not involved in the development process. The simple fact that there have been several significant efforts to devise content models that introduce a type of template-based, systematic approach to populating learning objects with instructional

content shows that there is a pressing desire to understand how best to address exactly what a learning object should contain. Each existing content model has its merits; but again, each model also has its roots in technological determinism and systematic design. Furthermore, there is a tendency to establish a predefined structure for content that is incompatible with content that follows other content models – the result being that each learning object that follows any one particular model defies the principle of spatial coexistence and must be adopted universally within a predefined system. This tendency to predefine and dictate the structure of the learning experience tends to not only ignore the basic characteristic of interoperability, it also conflicts with the contextual "here-and-now-ness" that is possible with LOBI and it defies the two key design principles explained earlier.

In the isolated world of computer based training where courses are loaded onto computer hard drives and learners interact with locally stored content only, the systematic approach to developing and delivering digital content has great merit for both learners and producers, but in the world of LOBI an all-important variable has been introduced into the equation – that is the ability to instantly access an almost unlimited supply of pertinent information instantly via the World Wide Web. This ability places an enormous amount of power to choose at the fingertips of learners and teachers in the target learning environment and it presents a somewhat daunting challenge for instructional designers to re-think their prescriptive and systematic tendency to control the information presented in a learning space. It is precisely this use of the Internet and search technologies to harness the power to choose within the learning environment that will drive the development of

successful content models for LOs as opposed to a prescribed approach to populating a pre-defined template with instructional content.

Obviously, no single content model has proven to be universally superior to others at this point in the development of learning objects. The proposed solution to this problem involves establishing a dynamic learning environment that enables curriculum directors, learners and teachers to actively employ technologies to choose which learning objects best suit their needs. Ultimately, analysis of this selection process within the learning environment, continued over time, will help the field of instructional technology to better understand how best to populate learning objects with content By adopting a diagnostic view of the learning environment and identifying commonly occurring activities, it may then be possible to create common classes of learning objects that can be categorized by their function within a learning environment rather than their place within a systematic framework imposed by an instructional designer who may, or may not have an accurate understanding of the needs in the target delivery environment.

Critique of Assumption #6 - Existing CBT Courses and Recorded Classroom Lectures Can be Broken into Learning Objects and Used to Drive Instruction in the K-12 Online Learning Environment

Learning objects represent whole experiences and for them to be most effective in a learning environment that supports LOBI, they should be designed that way. From the standpoint of agents in the target delivery environment, it may be best to view LOs as irreducible "black boxes" (Latour, 1987 & Berard, as cited in Friesen, 2001) While it is quite possible to manually deconstruct recorded learning events, call the disjointed pieces learning objects, and then present them to learners in an LMS shell, this practice has proven to be problematic from a learner perspective. The almost classic quote from M. David Merrill regarding this practice is "You can't chop things up and expect them to make sense" (Carmen, 2002). The process of chopping up whole educational experiences in the form of recorded classroom lectures or existing computer based training courses defies the very nature of transcendent formism that governs the creation of the original work (Pepper, 1961, p.162). This perversion of the artisan's original intention when creating the work - be it a performed classroom lecture or a whole computer-based training course - is quite often obvious to learners who encounter the modified artifact in the delivery environment.

Commercially produced learning materials like textbooks, filmstrips and exercise workbooks have always been designed as irreducible wholes categorized around a central theme in the learning space. This practice should continue in the LO compatible delivery environment. The key difference will be that the traditionally exclusionary and dominant stance of individual forms or instructional media (i.e. textbooks, computer-based training,

and live or recorded lecture presented online) can, and must, make room in the learning space for other forms of instructional media that support learning and teaching.

To avoid confusion and to help focus the efforts of content producers, this shift toward the necessary coexistence of types of learning objects must become part of the original design of each type of learning object. The producers of lectures, or instructional videos, or interactive flash movies, or any other form of learning material that wishes to be called a learning object must adhere to the simple concepts of experiential wholeness and spatial coexistence. Each learning object becomes its own free standing and self-contained entity of instructional content that is designed to be blended with other free standing and self-contained learning objects in the delivery environment. All learning objects are organized around one central organizing concept, or theme that represents the desired learning outcomes for the learner.

This guideline of experiential wholeness can help to resolve questions regarding whether or not a piece of digital media would qualify as a learning object and can ultimately solve the great riddle of "what is a learning object" by the application of a very simple test. In order for a learning object to be classified as experientially whole, the learner (or designer, or facilitator) must be able to determine the central organizing theme that it addresses independently, without input from any other sources. Learning objects must be self contained, but they must also be cognizant of other self-contained learning objects in the learning space that address the same instructional topic.

The challenge is to avoid a sense of disjointedness that leads to a type of disengaged confusion in learners who engage in LOBI. While it is true that experience and abductive inference are the mortar, or as Pepper calls it – the "positive dynamic

factor" (Pepper, 1961, p.261) that ties learning objects together in assembled lessons, there is a danger of an over-reliance upon the compulsive call to meaning in learners that makes all learning possible. An over reliance upon learners' ability to "connect the dots" is a very real danger in the world of LOBI because it has the potential to shift focus away from the cohesive and engaged active experience of learning to the individual learning objects themselves. The result is a shift that breaks the "flow" of abductive meaning-making on the part of learners and distracts them from the guiding principles that were used to assemble lessons.

A good mental image that can be used to describe the shift from epiphenomenalism to experiential wholeness is the experience of viewing stereograms - the computer generated pictures that consist of what seems to be a random smattering of dots until observers "unfocus" to see the hidden image. This process of "getting" the underlying image (guiding principle) is an excellent example of how learners can make a type of intuitive leap from epiphenomenalism to a type of abductive learning that can be elicited by a learning object based lesson that "flows" from one learning object to the next. On the other hand, if a lesson includes a mish-mash of learning objects that are haphazardly thrown together, learners experience much the same type of frustration as the unfortunate people who are unable to see the images contained within stereograms.

The idea that instructional materials must coexist in a learning environment is an important stance to take when advocating LOBI as a viable alternative to exclusionary online learning materials. As things stand now, very few content publishers create online learning materials that can co-exist in a learning environment with instructional materials from other publishers or with live instruction from an on-site teacher. This exclusionary

stance is partially due to economic and intellectual property concerns that motivate attempts to dominate the learning space, but another, less sinister motive may be that educational publishers do not create materials that can coexist in a learning environment because no such open learning environment yet exists that can make such interoperability financially attractive for them.

Regardless of which motive makes the most sense for each individual publisher, content developers who create learning objects will need to embrace the environmental realities of a learning space that not only can simultaneously accommodate learning objects from different publishers, but will also leverage this interplay among different forms of stored media to vastly improve the learning experience for students and teachers. Put very plainly, what I am advocating is a type of loosely coupled multimedia presentation based on manually assembled learning objects from various publishers that is congruent to the thinking of Wiley (2003) and Longmire (2000).

Critique of Assumption #7 - A Clear Definition of Metadata Referencing Standards Alone Will Make LOs Ubiquitous

A metadata referencing standard is NOT a content publishing standard. It is an attempt to simplify access and reuse of stored digital information. Perhaps the best depiction of the relationship between the content of a learning object and its metadata tag is presented below.

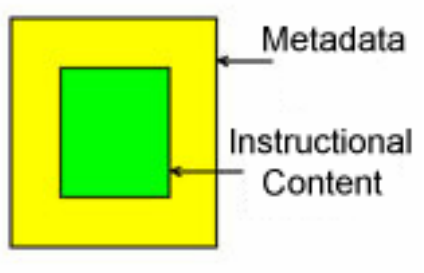

Figure 3. Simple depiction of relation between LO content and metadata

This simplistic depiction of the relation between metadata and instructional content is important because it clearly makes the distinction between the two. The importance of this distinction should not be overlooked. Metadata standards are, by necessity, ontological in nature because they govern the mechanistic processes involved in referencing materials according to the rules of a predefined search algorithm. On the other hand, content and publishing standards are more axiomatic in nature because they are an attempt to describe the transcendent formism that governs the creative process of developing instruction to be delivered via LOs (Pepper, 1961). Perhaps the greatest obstacle to devising a widely held understanding of learning objects is the fact that

learning object theorists and the educational technology community as a whole fail to embrace the dual nature of learning objects in that they simultaneously represent both the mechanistic and the contextual world views. For LOBI to be effective, these two perspectives need to coexist within single entities called learning objects and clear lines of demarcation need to be maintained. Again, from Pepper “Where multiplicative corroboration begins to trespass upon the domain of structural corroboration and to make prescriptions about hypotheses, there structural corroboration ceases to be respectful.” (Pepper, 1961, p.157)

A good visual image that can be used to explain how the hegemonic nature of the mechanistic world view tends to interfere with the creative processes involved in developing instructional content delivered in a LO is the paint-by-numbers artwork projects produced by the Palmer Paint Company that were popular in the 1950s and 1960s. While these projects were, indeed complete pieces after a painter filled in all of the spaces according to the directions of the designer, these finished works somehow fail to capture our imagination in the way that a true original artwork can – and few would actually go so far as to call them works of art. In such paintings, the mechanistic method clearly interferes with the natural experience that artists engage in to express themselves and, consequently, it disrupts the experience that art lovers are accustomed to when they go to a gallery to appreciate a masterpiece.

