ATHABASCA UNIVERSITY

FACULTY ASSESSMENT OF THE QUALITY AND REUSABILITY OF LEARNING OBJECTS

BY

NATASHA BOSKIC

A thesis submitted to the Athabasca University Governing Council in partial fulfillment of the requirements for the degree of

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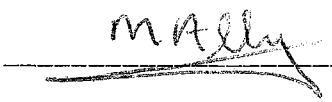
The undersigned certify that they have read and recommend to the Athabasca University Governing Council for acceptance a thesis "FACULTY ASSESSMENT OF THE QUALITY AND REUSABILITY OF LEARNING OBJECTS' submitted by NATASHA BOSKIC in partial fulfillment of the requirements for the degree of MASTER OF DISTANCE EDUCATION.



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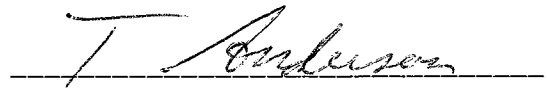

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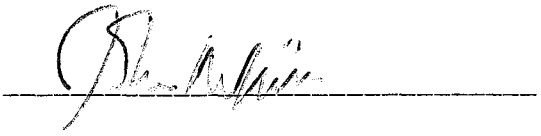

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DEDICATION

This thesis is dedicated to my children, Borislav and Nevena, whose generous support, love, and patience encouraged and sustained me throughout this program, and to my close friends who understood. The last, but not the least, I am devoting this thesis to Dr. Tony Bates who “pushed me into these waters” of online learning not only by his powerful and magic words, but by his inspiring personality as well.

ABSTRACT

The research explored the process of selecting learning objects and how it differs from choosing learning resources in a traditional teaching environment. The study was designed to identify the challenges educational practitioners face when designing, developing or selecting learning objects. Using an existing tool for learning object evaluation, Learning Object Review Instrument (LORI), I studied a) critical factors that determine the selection of educational material; b) the criteria educators use for selecting and evaluating leaning objects; and c) the participants' perception of validity of learning object evaluation due to the collaborative evaluation process, and the increase in quality. A number of research strategies were applied in order to answer the research questions. The educators' comments on learning objects and criteria for selection of digital teaching material were examined. The subjects were asked to participate in a learning object evaluation process. Interviews were conducted after the process to investigate if any changes appeared in the instructors' perceptions regarding the above issues. A review of current literature on learning objects and faculty development was executed to examine the innovative solutions to the research questions that have occurred in the process of conducting this study, if any. The results obtained from the survey questionnaires illustrate that the main criterion educational practitioners use for selecting learning objects is meeting prescribed learning outcomes. In regards to the question on collaborative assessment and the validity of that assessment, the results show that the participants recognized the necessity of collaboration in the design of complex online teaching and learning, and welcomed the presence of various expertise. Different

perspectives do not automatically bring quality, but they increase the likelihood for quality to be high.

ACKNOWLEDGMENTS

Among my greatest pleasures in acknowledging other is to thank all the participants in this study for their valuable contribution, unselfish dedication, and belief in me, without whom nothing of this could have happened. I would like to thank my committee members for their support and guidance, to my advisor, Dr. Mohamed Ally for his encouragement and help in making my wishes come true, to Dr. John Nesbit for keeping me motivated with his brilliant ideas and inquisitive mind, and to Dr. Terry Anderson for his interest in my work. Special thanks to Glenda Hawryluk, administrative assistant who has made everything go smoothly and easily with a “cheerio from Athabasca”.

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CHAPTER I

INTRODUCTION

Technology-mediated learning is no longer a new concept. Its place in the academic world is well established, from the use of computers as a supplement for specific courses and programs to general applications across the curriculum where technology provides the main mode of delivery; however, the key element in each case remains the teacher. Though the teacher's role has changed from that of the "pure" lecturer to one of facilitator (Beaudoin, 1990, Purdy & Wright, 1992), their importance and the necessity for their guidance remains a constant. Yet, little is known about how instructors adapt to these new circumstances, tools and approaches or what their attitudes are regarding the technology-mediated classroom. Nor is there sufficient understanding about the types of resources and tools needed to help instructors in their professional development.