In K-12 public schools today, when educators in the field are presented with SCORM or LOM compliant materials, many assume that compliance to these standards in some way makes the instructional material more educationally effective in their learning environments. This is simply not the case and the failure to clearly distinguish

between compliance with metadata standards and educational effectiveness of referenced materials is an enormous obstacle that interferes with the successful implementation of LOBI. Both M. David Merrill and Thor Andersen (Director of Specification Development at the IMS Global Learning Consortium – the advocates of LOM) agree that the issue with learning objects is, at its heart, a pedagogical, rather than a software issue (Welsch, 2002). Not only should metadata standards and content models be presented to educators as two separate entities, the whole philosophy surrounding LOBI should treat the two standard sets as mutually exclusive in much the same way that the Dewey Decimal System has little-to-no effect upon the resources that it references in your public library.

Currently, curriculum directors are, to one degree or another, what Claude-Levi Strauss terms *bricoleurs* (Levi-Strauss, 1974, as cited in Chandler, 2001) because they perform a task of assembling lessons that are driven by guiding principles (ideally, the same guiding principles that are driving classroom instruction) as they "hunt and gather" learning objects from various web-based repositories to piece together online lessons (Shank, 1993). In effect, these curriculum directors are the first line of defense against the disjointed sense of epiphenomenalism because they "see" the finished product (an online lesson that seamlessly integrates LOs to express the guiding principles) and they use that holistic image to guide their selection process as well as the abductive meaning making process for learners in the delivery environment. This hunting and gathering process on the part of curriculum directors will undoubtedly continue, but as more and more learning object publishers realize the importance of spatial coexistence and understand the needs of curriculum directors in this manual assembly process, this exposed demand will

ultimately inspire them to assist curriculum directors in their efforts to eliminate epiphenomenalism in finished lessons.

For a more concrete example of how a pragmatic view can actually leverage environmental factors and the principles of the social construction of technology (SCOT) to combat epiphenomenalism in LOBI, consider the peer-to-peer swapping technology that became popular in the form of products like Napster, Kazaa, and BearShare in the earliest part of the 21st century. Each of these technologies introduced a good deal of controversy in the digital publishing realm because they each placed an enormous amount of power to choose in the hands of anyone with a small amount of knowledge and a personal computer with the right technical configuration. If, for a moment, we put aside all the controversy surrounding ownership of digital materials that these technologies have brought to the fore and focus upon the technical inner workings of the search technologies and their (lack of) influence upon retrieved digital materials, we have a good working model for LOBI. The technology of learning objects should follow the lead of the peer-to-peer swapping technologies in that metadata standards should have nothing at all to do with the content of the material being accessed - just like the search engine in Napster has nothing at all to do with the content of the music (or other digital materials) that it retrieves. Put very simply, metadata can, and must remain mechanistic and ontological in nature because it deals with a predefined process of using established search technologies to locate resources. It has nothing to do with learning.

Not only should this distinction be clearly made among instructional technologists and publishers of digital learning materials, but it should also be clearly explained to educational practitioners in the field. Currently, the assumption that SCORM

compatible digital resources are in some way more educationally effective than non-compliant resources is not only incorrect, it overshadows the need to create digital materials that will facilitate learning and teaching in the context of the learning environment. In fact, compliance with a metadata tagging scheme like SCORM or LOM should be no more part of the creative process for publishers of learning objects than compliance with the algorithmic rules governing search engines like Napster are part of the creative process for musicians.

Learning objects are beholden to two world views. On one hand, the formalized logic of computer search engines must be adhered to, but on the other hand, the personal human need for expression in the learning environment must also be satisfied. This is precisely the point that the field of instructional technology should embrace in our collective efforts to tap into the wondrous world of LOs & LOBI. To some degree, LOs represent personal experience in the instruction that they contain, but those experiences must be formalized in such a manner that they can easily be retrieved and reused by computer search algorithms. Such formalization runs the risk of going too far unless it acknowledges, in advance, that it must remain within a framework of personal judgment in the form of creative expression on the part of content producers. (Polanyi, 1958). Granted, this acknowledgement of a need for an a priori framework that can be populated with learning materials is one of the basic assumptions that drives the systematic approach to instructional design. But the basic underlying assertion that I want to make clear is that the field of instructional technology has simply gone too far in its efforts to apply the systematic mindset in its collective endeavors with learning objects. Rather than a focusing upon the systematic processes involved in manufacturing learning

materials and making suggestions for presenting information, instructional designers and technologists should turn their attention toward a more learner centered view of learning objects in which content publishers follow maxims, or rules of art which are not necessarily known as such by the people following them to guide the organization of learning objects in the delivery environment (Polanyi, 1958). The key underlying axiom that governs the assembly process is that learning objects must be assembled and I am a strong advocate of the "by-hand" assembly method advocated by Wiley (2003).

Critique of Assumption #8 - Once a Metadata Standard is Established, Vendors will Cooperate and Interoperability will be Maintained

The key difference between the materials designed for the digital realm and materials designed for the traditional classroom environment is access. Learners and teachers in the online environment have an unprecedented ability to access learning materials, and it is precisely this exposed demand that will begin to drive the educational publishing industry in the future. LOBI introduces a demand for topic-based digital learning materials that simply did not exist in the educational marketplace of the past. Educational publishing firms face a future environment where their dominance will be threatened and they will undoubtedly attempt to maintain their control over instructional materials presented in K-12 online learning environment that supports LOBI. Unfortunately for them, the digital genie is out of the bottle, or perhaps the bottle has disappeared altogether (Barlow, 2000; McGreal, 2004) – and digital publishing firms will have to deal with the present realities of a delivery environment that thrives upon instantaneous access and use of stored digital content.

In the traditional classroom delivery environment, textbook publishers minimize competition by bundling instructional support materials into expensive and cumbersome collections of paper that address whole years of study. Other restriction methods include utilizing binding and graphic/illustration practices that introduce a barrier to entry that makes inclusion in the elite realm of textbook publishers a possibility for only a select few organizations that have the capital and the expertise required to create textbooks that meet an arbitrarily high standard in terms of production costs. Another restrictive practice is the use of a physical “thump factor” that makes it physically difficult for students to

carry multiple textbooks because of their sheer weight and cumbersome nature. The very act of carrying several books home can be a physical challenge for many students as things stand now, but to introduce even more books into the mix would make physical transport impossible. Furthermore, publishing firms typically utilize a pricing model for textbooks that is not based upon production costs, but rather upon what the market will bear. In other words, their prices are so consistently high that few schools can afford to buy multiple textbooks to cover the same subject. The collective result of these practices is that single publishers supply learning materials for a whole year of study in a particular course for a particular grade.

In the digital learning space, these restrictive publishing practices will no longer be effective and publishing firms will be challenged to come up with other ways to meet their profit motive. Ultimately, the demand for interoperability and reusability will most likely warrant some gravitation toward the learning object repository model so that they can continue to influence learning in the online environment and still make money.

The ability of LOs to present the same information contained in textbooks in the online learning environment will, by no means, eliminate textbooks from the classroom or from environments that support LOBI. Instead, this capability may inspire the formation of a cottage industry of for the creation of learning objects that augment the instruction presented in textbooks. Third party publishers have already begun to introduce high quality learning objects that mirror the sequence of instruction in various textbooks, and can be accessed according to the corresponding pages in the books themselves. Holt, Rhinehart & Winston's online resources, America Online's Step by Step Math series and the Monterrey Institute's Hippo Campus are excellent examples of such efforts. What is

interesting about these particular repositories is that they not only contain free standing learning objects that adhere to the principles of experiential wholeness, but learners and teachers can access these learning objects according to the specific textbook that they are using to guide their classroom instruction. This powerful feature not only makes the learning objects valuable for learners and advocates of LOBI, it also makes them valuable for textbook publishers because they augment the instruction that is included in their textbooks. In effect, learning objects become a value-added resource that can enhance the market value for textbooks as opposed to an alternative, and competing form of instructional delivery that threatens the very existence of the textbook publishing industry.

LOs need not replace textbooks. In fact, it will be entirely possible, and educationally beneficial of LOs are delivered alongside traditional textbook instruction. Students could not only read the textbook to learn the subject matter, but they could also login to an LMS and access a variety of self-contained LOs that address the same subject matter.

Critique of Assumption #9 – LOBI will only be effective if it accommodates a data driven student performance tracking function

One of the more difficult riddles that instructional technologists face in their efforts to successfully integrate LOBI into the K-12 online learning environment involves harnessing the technical capability of the computer to track student performance. This ability to generate personalized information for each learner via a learning management system is indeed a powerful feature that computer assisted learning affords, but attempts to accommodate this technical capability have greatly compromised the educational viability of LOBI since its inception.

Learning objects could quite possibly be the technology that best epitomizes a conflict that has been underway within the field of instructional technology since the first computer based training programs were created in the 1980s. On one hand, there are those who believe that the processing power of the computer can best be used in an educational setting to "crunch numbers" and that the ability to generate student performance data will vastly improve administrators' ability to identify the needs of individual students within a system. On the other hand, there are those who believe that the processing power of the computer will have the most value for education if it enables educational content publishers to create more engaging instructional materials that convey meaning to learners in an online learning environment.

The pragmatistic world view is especially relevant to this particular issue of generating student performance data for online learning because it recognizes the here-

and-nowness of a total learning event that utilizes LOs. Consider how the differing world views of mechanism and contextualism place value upon concept of time within the learning space. From a mechanistic point of view, time is measured as ticks on a clock and it is somehow a distinct and separate entity from other elements within the learning environment. It is quantitatively measured as a concrete entity and results are generated regarding "seat time" and "learning time" that have some value for administrators who are attempting to understand whether or not students have actually learned anything while they were "logged in." Indeed, this mechanistic view can produce any number of quantitative results regarding elements such as seat time, total correct versus incorrect responses on a test, or the browsing behavior of a learner, but these pieces of information are only valuable when they are viewed within a qualitative framework that must necessarily be applied to the whole learner experience.

The field of instructional technology has spent a great deal of effort devising various methods for retrieving LOs in such a way that they will be able to:

1. accommodate instructional content from various different publishers
2. be delivered in any number of learning management systems (LMS)
3. enable these various learning management systems to track students' performance while they are accessing the LO itself.

From the collective points of view of learning management system providers, instructional publishing tool developers, and digital publishers who use those tools to create learning materials, the first two desired aspects of LOs pose no insurmountable obstacles for implementation. This is because many of the issues surrounding these issues of reuse, access and interoperability have already been worked out by pioneers in the

fields of open architecture object oriented programming. The third desired characteristic of LOs – shared performance tracking - causes problems for two main reasons:

1. Publishers of digital materials (instructional content providers who create LOs) have no shared set of publishing standards for gathering performance data from online learners who are engaged in LOBI. When you consider the traditional method of using interactions to track student performance in stored digital learning environments (CBT), a world of questions arises. For instance, what do these interactions that generate student performance data look like? Will the interactions be embedded in the presentation of instruction or will they be separate from the presentation of material? What about pre and post tests? Are the questions multiple choice questions, fill-in-the-blank, essay, or drag and drop? How do you grade essay questions? What if my publishing firm doesn't believe in forcing students to answer questions, what then? Will my digital materials be excluded from this environment? etc…, etc…, ad infinitum…
2. Another obstacle that invalidates attempts to accurately track student performance *using technology and quantitative measures alone* is the fact that there is often no effective way to measure seat time in learning objects that do not require extensive user interactions (for example, instructional videos). Consider a situation where a learner accesses the LO, pushes "play" and then leaves the computer on while he or she proceeds to sit on the couch and watch television or go to the mall? Some instructional technologists have overreacted to this possibility by strongly advocating synchronous distance education technologies like videoconferencing for the K-12 distance education environment, but this

approach is inappropriate for the vast majority of K-12 online learners and its shortcomings are addressed later in this study.

It is precisely this inappropriate imposition of processing capabilities to track student performance that is interfering with the successful use of LOBI in the K-12 online learning environment today because to do so, one must impose an exclusively quantitative and mechanistic view upon the creation of instructional content in order to generate performance data. Only when the field of instructional technology resists the temptation to impose some sort of mechanistic data collection strategy upon learners engaged in LOBI will the true value of this form of expression in the learning space be realized. Simply because it is possible to use the processing capabilities of the computer to generate quantitative measures of student performance in the learning space, does not mean that it is always educationally appropriate to do so.

The search for an exclusively technical solution to address the need for performance tracking and assessment in the delivery environment is a futile quest. C.S. Peirce labels this form of fixation upon a belief to avoid the inconveniences of encountering situations that may change opinion as tenacity, and it necessarily goes against our innate social impulse (Peirce, 1877).

By no means am I suggesting that quantitative student performance data should be excluded from the online learning experience. It can, and should, be part of an overall blended learning strategy that incorporates both computing power and interpersonal contact with an on-site facilitator and other students (if possible) in the learning environment. So, rather than relying upon an exclusively computer-driven evaluation

strategy, online learners and teachers who participate in LOBI can capitalize upon both quantitative and qualitative evaluation strategies to track student progress and assess performance.

Critique of Assumption #10 - Models for Implementing Distance Education in Higher Education are Transferable to the K-12 Online Learning Environment

According to the National Center for Education Statistics (NCES), during the 2000-2001 academic year, 56 percent of all 2- and 4-year institutions offered distance education courses, and this represents an increase of approximately 34 percent over a three-year period. According to the report, ninety percent of all institutions that offered distance education courses used asynchronous Internet courses as their primary technology for instructional delivery (NCES, 2003). Online learning is becoming more and more popular in the K-12 public school environment as well. A 2005 study published by the US Department of Education indicated that 32 states have K-12 online learning initiatives (state virtual school or cyber charters), 36% of school districts use distance learning, and 72% of school districts intend to increase their usage of online courses. Estimates for 2004-05 cyber charter penetration were 85 Schools in 16 states with approximately 53,000 full time students.

These numbers clearly indicate a growing trend toward online learning in both the higher education and the K-12 learning environments, but rarely does the available research make a distinction between the teaching methodologies used in each environment. For the most part, K-12 administrators assume the online learning and teaching practices that are used in the higher education realm are, for the most part, transferable into the K-12 online learning environment. This is simply not the case. Distinguishing between andragogy and pedagogy is just as important in the online learning environment as it is in the traditional classroom setting, but the specific

manifestations of these differences in the online learning environment require some further explanation.

Online learning in higher education only works if students are self motivated, self directed learners. While some universities are incorporating synchronous technologies like videoconferencing, chat and whiteboard technologies, a great amount of the instruction in adult online learning is carried via asynchronous discussion boards. Rarely does a university course include a learning object that adheres to the concepts of experiential wholeness or spatial coexistence. Instead, secondary or supporting instructional materials are made available to students via the Internet and a remote teacher disseminates the learning materials and controls the overall flow of the instruction in a virtual learning environment where all of the educational interactions occur within the confines of a learning management system like Blackboard or WebCT. This whole instructional model rests upon one key factor – that is, student motivation. Put very simply adult learners are traditionally more motivated and responsible for their role in the learning process than students in the K-12 environment (Kelly, 2006).

K-12 online learners need more. They need more guidance and they need more engaging learning experiences that will keep them involved in the learning. In order to provide such guidance for K-12 online learners, a new role for an educational facilitator, or learning coach, has emerged. To avoid confusion, I will use the term facilitator to describe this person who is a key agent in the learning environment. Facilitators are not teachers who present instruction, nor are they the curriculum directors who arrange learning objects; rather, they support the learning process in the delivery environment. They provide the behavior support and targeted assistance that is blended with stored

media and communication technologies. Typically, in a full time home-based cyber school situation, the facilitator is a student's parent or guardian and he or she provides instructional support and targeted assistance for a student who is engaged in online learning. Cyber charter schools across America typically mandate that a parent or guardian signs a learning contract that spells out his or her responsibilities regarding this supportive role in the learning process. The necessary involvement of this facilitator in the learning process is a critical difference between online learning in higher education and online learning in the K-12 environment and it introduces many exciting possibilities for remediation and support in the learning environment that are beyond the scope of this study.

Another key difference between online learning in higher education and online learning in the K-12 environment again has its roots in motivational factors. K-12 students need to be more actively involved in their learning to maintain their interest. In other words, the instructional materials that are used to make learning happen in the K-12 environment must be more inherently engaging than materials presented to online learners in higher education. Few educators would suggest that a typical college freshman lecture format be used in a fourth grade classroom – even if the lecture was presented in a classroom setting where the instructor could employ traditional classroom management techniques. Now consider removing any type of motivational influence that is an inherent part of sharing the same physical space, and the need for engaging instructional materials in K-12 online lessons becomes more apparent.

The combination of these two key characteristics – the need for engaging content and the need for behavior support in the learning space can be viewed as an excellent

motivation for digital publishers to embrace the concept of experiential wholeness when designing and producing learning objects. Experiential wholeness as a design maxim makes sense in the K-12 online learning environment that includes a facilitator because there is no guarantee that a facilitator can (or even should) carry the primary instructional message – simply because that is not his or her role. The term *blended learning* has emerged to describe this interplay between on-site facilitators who provide targeted assistance as learners access stored media delivered via the Internet and it is precisely this type of instruction that uses learning objects as performance support tools for facilitators and learners in a physical learning space that makes online learning in the K-12 environment very different from online learning in higher education.