According to Berge (1998), about one third of the subjects surveyed expressed concern regarding online teaching, especially in regard to the quality of online course design and the effectiveness of their teaching. Beaudoin (1990) cites the necessity of supporting instructors with orientation and training designed to meet the requirements of the new teaching methods. More than a decade later, the same issues were discussed at the Eighth Sloan-C International Conference on Asynchronous Learning Networks (ALN): The Power of Online Learning: The Faculty

Experience (November, 2002). A number of sessions were devoted to addressing the following questions:

- How do different institutions cope with professional development, keeping their faculty updated?
- What are the barriers that distance educators experience and how do they overcome them?
- How could and should faculty cooperate in order to create high quality courses?
- How should faculty workloads be managed? and
- What will motivate faculty members to remain in the distance education field (Sloan-C, 2002)?

Another issue which is a pressing concern to faculty, and yet is frequently overlooked as a subject of research is the problem of selecting the most appropriate course material for the mode of delivery. This study, therefore, focuses on that particular aspect of the teaching experience: that of selecting course material capable of enhancing student learning. In the digital environment, different labels are used to denote such material, one of which is the term "learning object". This study explores the process of selecting learning objects and examines how this differs from choosing learning resources in a traditional teaching environment.

Understanding why some selected learning resources fail to promote the prescribed learning outcomes elucidates flaws and weaknesses in instructional design, a first and critical step toward its improvement.

Statement of the Purpose

The purpose of this study was to identify the challenges educational practitioners face when designing, developing or selecting learning objects. The focus here was on the process of selecting learning and teaching resources as well as on the selection criteria educational practitioners use to make their choices. The Learning Object Review Instrument (LORI) (Belfer, *et al*., 2002), a tool for evaluating learning objects, was used to explore participants' perceptions regarding the attributes appropriate to a learning object. In addition, the participants were asked to comment on both the individual and collaborative evaluation processes. This study concludes by recommending that learning object evaluation be included in teacher training programs or other forms of professional development.

Research Questions

The following questions have been formulated with a view to achieving the above purpose:

1. What critical factors determine the selection of educational material?
2. What criteria do educators use, if any, for selecting and evaluating learning objects?
3. Does collaborative evaluation, according to the perception of the participants, increase the validity of learning object evaluation? Does it automatically translate into an increase in the quality of the objects and their reusability?

Assumptions of the Study

It was assumed that the educational practitioners would face certain challenges in designing and developing online or mixed mode courses, depending on their familiarity with the nature of the online environments and their attitudes towards the new medium. Experience in e-learning, as well as practitioners' flexibility in adapting to new models, will determine success in making a seamless transition to technology-based learning. In addition, the syntax used to describe learning objects and their features might prove an obstacle to understanding them -- hardly surprising given that their definition is a matter of passionate debate around the world.

Research Problem

Bates (1995) points out an underlying problem in technology-based learning:

> Technology does provide an opportunity to teach differently. … This, however, requires new approaches to teaching and learning, that exploit the unique features of different technologies in order to meet the widely different needs of many types of learners. These approaches must be based on the considerable amount of knowledge now available about how people learn and how to design effective learning environments, as well as on a good understanding of the educational strengths and limitations of different technologies (Bates, 1995, p. 17).

What Bates is suggesting here is the need to educate the educators. Some instructors adapt more quickly to new circumstances than do others. However, difficulty in adapting is not a matter of pedagogical competence or lack of technical skill; rather it is more a question of an innate ability to recognize the changes new learning environments have introduced. The strength of every good teacher lies in his/her ability to critically assess the quality of learning material, i.e., material that will aid students in understanding concepts and acquiring knowledge. Evaluating online teaching resources, or learning objects, is not the same as evaluating traditional learning materials.

This study explores the attitudes of educational practitioners towards learning object selection and their perceptions of the most important factors influencing their choices.

Significance of the Study

The research has the potential to make a significant contribution to educational institutions. It recognizes the challenges educators face in creating and selecting teaching resources for online learning, records examples of how educators decide to make this selection in a new digital environment, and examines existing tools and developed criteria for learning object evaluation. The results obtained through this research could be used in various types of professional development programs to help educators establish valid and reliable standards for teaching and learning material that will enrich the learning process and make it interesting, motivating and inspiring.

Limitations

1. Given the scope of the study and the variety of research methods involved, the number of the participants had to be limited. The contribution of each individual subject was considerable and time consuming. Having included a larger number of participants might have given more reliable results, but it would have extended the duration of the research to at least one year.

2. The learning objects selected for individual and later collaborative evaluation were not necessarily related to the current participants' work and therefore were not as motivating as they would have been had they related directly to their particular fields of interest. Of necessity, the study created a simulation in which all team members would work on the same course development project.

Delimitations

To maximize their interest in the project, all the participants selected for the study were professionally involved in the areas of language and literature. The learning objects chosen for evaluation dealt with content from the same field. It was assumed that in that way the subjects would be more motivated to engage in the evaluation process.

To compensate for the limitation in the number of participants, the sampled population included various professions: instructional designers, university instructors, college teachers, web designers, programmers, media developers, librarians, and students. Due to the quantity of data collected and the diversity of the

sampled population, the results of the research may be generalizable to the work of educational practitioners.

The creation of the focus groups for a collaborative assessment process, as well as the selection of the individuals for the interviews, was very carefully planned and structured to include the representatives of different professions. In this way, the results obtained ensured the presentation of various perspectives.

Definitions of Terms

Convergent participation: a model of a collaborative process consisting of individual and team work. The participants first do the individual evaluation, and then meet with the other group members and try to reach an agreement on each individual item.

Evaluation: according to Scriven's *Evaluation Thesaurus* (1991), "evaluation is the process of determining the merit or worth of something; or the product of that process."

Granularity of learning objects: the optimum size of a reusable learning object.

Instructional Design: The term refers to the systematic process of transforming teaching principles into practice (Smith & Ragan, 1999).

Learning Object: The term learning object is used by many educators (Downes, 2002, Wiley, 2000b) but there are also other terms referring to the same entity: knowledge elements, learning resource, online material, instructional component, information objects (Vargo, *et al*., 2002). The most widely used definition is one given by the Institute of Electrical and Electronic Engineers (IEEE) that defines

learning objects as “any entity, digital or non-digital, which can be used, re-used or referenced during technology-supported learning” (2002).

Metadata: Metadata can be considered to be data about data (Wason, 2003).

Professional Development: programs developed in institutions and companies with an aim to improve the performance of their employees.

Repository: a place where things are stored and can be found (Cambridge Online Dictionary). It is the most commonly used term for the storage of learning resources.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

This chapter reports on the literature and research associated with the research questions stated in the introductory chapter of this paper.

The theoretical framework includes an overview of various sets of principles of practice related to the main factors for learning object (LO) selection that educational practitioners have to consider when designing and developing technology-mediated learning.

Secondly, literature dealing with learning object repositories is discussed, and the Learning Object Review Instrument (LORI) is described.

Thirdly, the underlying theoretical position of contemporary scholars related specifically to learning object reusability, and the collaboration of educational practitioners in that domain, establishes the context and importance of the current study.

Finally, a review of current thought is presented on the issues of teacher training and professional development initiatives in the area of online learning.

Main factors influencing learning object selection

Four main factors were distinguished that influence learning object selection: cognitive process, interaction, evaluation, and instructional design.

Cognition. Various schools of thought have been developed in relation to how students build knowledge. This study applied a theory of constructivism, based on the results of Piaget's (1954) and Vygotsky's (1978) research. Whereas in the view of learning which posits that knowledge exists independently of the individual, Piaget and Vygotsky argue that learners actively construct their knowledge. Students assimilate new information and build it into their existing knowledge and experience, modifying their understanding in light of the new information (Brogan, 2002). Enriching their ideas, they develop critical insight into how they think and what they know about the world as their understanding increases in depth and detail (Bednar, *et al.*, 1992, Johnston, 2000, Jelfs & Whitelock, 2001).

Constructivist principles of "creating new knowledge" are even more relevant in the current technological era, where the "constructing" is happening through using different media. The term "information highway" (Wagner, 1998), used very often during the "stone age" of internet, implies a linear mode of learning. With the constructivist theory in mind, seeing learning process as a straight line from point A to point B is inadequate. Learning more closely resembles a quest for the "Holy Grail", a journey of individual exploration, challenges, and moments of insights. It is the role of instructors to design this journey so that the travelers always find those clues essential to completing the puzzle, to directing them to their respective goals. It is crucial, then, that the material selected as a learning resource must correspond to their cognitive skills.