Critique of Assumption #11 - Synchronous Distance Education Techniques like Videoconferencing are the Best Way to Teach the Target Audience (K-12 Online Learners)

Two-way videoconferencing is a bad idea for K-12 online learning environments of today for the same reasons that instructional television was a bad idea for classrooms in the mid 1960s. Many reasons were cited to explain why instructional television was not widely adopted, but the three most prevalent reasons were that there was a good deal of teacher resistance to this form of learning and teaching, there was a great deal of expense involved with implementation, and the simple fact that television alone was not able to create the various conditions necessary for student learning (Reiser, 2001). These three reasons can easily be used to critique efforts to implement two way videoconferencing and synchronous communication technologies in the online learning environment. But another, perhaps more relevant criticism concerning the appropriateness of this technology the K-12 online learning becomes clear when we examine the typical target audience in K-12 distance education delivery environments.

The two target primary audiences for K-12 distance education are students who have chosen not to attend classes presented in the traditional classroom and students who have been removed from that environment because of behavioral issues, illness, or for some other reason. In the majority of these situations, the efficacy of traditional classroom-based lecture model for instructional delivery is at least suspect, as is evidenced by the fundamental need for a distance education solution in the first place. In other words, if the traditional classroom based “chalk-talk” lecture format was effective for these learners, many of them would not need to enroll in an online program. Granted,

there are subsets of the online student population who have had few, if any, problems with the lecture-based model (i.e. students who are removed from the classroom due to illness) who could potentially be served with a distance education model that supports synchronous communication techniques, but again the inherent motivational concerns for the K-12 target audience and the inability for an instructor to manage the classroom come into play and threaten the viability of the chalk-talk lecture in the online learning environment.

In many cases, the *very best* that synchronous communication technologies like two-way videoconferencing can do in terms of instructional efficacy is to mimic a form of instruction that has already failed for the majority of students in the target learning environment. When you consider the potential technical difficulties that can arise, coupled with the fact that no widely adopted model exists for this form of learning and teaching in the K-12 environment, synchronous technologies like two-way videoconferencing seem to be useful, but their pedagogical utility in the blended learning environment is highly suspect.

Critique of Assumption #12 - Copyright restrictions will prevent educators from utilizing LOBI in their instructional practice.

The following excerpt is taken directly from the Copyright Act of 1976:

> Notwithstanding the provisions of sections 106 and 106A, the fair use of a copyrighted work, including such use by reproduction in copies or phonorecords or by any other means specified by that section, for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include —
>
> (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
>
> (2) the nature of the copyrighted work;
>
> (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
>
> (4) the effect of the use upon the potential market for or value of the copyrighted work.
>
> The fact that a work is unpublished shall not itself bar a finding of fair use if such finding is made upon consideration of all the above factors.
>
> (Copyright Act of 1976, 17 U.S.C. § 107)

There have been several legal proceedings that have challenged the fundamental concept of “fair use” in the public domain (such as Sony Corp. v. Universal City Studios, Kelly v. Arriba Soft Corporation, and Harper & Row, Publishers, Inc. v. Nation Enters) and any in-depth analysis of those legal proceedings is beyond the scope of this study. It is important, however, to acknowledge that the Fair Use Act cited above does allow for the reproduction of materials for classroom teaching purposes.

In this age of nearly ubiquitous access to digital materials, intellectual property issues have become a central concern for many educational publishing companies. In the wake of an online music swapping craze initiated by peer-to-peer technologies like Napster, Kazaaa and Youtube, some very basic assumptions concerning digital property rights are being challenged. Indeed, the global nature of the Internet and the ability to instantly communicate with cultures and economies that are outside any jurisdictional control of national copyright laws pose very interesting questions concerning the ability to restrict access to digital materials (Barlow, 2000; McGreal, 2004). But rather than enter into the legal and ethical debate concerning digital intellectual property, a debate that will most likely be pointless in the very near future because it will soon be possible to access nearly any type of instructional information freely via the Internet (a very interesting, and quite likely, possibility), it may be most beneficial for learners and teachers who practice LOBI if the field of instructional technology embraces a repository, or silo model (Downes, 2002) that uses tried and true login procedures to restrict access and maintain property rights for publishers. In such a scenario, learning objects would be collected in vast libraries and organized by the need that they meet in the learning environment. For instance, a repository may include several types of learning objects that

are all accessible on an annual basis for a one-time subscription fee. In order to access the learning objects, users must not only pay the subscription fee, but a user login string must be passed from the learning management system (LMS) to the repository every time a learning object is incorporated into the final instructional sequence. This way, owners of the digital repositories retain control over access while they can still follow the profit motive that will inspire some publishers. The key difference being that the inner-workings of such an economy will be that the supply of learning objects contained in the consolidated libraries can be more directly influenced by the educational demands of individual learners in the delivery environment as opposed to the financial motives of publishing companies, and even school administrators.

This approach can not only eliminate many concerns about copyright infringement for curriculum directors who access learning objects and weave them together to make online lessons; it also can have a profound effect upon the dynamics of the educational publishing industry and it can empower teachers to drive the economics of publishing LOs from within their learning environments. Currently, textbooks continue to dominate the K-12 learning environment almost to the exclusion of all other types of media. Textbooks are expensive, cumbersome, and they typically represent year-long units of study. Furthermore, few educators would contend that even the very best textbook could not be (at least) enhanced with other forms of instructional media like videos and interactive simulations that address the same subject areas. In the proposed silo-based learning object repository model, digital instructional materials (LOs) will be broken into chunks of instruction based upon topics addressed, added to repositories and classified in a way that makes them easy to access. Curriculum directors then log into one

master learning management system (that can pass access information to each library) and then search through numerous libraries, many with learning objects from different publishers that address the exact same instructional topics, to find the best learning objects that meet their specific learning needs. The final step in this simple harvesting process is adding "pointers" or links to the centralized learning management system and making those links available to learners as lessons. At this juncture in the evolution of LOBI this approach can not only mitigate any concerns for copyright infringement in the learning environment (concerns that are soon to be antiquated, if they are not already made so by the Fair Use Act), it also introduces a model for digital access that protects the ownership of materials – and ultimately a critical financial motive for many publishers that will continue to foster needed competition.

Such a migration to a library-based ownership model that uses a recurring and fixed fee structure has already swept the entertainment market with the introduction of services like I-Tunes, Netflix, and Vongo and it will likely be the most viable model for the use and distribution of learning objects. What will be interesting about the application of this approach to the learning object movement is that it will be quite possible for a new economy that governs the access and use of digital materials to emerge. If learning objects are pre-defined as topic-based pieces of instruction that are amalgamated into libraries according to the specific needs they meet in the learning environment (assessment, presentation, interaction, off line activities, etc…) it will be possible for publishers to more effectively meet the immediate needs of educators in their learning environments. Of course, initial efforts from publishers will attempt to use economic restrictions (i.e. high annual fees or proprietary interface/access schemes) to exclude

other publishers from gaining access to the learning space, but the ubiquitous nature of the Internet, and the already emerging volumes of free resources like the Monterrey Institute's National Repository of Online Courses (www.montereyinstitute.org/nroc/) will make such exclusionary practices unlikely simply because educators can access huge volumes of high quality instructional materials for free. No longer will single publishers dominate the instructional materials that are available for a whole year in a classroom. Instead, end-users will be able to pick and choose the most effective resources available on an as-needed basis, and the pressure will be on publishers to meet the exposed and accessible demands of educators in the actual learning environment in an almost real-time manner.

CHAPTER 4

CONCLUSION

This study spells out several of the more prominent assumptions that interfere with the successful implementation of LOBI in K-12 public schools and then presents a critique of each assumption. After providing a brief history of the learning object movement and an explanation of its roots in the realm of object-oriented programming, the study introduces the predominant assertion that is carried throughout the paper. That assertion is that environmental factors have been largely ignored in the development of learning objects and in most of the attempts that have been made to implement them into the K-12 instructional environment in America. The terms technical standards, production standards and adoption standards are introduced to explain the iterative interplay among technology producers, publishers and end users as a way to explain how all three groups have a vested interest in, and formative input upon, the final artifacts that are used in the target delivery environment. Of the three types of standards that are currently being utilized in the implementation of LOBI in the K-12 learning environment, thus far, adoption standards are largely being overlooked.

At the center of all this formative activity is the target learning environment that supports the technology in question – in this case, LOBI. The fact is that the vast majority of public schools across America already have the necessary infrastructure to support LOBI, but, as yet, very few public schools have embraced this exciting new form of learning and teaching. The obvious question that arises is “why not?” This study addresses this question directly by identifying twelve specific assumptions and/or

theoretical obstacles that interfere with the implementation of LOBI and then provides a critique of each assumption.

In chapter one I address several key ideas that have served as a theoretical foundation for this work and I present a graphic depiction of the authors who have influenced this study most. Admittedly, this project is the barest beginning in what I hope to be an overall move toward a more structured and productive discourse regarding learning objects and their potential. Some ideas for possible future research presented include conceptual foundational work in semiotics, critical hermeneutics, phenomenological semantics, and the social construction of technology. There is also great potential to use the learning space as a venue that could house various semiotic analyses of the use of abductive logic in the learning process.