Interaction. Many educators and researchers emphasize the social aspect of learning process. For them, interaction is the key to effective learning (Keegan,

1990, Moore, 1989). Moore (1989) identifies three different interactions that occur during the education process: learner-instructor, learner-learner, and learner-content interaction. When considering the digital environment, Hillman *et al*. (1994) add a four: learner-interface interaction. It is difficult to say which of the four is more important. What is essential is to recognize them and to understand that new media create new relationships. Those who create knowledge elements or select them for students must be aware of the impact of these new relations on student motivation and, consequently, on the learning process (Fulford & Zhang, 1993). Hillman *et al*. (1994) point out "the medium must be evaluated not only as an information delivery system, but also as a medium through which interaction must pass."

Evaluation. Understanding how students learn and how they interact helps teachers select material that will enhance the learning process. A principle aim of every teacher, instructor or other educational practitioner should be to organize instructional activities in such a way as to achieve his/her educational goals; In other words, to offer resources capable of fulfilling the needs of learners. To this end, whatever is offered has first to be evaluated. Learners should receive only high quality learning materials. But how can instructors ensure that a learning object from the repository of learning objects is, in terms of quality, adequate for meeting the specific needs of learners? While there exist a number of repositories on the Web, only a few allow users to review and rank learning objects.

The process of evaluation of teaching and learning materials has also undergone enormous change as a result of the changing learning environment. For example, Web-based instruction requires the learners' active relationship not only towards the

written word, but towards a content that is in constant flux, content that demands more than a passive reading role. This change in the way the learner interacts with the content necessarily means that the evaluation of that content must be adjusted. The instructor is faced with selecting not only text, but also animation, multimedia elements, music, a simulation, interactive games, etc. The resources that educators are more familiar with, such as textbooks, for instance, are easier both to evaluate and select. They know which criteria to apply when examining conventional course material. However, when faced with a multimedia element or a learning object that is part of virtual repository, they have few tools available to establish criteria for the evaluation of those resources. Educators need to have specific standards to enable them to store learning objects in virtual space, and retrieve them when required. Moreover, whereas in the past educators were mainly responsible only for the content of their lessons, nowadays, educators must also worry about matching that content to the most suitable medium, and anticipate how their students will use it. Knowing how students respond to different stimuli will help instructors identify what to look for while selecting and evaluating a learning object.

Instructional Design. An understanding of the changes that occur in the cognitive process of learners and in their interactions with instructors, with one another, and with various content and interfaces, along with an ability to evaluate learning objects and re-use them in a new customized digital environment, leads to better instructional design. Different learning and teaching tools require different approaches (Bates, 1995). Instructional design has been influenced by a paradigm shift that had occurred in several domains from:

1. teacher-centred education to learner-centred education (Laurillard, 1993, Marzano,1992, Norman & Draper, 1986, Soloway et al., 1994);
2. the collective learning environment (physical space) to personalized and independent learning environments (Delahoussaye, 2002, Johnston, 2000);
3. individual learning to cooperative and collaborative learning (Moore & Kearsley, 1996);
4. a focus on product to a focus on process (Davis, 1978);
5. common knowledge to “only what I need knowledge” (Lunzer & Tanaka, 2001); and
6. passive learning and absorption to active learning and exploration.

Well-planned and organized instructional design requires identifying learning goals and finding ways to realize them. This process includes the selection of instructional materials, activities, and methods of assessment. Good instructional design makes the learner comfortable and more receptive to the content (Hillman *et al.*, 1994).

The fact that learning objects can be stored virtually means that they are easily accessible to all those who have the appropriate technology and so can be shared. The process of designing a multimedia element can be costly and time-consuming. Yet, once completed it can be used repeatedly for different purposes and in different learning situations. With the increasing need to share such knowledge components, comes the need for criteria capable of guiding the development of learning objects, i.e. standards (South & Monson, 2002, Vargo *et al*, 2002, Williams, 2000, Wiley (2002b). The Learning Technology Standards Committee (LTSC) of the IEEE has

developed accredited technical standards, recommended practices and guidelines for learning object metadata (approved in June, 2002). The question is how important is it for educators to know these standards? This study explores the view of educators on metadata standards in relation to learning object selection and evaluation.