Critical theory is then presented as a research paradigm that influenced this study in the hope that this perspective will continue in future studies. The basic ideas of Habermas' universal pragmatics are advocated and a basic acknowledgement of the emancipatory potential of critical theory are presented as well.

As the title indicates, this study is heavily influenced by Charles Sanders Peirce primarily, and, to a lesser extent, William James and John Dewey. These three great pragmatists provide a solid foundation upon which to build because they all so clearly focus upon environmental factors and realism in their philosophical writings. Other key ideas from the pragmatistic point of view as portrayed by Peirce include the concepts of genuine doubt, the scientific method for inquiry, and abductive reasoning. Also, John Dewey's ideas on instrumentalism and William James' emphasis upon experientialism have certainly influenced this study. The field of critical theory and Jurgen Habermas'

ideas on universal pragmatics are also key contributors to the thinking that has gone into this study. Other fields like phenomenology, linguistics, semiotics and the social construction of technology have also influenced this work.

The Gordian Knot

Chapter two is titled “The Gordian Knot” in reference to the myth of Alexander the Great of Macedonia and his encounter with the Gordian Knot. It lays out twelve assumptions that interfere with the successful implementation of LOBI and groups them into four basic categories: The Unique Nature of LOs and LOBI, LO Design Issues, Metadata Standards and Content Models, and Implementation Issues.

The list of assumptions in the first grouping, titled The Unique Nature of LOs and LOBI, addresses the need for a relevant body of research that more effectively addresses environmental issues surrounding the implementation of this technology in the K-12 online learning environment. To date, there has been a good bit of research dedicated to the study of online learning in general, and LOBI in particular, in the realm of higher education, but surprisingly little research has been conducted regarding the implementation of this technology in the K-12 environment. Furthermore, there is no one clear voice within the body of research that can help K-12 educators in the field understand this technology and how it can benefit them in their actual teaching practices. Simply put, educators assume that there is a clear and legible body of research regarding this technology, and the fact of the matter is that the body of research leave a good bit to be desired. The next assumption presented in this section deals with the shared notion

that learning objects and learning object based instruction will replace classroom teachers. K-12 educators have voiced this concern ever since the earliest days of computer assisted learning in the 1980s and this shared aversion to the use of the computer to teach in the classroom because it threatens teachers is still prevalent today. This aversion to computer assisted learning leads into the third assumption which is the idea that LOBI is just another form of computer based training and it will have little impact upon learners and teachers in their present realities. This assumption is rooted in the belief that LOBI is very much like other forms of computer assisted learning hat have failed in the K-12 learning environment in the past.

The next grouping of assumptions deals with design issues that should be addressed if LOBI is to be successfully integrated into the K-12 learning environment. The first assumption listed in this grouping deals with the idea that the field of instructional technology is obligated to adhere to a mindset that is necessarily systematic in nature. There is a tendency among instructional designers to apply a mechanistic world view to the design of instructional materials and this tendency interferes with the successful design of learning objects because it tends to neglect contextual issues in the formative design and development phases for the finished products. The second design issue presented in this grouping deals with the idea that a universal set of content publishing standards (a.k.a. content models) must be developed before LOBI can be implemented in the K-12 learning environment. There is, among some instructional designers and learning object theorists, a strong predilection toward a template-based approach to the creation of LOs and this stance is interfering with implementation because the universal set of learning object templates that will drive implementation are

still (unnecessarily) “on the drawing board.” The third, and final, assumption in this section addresses the idea that existing recorded lectures and completed computer-based training courses can be “chopped up” to make learning objects. While economically beneficial, this practice causes problems in the delivery environment because it compromises the quality of the finished product.

The third grouping in the chapter lists two assumptions that deal with the technical aspects of metadata standards and content models. It starts by identifying the commonly held belief in the field of instructional technology that a clear definition of metadata referencing standards alone will make learning objects ubiquitous. Clearly, metadata standards are important, but the formulation of these standards for access have dominated the discussion to the point that other key issues that need to be addresses are being ignored. This section then addresses the idea that there will be some type of cooperation among vendors if the design principle of interoperability is clearly spelled out in a production standard.

Chapter two concludes by listing four assumptions surrounding implementation issues that must be addressed if LOBI it to be successful in the K-12 delivery environment. First, the idea that LOBI will only be effective if it accommodates data driven decision making is presented. Next, the idea that models used to deliver online learning in the higher education realm can automatically be transferred to the K-12 environment is scrutinized. Ideas surrounding the pedagogical efficacy of synchronous technologies like videoconferencing in the K-12 learning environment are then presented, and finally, several commonly held beliefs of educators in the field concerning copyrights are isolated for analysis.

Experience

The third chapter is titled “Experience” and it provides critiques of each of the assumptions that interfere with the successful implementation of LOBI in K-12 environments of today. After a brief exercise that demonstrates the relationship between learning objects and the contextual world view, this chapter launches into the critiques that follow the same sequence as the list of assumptions presented in the previous chapter.

The set of critiques that address the unique nature of learning objects introduces the basic argument against a systematic mindset when designing and developing learning objects. Building upon a basic idea that the existing body of research is not applicable because it does not include any experience in actual K-12 learning environments that utilize LOBI, this chapter introduces several ideas that will help future inquirers to actually build such an environment. The terms “blended learning” and “blended learning environment” are introduced and a suggestion is made for a complete shift in focus for the field of instructional technology that will leverage the pragmatistic method and environmental factors to form a new foundation for research regarding the use of LOs in the K-12 learning environment. Next, the common concern that LOBI will replace classroom teachers is addressed. Several ideas concerning the ideal target learning environment for LOBI (auxiliary learning environments) are presented and the phenomenon of removal and remediation is explained. The last critique presented in this grouping presents several key reasons why LOBI is different from or forms of computer

assisted learning that have been introduced to K-12 public schools in the past. An exercise in abductive versus deductive reasoning is presented, and a general call to utilize the uniquely contextual nature of learning objects as a type of experiential language that can serve as an invitation for inquiry.

The critiques included in the next section, titled “Learning Object Design Issues” introduce some key ideas regarding the systematic mindset that is commonly used in the field of instructional design and how it has come to trespass upon the field of instructional technology regarding learning objects and LOBI. Also the theme of environmental variables replacing fixed beliefs is presented and several examples from the human history of innovation are presented to underscore the importance of a contextual world view when designing learning objects and LOBI.

Next, the key ideas surrounding metadata standards and content models are critiqued. The major point in this section is that environmental factors have been largely ignored in the development of this technology and, if it is to reach its full potential, not only should these environmental factors be considered more closely, but that also may have an actual hand in the formative development of learning objects and LOBI. Instrumentalist ideas are explored and the role of the curriculum director is explained in brief detail. The section concludes with a critique of the practice of “chopping up” existing recorded lectures and/or computer-based training courses in order to produce cost effective learning objects. A key point about the fact that compliance to metadata standards, in no way, reflects upon the pedagogical effectiveness of a learning object. Ideas concerning experiential wholeness and spatial coexistence are presented and the key point is made regarding the value of the pragmatistic point of view and how it can

leverage environmental factors to help maintain a healthy distance between form and function within a learning object. The final critique in this section addresses interoperability and the likely scenario where vendors will attempt to dominate the learning space with their learning materials only. This issue is addressed by explaining how learning objects can be viewed as supporting instructional materials that actually augment information presented in textbooks. Also, it lists several repositories that are actually aligning their learning objects to specific textbooks to demonstrate the viability of the ideas presented.

The final grouping of critiques all address the assumptions surrounding implementation issues that interfere with the successful implementation of LOBI. First, a critique how an emphasis of technology-based students' assessments and exclusively quantitative measure for evaluating the effectiveness of LOBI is hindering attempts to validate LOBI. Several examples that show the limits of purely quantitative assessment strategies in the online environment are presented and a call is made for more qualitative studies and assessment measure that will help to more effectively prove the instructional effectiveness of LOBI. This idea that models for online learning in higher education are transferable to the K-12 environment are then isolated. Key reasons for a need to address the two target audiences with separate models for online learning include motivational factors and the need for an on-site facilitator in the K-12 online learning environment that uses LOBI. Next, some ideas about why synchronous technologies are a bad idea for K-12 online learners are presented. An analysis of the target audience shows that, in many cases, the lecture-based instructional presentation format has proven problematic for the target audience, and that it may not be the best idea to spend time and money setting up

and maintaining technical delivery systems that mimic a form on instructional delivery that has already failed. Finally, a brief overview of some of the interesting ways that curriculum directors can bypass concerns regarding copyright restrictions are presented. More specifically, the silo model is introduced as a viable way to access repositories of interoperable learning objects for an annual fee. This approach is viable because it maintains the profit motive for publishers (in the form of annual membership fees) and it allows users to access digital materials without infringing upon publishers' concerns regarding copyrights.

Future Research

This discourse is only the barest beginning of a required dialog among researchers regarding LOBI and its efficacy in the K-12 learning environment. It is only the first step in a long, and evolving journey that scholars can undertake to better understand the merits of LOBI through critical qualitative research. Although providing any great detail about the merits of this approach is beyond the scope of this study, it is safe to say that critical theory's emphasis upon the humanistic *purpose* of applied technology in the learning space as opposed to the issues of technique, procedure and correct method will make it a leading candidate for future research regarding LOBI (Kinchloe & McLauren, as cited in Denizen & Lincoln, 2000).

More specifically, the particular practice of critical or "depth" hermeneutics holds great potential to yield many great harvests in future research efforts that address LOBI because, as Paolo Freire (1998) explains, it is both epistemological (knowledge) and

ontological (being). It is epistemological in that it will enable researchers to focus upon interpretive acts performed by people in the learning environment to establish a consensus regarding the value and purpose of learning objects and it is ontological in that it acknowledges the humanness of the people engaged in the compulsive call to meaning that is an integral part of learning and teaching. Other research efforts that could produce great results might include a critical ethnography of students and teachers engaged in LOBI, or an exploration of the socially constructed realities (Berger & Luckmann, 1966) that not only influence the perceptions of agents in the delivery environment, but also affect the evolution of the technology of learning objects themselves.

Another possible topic for research could be to view the use of learning objects as deliberate "speech acts" that can be analyzed to begin a study of the rational reconstruction of universal competencies among learners and teachers in the target environment (McCarthy, 1981). Identifying such competencies from a perspective that is founded in Habermas' universal pragmatics will help to not only foster instructional technology literacy in today's public schools, it will also lead to deeper understandings concerning the use of learning objects to communicate in the learning space. Such understandings could lead to fascinating revelations about the non-material, or universal aspects of communication. For instance, as Alverson puts it, a study of the purposeful use of media in the target delivery environment could help us to "understand the pan-cultural and pan-linguistic dimension of experience upon which we could build (and explore) theories of meaning" (Alverson, 1994). Such a project in phenomenologoical semantics could utilize basic principles of critical theory to help to define the material "boundaries"

that obstruct the (*agapastic*) progression toward an understanding of the universals of experience.

Pursuing the idea that learning objects are a socially constructed technology (SCOT) as presented by Bijker, Pinch, & Hughes (1987) could prove to be another influential follow up study because it not only acknowledges the role of various societal forces upon the development processes involved in creating learning objects, but it actually analyzes the impacts that societal forces have upon the delivered artifacts themselves in a very material sense. This environmental/societal perspective and the ways that such forces can mould learning objects has largely been missing from the research surrounding LOs and LOBI to date. The commonly heard call for a templatized "content model" or "production standards" that is so often heard in the field of instructional technology today in discussions regarding learning objects is an attempt to inspire just such a project in social construction. A study that more directly questions the validity of this positivistic approach and analyzes historical instances of how societal forces have shaped digital media in the past would be an excellent follow up study.

Another fascinating vein of research that can be mined as a result of this study could be an analysis of the abductive logic that actors in the target learning environment perform to "make sense" of learning objects. This type of study could enable the field of instructional technology to analyze actual inquiry that is grounded in abductive logic in order to see the emphasis on creating hypothetical patterns of understanding that allow us to move inquiry forward, not only theoretically and empirically, but conceptually as well (Shank, 1993). Research of this type could benefit both the fields of qualitative educational research and semiotics (Shank, 1995).

The suggestions above indicate a personal bias toward qualitative research, but by no means am I attempting to exclude quantitative researchers from the learning space. In this age of high-stakes testing, quantitative measures will undoubtedly play a major role in the evolution of this technology. It would, indeed, be quite narrow-minded, and ultimately detrimental to learners, if follow-up studies were reserved for qualitative researchers only. The point of this study is to initiate a conversation and all are welcome to participate.

Closing Thoughts

In keeping with the sentiment used to open this study, I have selected two artistic pieces that have simultaneously resonated with, and inspired, the thinking that has gone into this study. The first selection is a poem by Joseph Addison that was published in the 17th century:

> The spacious firmament on high,
> With all the blue ethereal sky,
> And spangled heavens, a shining frame,
> Their great Original Proclaim.
> Th' unwearied Sun from day to day
> Does his Creator's power display;
> And publishes to every land
> The work of an Almighty hand.

Soon as the evening shades prevail,
The Moon takes up the wondrous tale;
And nightly the listening Earth
Repeats the story of her birth;
Whilst all the stars that around her burn,
And all the planets in their turn,
Confirm the tidings as they roll,
And spread the truth from pole to pole.

What though in solemn silence all
Move round the dark terrestrial ball;
What though nor real voice nor sound
Amidst their radiant orbs be found?
In Reason's ear they all rejoice,
And utter forth a glorious voice;
For ever singing as they shine,
"The Hand that made us is divine.'
(Addison, 1672)

… and to finish this particular opening stage of a long, and hopefully fruitful, journey that will yield many revelations concerning learning objects and LOBI, I'd like to submit the following lyrics from a song called *The Spirit of Radio* performed by a rock and roll band called Rush:

Invisible airwaves crackle with life

Bright antennae bristle with the energy

Emotional feedback on timeless wavelength

Bearing a gift beyond price, almost free

All this machinery making modern music

Can still be open hearted

Not so coldly charted

It's really just a question of your honesty, yeah

Your honesty

One likes to believe in the freedom of music

But glittering prizes and endless compromises

Shatter the illusion of integrity

For the words of the profits

Were written on the studio wall

Concert hall

And echoes with the sound

Of salesmen

(Peart, Lee, & Lifeson 1980)

References

Addison, J. (1672). *Hymn*. Retrieved February 9, 2007, from the World Wide Web: http://www.poetry-archive.com/a/hymn.html

Alverson, H. (1994). *Semantics and experience: Universal metaphors of time in English, Mandarin, Hindi, and Sesotho*: Johns Hopkins University Press.

Barlow, J. (2000). The next economy of ideas. *Wired News, 8*(10). Retrieved January 26, 2007, from the World Wide Web: http://www.wired.com/wired/archive/8.10/download.html

Baruque, L. B. & Menlo, R.N. (2003). Learning theory and instructional design using learning objects. *Journal of Educational Multimedia and Hypermedia*.

Berger, P. L., & Luckmann, T. (1966). *The social construction of reality; a treatise in the sociology of knowledge* (1st ed.): Doubleday.

Bijker, W., Pinch, T & Hughes, T. (1987). *Toward the social construction of technological systems: New directions in the sociology and history of technology*. Cambridge, MA: Harvard University Press.

Bijker, W. E. (1995). *Of bicycles, bakelites, and bulbs: Toward a theory of sociotechnical change*: MIT Press.

Bloom, B. S., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives: the classification of educational goals* (1st ed.): Longmans Green.

Bonk, C. J., & Graham, C. R. (2007). *Handbook of blended learning: Global Perspectives, local designs.* San Francisco, CA: Pfeiffer Publishing.

Boydston, J. A. (1981). *The later works of John Dewey, 1925-1953*: Southern Illinois University Press ; Feffer & Simons.

Brown, J. (2002). *Making a Macromedia Flash MX learning object SCORM-conformant*. San Francisco, CA: Macromedia.

Buchler, J. (1955). *Philosophical writings of Peirce*. New York: Dover.

Carman, J. (2002). *Blended learning design: Five key ingredients*. Retrieved January 26, 2007, from the World Wide Web: http://www.agilantlearning.com/instructionaldesign.html

Cavanaugh, C. (2001). The effectiveness of interactive distance education technologies in K-12 learning: A meta-analysis. *International Journal of Educational Telecommunications, 7*(1), 73-88.

Chandler, D. (2001). *Semiotics for Beginners*. Retrieved January 30, 2007, from the World Wide Web: http://www.aber.ac.uk/media/Documents/S4B/semiotic.html

Copyright Act of 1976, 17 U.S.C. § 107 (1976).

Crossley, N. (2005). *Key concepts in critical social theory*: Sage.

Dewey, J. (1927). *Philosophy and civilization*. Retrieved January 26th, 2007, from http://authenticate.library.duq.edu:2048/login?url=http://library.nlx.com

Dewey, J. (1981). *The Later Works* (Vol. 1). Carbondale, Ill: S. Illinois University Press.

Dick, W., Carey, L., & Carey, J. (2001). *The systematic design of instruction* (5th ed.): Longman.

Dickinson, W. P. (2005). *Toward a deeper understanding of student performance in virtual high school courses: Using quantitative analyses and data visualization to inform decision making*. Naperville, IL: Michigan Virtual University.

Dodds, P. (2001). Advanced Distributed Learning Sharable Content Object Reference Model Version 1.2. The SCORM Content Aggregation Model. Retrieved January 30, 2007, from the World Wide Web: http://www.adlnet.gov/downloads/52.cfm

Downes, S. (2001). Learning objects: resources for distance education worldwide. *International Review of Research in Open and Distance Learning, 2*(1), 29.

Downes, S. (2002). Design and reusability of learning objects in an academic context: A new economy of education? *USDLA Journal, 17*(1), 3-22.