All these circumstances place learning objects and their features in a special niche in the instructional design process. Careful attention paid to their development and storage, with a view to their reuse, leads to enhanced learning outcomes.

Learning objects

Before moving on to examine the literature pertaining to learning object repositories, let us review definitions of the term "learning object". This is essential as many of the difficulties related to learning objects begin with their definitions. The latter range from the IEEE's extremely broad “any entity, digital or non-digital, which can be used, re-used or referenced during technology-supported learning” (meaning virtually anything and everything) to Ally's very specific “any digital resource that can be used and re-used to achieve a specific learning outcome or outcomes” (in press).

Learning objects have their origin in Object Oriented Programming (OOP) found in computer programming. The basic idea behind OOP is that codes can be organized into distinct units with distinct purposes for reuse in other contexts. In the field of education, learning objects should help realize the constructivist goal of building knowledge, i.e. of identifying units of instruction, deconstructing them and reconstructing them for use in other contexts. In the future, the term will move from

the computer programming to the education sphere. Regardless of how it is defined, and whether we call it a learning resource, knowledge element, or something else, educational practitioners must be able to distinguish between good and bad online teaching material. When designing courses they have two options: to create something on their own or to use something already made.

Learning object repositories. Repositories for learning objects began emerging in the mid 1990s. They serve as a place where learning objects are stored and maintained, usually on a centralized server. The number of learning objects has been increasing daily while their function has remained the same: to be usable/reusable/sharable by others.

The most famous learning object metadata repository is MERLOT (Multimedia Educational Resource for Learning and Online Teaching) (www.merlot.org). The problem with the existing repositories is not the availability of resources, but the quality of the materials. (Belfer, *et al.,* 2002, Wiley, 2000b, Williams, 2000). Individual evaluation might provide insight regarding the quality and utility of learning objects, but is it reliable or valid?

Developed by the California State University Center for Distributed Learning in 1997, MERLOT is a leading and exemplary repository for learning objects. Educators evaluate learning objects on the basis of three criteria: content quality, potential effectiveness, and user friendliness. A 1-5 star rating scale (http://taste.merlot.org/rate.html) is used for each criterion. This scale should prove useful to those who read the reviews and try to use instructional technology in the classroom. The MERLOT administrative team and discipline teams play important

roles in the evaluation process. It is they, along with faculty members, who select the material to be reviewed and who conduct peer evaluation. Two subject matter experts work asynchronously to carry out the peer evaluation process.

Most learning object repositories offer no support for quality evaluation (e.g., Telecampus, Apple Learning Interchange, MathForum, Alexandria/Careo); a few provide space for user comments (e. g. Wisconsin Online Resource Center), but only MERLOT and Harvey Project feature peer reviews.

Williams (2000) expresses curiosity as to how selections are made given the many features intrinsic to learning objects. He discusses criteria such as reusability, repurposability, granularity, instructional value, existence of metadata, ability to adjust, architecture, approach, and sequence.

Recker, Dorward, Walker and Wiley of Utah State University have created a special search function for their digital libraries**,** which will allow educational practitioners to search for learning objects (Recker *et al.,* 2000). This project, dubbed Altered Vista (currently inaccessible), is described in the Recker, Walker and Wiley article on collaboratively filtering learning objects (2000). It is important to note that the developers planned to use this method in evaluating and recommending learning objects to users.

Learning Object Review Instrument (LORI). To increase the reliability and address the potential deficiencies of MERLOT's evaluation process, Vargo *et al.* have developed a new tool, the Learning Object Review Instrument (LORI) (Vargo *et al.*, 2002, Belfer, *et al*., 2002). LORI is unique in that it is capable of measuring nine

separate attributes of learning objects, listed in Table 1. This tool can be used by both individual and teams.

Table 1
LORI Items with Brief Descriptions

	LORI items
1	**Content Quality**: Veracity, accuracy, balanced presentation of ideas, and appropriate level of detail
2	**Learning Goal Alignment:** Alignment among learning goals, activities, assessments, and learner characteristics
3	**Feedback and Adaptation:** Adaptive content or feedback driven by differential learner input or learner modeling
4	**Motivation:** Ability to motivate, and stimulate the interest or curiosity of, an identified population of learners
5	**Presentation Design:** Design of visual and auditory information for enhanced learning and efficient mental processing
6	**Interaction Usability:** Ease of navigation, predictability of the user interface, and the quality of user Interface help features
7	**Accessibility:** Support for learners with disabilities
8	**Reusability:** Ability to port between different courses or learning contexts without modification
9	**Standards Compliance:** Adherence to international standards and specifications

Vargo *et al*. view LORI as a support for learning object repositories; LORI itself is not a digital library, but rather a tool for facilitating the selection of learning objects. The participants in the evaluation process come from various professions. They include not only subject matter experts, who comprise the majority of MERLOT's team of evaluators, but also instructional designers, media developers and even students (Nesbit, *et al.,* 2002). Nesbit describes the instrument as a "memorable set

of broad categories allowing reviewers to quickly assess areas of strength and weakness" (Nesbit *et al*., 2003). According to Vargo (2002), this should result in greater inter-rater reliability of learning objects. They view their tool as more effective as it can be used by a single individual, and, owing to the model used for collaborative evaluation, it has the validity and credibility necessary for the selection of a particular learning object.

Perspectives on Reusability and Collaboration

Reusability of learning objects. The main attraction of learning objects is that they can be used and re-used (Eduworks.com). Creating systems such as digital repositories that allow educators to easily search for and access learning objects -- for example, digital repositories -- will eventually lead to an "economy of educational objects" (Ring & MacLeod, 2001) where the same learning objects will be used for different purposes. This will apply not only to material related to academic education. An example from the corporate world is the Reusable Learning Object Strategy developed by Cisco Systems, Inc., which places major emphasis on the granularity of learning objects and easy knowledge management (Barritt, 2001, Muzio, *et al*., 2001). It is increasingly imperative for any developed content and information to be sustainable. Can it be a completely independent entity? How can a "searcher" distinguish a good learning object from a bad one? If reused, will it achieve its instructional goals?

The concept of reusability can be approached from a number of different viewpoints. In this paper two perspectives are distinguished: a) technical or operational, and b) Instructional or pedagogical.

Teachers, instructors and other educational practitioners have always used all available teaching resources to facilitate student learning. The difference between the present and the recent past is that more and more resources are being created or transformed into digital form and placed on the Web. The technology requires new answers to old questions.

First, the question of how to catalogue learning objects is of critical importance. Specifications describing important characteristics of a learning object are called metadata**.** Learning objects are catalogued according to the metadata they possess; this process of cataloging is referred to in the digital world as “metatagging”. This metatagging allows “effective retrieval, management, transfer and use” (Merkel *et al*., 2002) of learning objects. Some researchers argue that metadata is and should be more than data about data. Rather than being limited to pure description, metadata should, according to Gilliland-Sweetland (1998) also explain the behaviour of objects, their function and relationship to other objects. For Jacobsen and Ruyle (2003), the issue of whether metadata should be “more than data about data” can be resolved by distinguishing between its "objective" and "subjective" forms. The former is information that can be recognized by technology without the aid of human intervention, and consequently is "tagged" automatically; the latter requires human intervention. Examples of subjective metadata provided by the authors include: classification keywords, interactivity levels, keywords and the status of learning objects.

Metacognition is a term originally coined by Flavell (1976) to refer to one’s personal knowledge about cognitive processes. The purpose of this “thinking about

thinking" (Vacca & Vacca, 1999) lies in gaining active control over cognitive processes. Similarly, recording metadata about learning objects may facilitate their sorting, monitoring, management and retrieval. If, as Pressley, Borkowski and Schneider (1987) claim, metacognitive ability is crucial to learning and success in education (Osborne, 2002), metadata may enhance both the interoperability and repurposability of learning objects. Some go even further, concluding that common technological standards for e-learning content will result in "plug-and-play" (Gordon, J., 2002) ease of use.

The second question is how cataloging will help individuals find learning objects, i.e. the issue of retrieval. In other words, common standards of cataloging will enhance the accessibility of the learning objects and thus increase their chance of being reused. The only way to ensure the usability and reusability of learning objects is to develop standards to which everyone will have to comply. The IEEE LOM standards are divided into nine distinct categories. Vargo *et al*. argue that the development of appropriate tools for quality evaluation, such as LORI, would improve the design of interactive media for web-based learning and facilitate retrieval of stored learning objects.