Downes, S. (2004). Personal Communication. 12/13/2004. Retrieved January 14, 2007, from the World Wide Web: http://www.masternewmedia.org/news/2004/12/12/learning_objects_metadata_blogs_and.htm

Duval, E. & Hodgins, W. (2003, May 20-24). *A LOM research agenda.* Paper presented at the WWW2003 Conference, Budapest, Hungary.

Finley, L., & Hartman, D. (2004). Institutional change and resistance: Teacher preparatory faculty and technology integration. *Journal of Technology and Teacher Education, 12*.

Freire, P. (1998). *Politics and education*: UCLA Latin American Center Publications.

Friesen, N. (2001). What are educational objects? *Interactive Learning Environments, 9*(3).

Friesen, N. (2003). Three objections to learning objects and e-learning standards. In R. E. McGreal (Ed.), *Online education using learning objects* (pp. 59-70). London: Routledge.

Gagné, R. M. (1965). *The conditions of learning*: Holt Rinehart and Winston.

Gagné, R. M., Briggs, L. J., & Wager, W. W. (1992). *Principles of instructional design* (4th ed.): Harcourt Brace Jovanovich College Publishers.

Geary, G. (1991). *Electronic performance support system* (1st ed edition ed.). Tolland, MA: Gery Associates.

Gardner, H. (1999). *Intelligence reframed: Multiple intelligences for the 21st century*: Basic Books.

Gibbons, A. S., Nelson, J. & Richards, R. (2000). The nature and origin of instructional objects. In D. A. Wiley (Ed.), *The instructional use of learning objects: Online version*. Retrieved January 30, 2007, from the World Wide Web: http://reusability.org/read/chapters/gibbons.doc

Godwin-Jones, R. (2004). Learning objects: Scorn or SCORM? *Language Learning & Technology, 8*(2), 7-12.

Habermas, J. (2001). *On the pragmatics of social interaction: Preliminary studies in the theory of communicative action*: MIT Press.

Haughey, M. (2005). Evaluating learning objects for schools. *E-Journal of Instructional Science and Technology, 8*(1).

Heinrich, R. (1984). The proper study of instructional technology. *Educational Communications and Technology Journal, 32*(2), 67-87.

Hickman, L. A. (2001). *Philosophical tools for technological culture: Putting pragmatism to work*. Bloomington: Indiana University Press.

Hodas, S. (1993). Technology refusal and the organizational culture of schools. *Education Policy Analysis Archives, 1*(10).

Hodgins, H. W. (2000). The future of learning objects. In D. A. Wiley (Ed.), *The*

instructional use of learning objects: Online version. Retrieved January 26, 2007, from the World Wide Web: http://reusability.org/read/chapters/hodgins.doc

IEEE (The Institute of Electrical and Electronics Engineers, Inc.) (2002). *Position Statement on 1484.12.1-2002 Learning Object Metadata (LOM) Standard*. Retrieved January 30, 2007, from http://ltsc.ieee.org/wg12/

James, W. (1907) What Pragmatism Means. Lecture 2 in *Pragmatism: A new name for some old ways of thinking*. New York: Longman Green and Co: 17-32. Retrieved from January 26th, 2007 from the World Wide Web: http://spartan.ac.brocku.ca/~lward/James/James_1907/James_1907_02.html

James, W. (1967). *Essays in radical empiricism and A pluralistic universe*: P. Smith.

Kant, I., & Meiklejohn, J. M. D. (1897). *Critique of pure reason*: Bell.

Kelly, D. (2006). *Adult learners: characteristics, theories, motivations, learning environment*. Retrieved January 26, 2007, from the World Wide Web: http://www.dit.ie/DIT/lifelong/adult/adlearn_chars.pdf

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. University of Chicago Press.

Lantos, R.; Milliken, S.; Norlen, E.; Reichel, S. (Producers), & Beresford, B. (Director) (1991) *The black robe* [Motion picture]. United States: Samuel Goldwyn Co.

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*: Harvard University Press.

Liber, O. (2005). Learning objects: Conditions for viability. *Journal of Computer Assisted Learning, 21,* 366 - 373.

Mager, R. F. (1962). *Preparing instructional objectives.* Fearon Publishers.

McCarthy, T. A. (1981). *The critical theory of Jürgen Habermas*: MIT Press.

McCormick, R. & Scrimshaw., P.; Li, N.; & Clifford, C. (2003). *Keeping the pedagogy out of learning objects.* Paper presented at the Designing Virtual Learning Material EARLI Conference.

McCormick, R. & Scrimshaw, P.; Li, N. & Clifford, C. (2004). *CELEBRATE Evaluation Report Version 2*. Brussels, Belgium: The Open University.

McGreal, R. (2003). Learning objects: A practical definition. In R. E. McGreal (Ed.), *Online education using learning objects* (p. 14). London: Routledge.

McGreal, R. (2004). Stealing the goose: Copyright and learning. *International Review of Research in Open and Distance Learning*, 5(3). Retrieved January 26, 2007, from the World Wide Web: http://www.irrodl.org/index.php/irrodl/article/view/205/287

Merrill, M. D. (1998). ID expert: A second generation instructional development system. *Instructional Science, 26*(3-4), 243 - 262.

Merrill, M. D. (2000). Instructional transaction theory (ITT): Instructional design based on knowledge objects. In *Instructional design theories and models: A new paradigm of instructional theory*. Mahwah, NJ: Lawrence Erlbaum Associates.

Merrill, M. D. (2002). Effective use of instructional technology requires educational reform. *Educational Technology*, 13 - 16.

Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: a review of the literature. *Journal of Information Technology for Teacher Education, 9*(3), 319 - 342.

NCES. (National Center for Educational Statistics) (2003). *Distance education at degree-granting postsecondary institutions: 2000-2001*. Retrieved November 9, 2006,

from the World Wide Web: http://nces.ed.gov/pubs2003/2003017.pdf

Ong, W. J. (1982). *Orality and literacy: The technologizing of the word*. London: Routeledge.

Papert, S. (1984). New theories for new learnings. *School Psychology Review, 13*(4), 422-428.

Peart, N, Lee, G., & Lifeson, A. (1980) The Spirit of Radio recorded by Rush. On *Permanent waves* [CD]. Quebec: Mercury Records 1979.

Peirce, C. S. (1868). Questions Concerning Certain Faculties Claimed for Man. *Journal of Speculative Philosophy, 2,* 103-114.

Peirce, C. S. (1877). The Fixation of Belief. *Popular Science Monthly, 12*(1), 1-15.

Peirce, C. S. (1878). How to Make Our Ideas Clear. *Popular Science Monthly* (2), *12,* 286-302.

Peirce, C.S. (1955a). The scientific attitude and fallabilism. In Buchler, J. *Philosophical writings of Peirce*. New York: Dover. (Original work published in 1896).

Peirce, C.S. (1955b). The principles of phenomenology. In Buchler, J. *Philosophical writings of Peirce*. New York: Dover. (Original work published in 1904).

Pepper, S. C. (1961). *World hypotheses: A study in evidence*: University of California Press.

Piaget, J. (1955). *The Child's Construction of Reality.* London: Routledge and Kegan Paul.

Polanyi, M. (1962). *Personal knowledge: Towards a post-critical philosophy*: University of Chicago Press.

Reiser, R. A. (2001). A history of instructional design and technology: Part I: A history

of instructional media. *Educational Technology, Research and Development, 49*(1), 53 - 64.

Ryder, M. (1997). *Abductive logic: Primary skill for a postmodern era*. Retrieved February 2, 2007, from the World Wide Web: http://www.cudenver.edu/~mryder/semiotics_97.html

Salpeter, J. (2004, March 15). *Data: Mining with a mission*. Retrieved February 12, 2007, from the World Wide Web: http://www.techlearning.com/showArticle.php?articleID=18311595

Shank, G. D. (2002). *Qualitative research: A personal skills approach*: Prentice Hall; Merrill/Prentice Hall.

Shank, G. D., & Cunningham, D. J. (1996). *Modeling the six modes of Peircean abduction for educational purposes.* Paper presented at the Midwest AI and Cognitive Science Conference, Bloomington, IN.

Shank, G. (1995). Semiotics and qualitative research in education: The third crossroad. *The Qualitative Report, 2*(3).

Shank, G. (1993). Abductive multiloguing: The semiotic dynamics of navigating the net. *The Arachnet Electromic Journal on Virtual Culture, 1*(1).

Thompson, K. (2004). *Readings from Emile Durkheim.* London: Routledge.

Toffler, A. (1970). *Future shock*. New York: Random House.

Tripp, S., & Bichelmeyer, B. (1990). Rapid prototyping: An alternative instructional design strategy. *Educational Technology Research & Development, 38*(1), 31-44.

Verbert, K., & Duval, E. (2004). *Towards a global architecture for learning objects: A comparative analysis of learning object content models.* Retrieved January 26,

2007, from the World Wide Web: http://www.cs.kuleuven.ac.be/~hmdb/publications/files/pdfversion/41315.pdf

Voos, R. (2003). Blended learning - What is it and where might it take us? *Sloan-C View, 2*(1), 3-5.

Wade, H. (2001). Data inquiry and analysis for educational reform. *ERIC Digest, 153*.

Wall, James M., *Hidden Treasures: Searching for God in Modern Culture*. The Christian Century Press, Chicago: 1997, pp. 54-56.

Welsch, E. (2002). SCORM: Clarity or calamity? *Online Learning Magazine, 07*(1), 4.

White, K. W., & Weight, B. H. (2000). *The online teaching guide: A handbook of attitudes, strategies, and techniques for the virtual classroom*: Allyn and Bacon.

Wiggins, G. P., & McTighe, J. (2005). *Understanding by design* (Expanded 2nd ed.). Upper Saddle River, NJ: Association for Supervision and Curriculum Development.

Wiley, D. A. (2000). Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy. In D. A. Wiley (Ed.), *The instructional use of learning objects: Online version*. Retrieved January 26, 2007, from the World Wide Web: http://reusability.org/read/chapters/wiley.doc

Wiley, D. (2001). *Learning Objects: Difficulties and opportunities*. Retrieved January 30, 2007, from the World Wide Web: http://opencontent.org/docs/lo_do.pdf

Wiley, D. (2003). *Getting axiomatic about learning objects*. Retrieved January 26, 2007, from the World Wide Web: http://www.reusability.org/axiomatic.pdf

Wilson, B. G. (1995). *Situated instructional design: Blurring the distinctions between theory and practice, design and implementation, curriculum and instruction.*

Paper presented at the Association for Educational Communications and Technology, Washington DC.

Appendix

This section is included to further explain how the work of the authors shown in the diagram below has influenced the thinking that has gone into this study. By no means am I claiming to thoroughly and completely understand all of the major ideas that these people advocate. The purpose of this section is to help other inquirers trace the intellectual steps I've taken so far in this continuing journey.

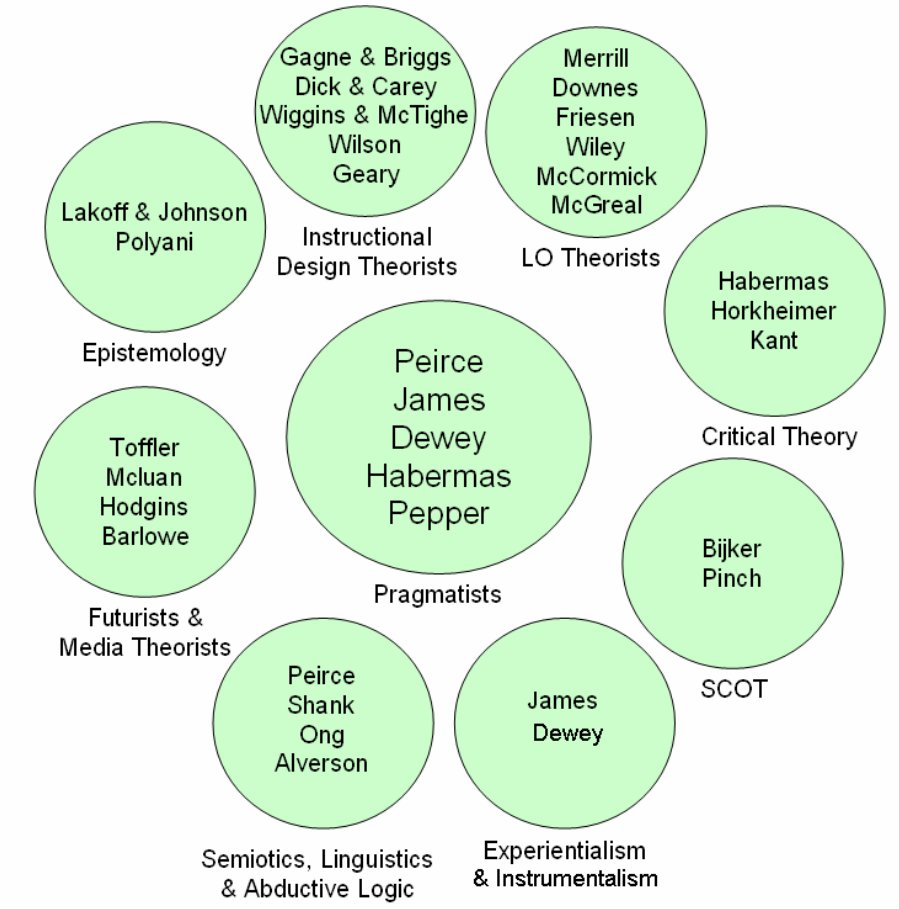

Figure 2. Thinkers who have influenced this study

Pragmatists – The "big three" of Peirce, James and Dewey have had a profound effect upon this study. I was also quite enamored with the ideas presented by Stephen Pepper; especially his root metaphor method presented in the book *World Hypotheses: A Study in Evidence* (1961).

Instructional Design Theorists – Dick & Carey and Gagne & Briggs provided the foundational concepts that I (and many other instructional designers in the field) have been utilizing over the past decade or so. I have recently been exposed to the backward design model of Wiggins McTighe and I found some merit in it. Even more recently, I was quite encouraged to happen across Brent Wilson's ideas on situated instructional design. Gloria Geary's ideas on performance support have been a constant throughout my career as an instructional designer and I have always admired her instrumentalistic use of stored media to support learners in situ.

LO Theorists - I was first introduced to learning objects through the work of David Merrill and the ID2 group in Utah. I found his early work on a project called ID Fountain™ to be quite interesting and it actually raised many of the questions that drove this study. I was pleased to see his influence in the work of David Wiley and I was especially pleased with Wiley's work on learning objects in the online, open authoring project called The Instructional Use of Learning Objects that can be accessed through the following website http://www.reusability.org/. This is brilliant stuff and important reading for any aspiring LO theorist.

Then, of course, there are the great Canadians. The ideas of Stephen Downes, Norm Freisen and Rory McGreal have all played a major part in helping me to understand many of the issues surrounding learning objects and standardization efforts that are currently being ironed out by the field of instructional technology.

McCormick's work with the CELEBRATE project in Europe was also especially helpful. His conclusions presented in the evaluation report for this project and his ideas about separating pedagogy from delivery mechanisms helped me to solidify some of the notions I was wrestling with at the time.

Critical Theory: Jürgen Habermas was the primary critical theorist who influenced this work because of his association with modern pragmatism. I include Horkheimer in this list because of his position of importance in the field of critical theory and, although I have had little exposure to his ideas thus far, I expect that he will greatly influence future work. My experience with Emanuel Kant's *Critique of Pure Reason* was eye-opening, but it was also transitional. At the time I was wrestling with the idea that "truth is unknowable" and I became very interested in his ideas regarding *nomena*. While I think this was an important step in my journey, I now realize that a more realistic view of the truth (in the philosophical sense of the term *realism*) will serve me much better in my travels. Namely, that "The opinion which is ultimately fated to be agreed to by all who investigate is what we mean by truth, and the object represented in this opinion is the real." (Peirce, 1877).

The Social Construction of Technology (SCOT) - I include this reference because in my efforts to locate a body of research that opposes technological determinism, I came across some fascinating work surrounding the social construction of technology that, in some ways, aligns with the ideas of discourse and universal pragmatics presented by Habermas. By no means, am I claiming to thoroughly understand the ideas presented by Bijker, Pinch and other advocates of SCOT, it is, however; a promising area for future investigation.

Semiotics, Linguistics and Abductive Logic – The vast majority of my understanding in this area came from personal communications with Gary Shank. He was extremely patient with me as I struggled to understand the depth and breadth of these fields, how they influence my current work, and the potential they hold for future research. Of course, Peirce's ideas on abduction were important as well.

Walter Ong's ideas presented in the book O*rality and Literacy: The Technologising of the Word* (1980) were key in opening my eyes to the instrumentalistic view of language as a technology and the simple mantra that "writing restructures consciousness" had a profound effect upon this work. Alverson's ideas on Semantics and experience with various cultures was an interesting read as well, and I intend to spend more time with it in my future research.

Futurists and Media Theorists – Alvin Toffler's book *Future Shock* (1970) played a formative role in my development as an instructional technologist. I read it during period when was struggling to find direction in my life (on a beach in South Carolina), and I was

fascinated with his perspective and the ways that he describes how the currents of change are interwoven into modern life. It sparked a fascination with technological change that led me toward a career as a designer and developer of instructional multimedia.

I became acquainted with the work of Marshall McLuan, Wayne Hodgins and John Barlowe later in my life when I was immersed in the formal study of the field of instructional technology and I always found their ideas to be a welcome and refreshing break from my studies of learning theory and instructional systems design.

Epistemology – Perhaps this category should be titled epistemological *fallibilism*. Although the debate about the depth and breath of fallabilism is, I believe, what caused a split between Peirce and the main stream pragmatists, it is safe to say that my meager experience in this area has shed some light upon this study. Lakoff and Johnson's work in *Metaphors We Live By* (1980) and Polyani's ideas presented in *Personal Knowledge: Towards a Post-Critical Philosophy* (1962) have helped me to understand this area a bit more.