Third, if one repository lacks the required learning object(s), how can one access another? POOL (The Portal for Online Objects in Learning), a consortium of educational and private and public sector organizations was created with a view to developing an infrastructure for learning object repositories (http://www.edusplash.net/). In particular, the POOL project seeks to connect users in an online community. Resolving the problem of repository interrelation is

inevitable given the rapid rate of technological progress in this area. However, for the immediate future Wiley (2002b) is quite correct in expressing concern that metadata may further confuse the process of data retrieval unless common standards are adopted that will enable incompatible systems to understand each other.

Sooner or later, technical solutions will be found and standards introduced for repository interconnectivity. However, in order for successful learning to really happen, we need good instructional design. Some researchers think that resolving the instructional/pedagogical issues is where the real challenges lie. Collecting material from different resources and creating personalized teaching content is as old as the teaching profession. Wiley (2000b) supports his argument about how instructors work by quoting Reigeluth and Nelson's (1997) findings on deconstructing and reconstructing. They point out that every teacher breaks the resource down into its constituent parts first, and then puts them together again in a different arrangement. To avoid the deconstruction/reconstruction process, Downes (2002) argues that a learning object should be that elemental constituent component that cannot be broken down any further and is ready for instructional use in different combinations. It sounds so easy and simple. For that reason, learning objects are often compared to LEGO blocks (Hodgins, 2002). Wiley (2002c) disagrees with this analogy pointing out that LEGO blocks can be put in any combination with each other. He prefers to see learning objects as atoms where a limited number of combinations will work.

This discussion raises the question “How big or small should a learning object be?” South and Monson (2002) suggest moving from the course level to the concept level of granularity, but at the same time cautiously state that, “the optimal level of granularity must be determined for each project based on its individual goals”. Stephen Downes (2000) views the issue of granularity through the prism of economics. He suggests that learning objects have “common elements” that are shareable by educational institutions, and so in the interest of lowering course production costs, the ideal size of a learning object is the “common element”. This breakdown of learning objects into common elements results in decontextualization and isolation, something which Wiley (2002b) is strongly opposed to. He analyzes a paradox related to learning objects size and their reusability. A number of authors distinguish between reusing and repurposing of learning objects (Ring & Macleod, 2001, Jacobsen & Ruyle, 2003, Wiley, 2002a), the former is seen as using the existing elements with no modification, and the latter using them with modifications designed to serve individual instructional goals.

Breaking down learning objects into these common elements inevitably leads to the next question: Who owns what? Downes is a big advocate of an “open-source“ type of approach, but not all academics agree with this idea of free sharing. The American Association of University Professors (AAUP) established a policy on intellectual property in 1999, and issued its Statement on Copyright (http://www.aaup.org). Despite the fact that new technologies may make copyright obsolete, protecting the rights of faculty remains crucial to the Association (Smith, 2002). The pros and cons of free sharing can be seen at: www.col.org/copyright.

This document is a transcript from the virtual conference on copyright and intellectual property issues, held in February 2003 in which more than 500 people participated. Protecting the legal rights of the authors of learning objects may prevent some of them from being reusable.

Finally, if the learning objects are exactly the size we would like them to be, with exactly the content we are interested in, and with no copyright problems, how can we be assured of the quality of the resources found in the repositories? Williams (2000) states that learning objects must be subjected to an evaluation process. He tries to formulate an evaluation process based on answers to the following questions:

a) **Who** will the users of the learning object be?

b) **Why** do they need the learning object and how will they use it?

From these answers, he decides what criteria to use for evaluation and how the evaluation will be built into the instructional process.

Collaboration. There are three basic types of evaluation: individual, peer-to-peer, and collaborative. LORI includes all three. The increased importance of collaboration lies in the fact that the creation of a learning object ("any digital, or non digital resource…") is more and more often done in teams. For a learning object to obtain a "good quality" rating, it is essential but not sufficient to have content that is "accurate, with [a] balanced presentation of ideas and appropriate level of detail" (see LORI, items description) and is aligned with learning goals. Moreover, the quality of learning objects is reflected in their ease of navigation, in whether or not their presentation design will "enhance learning and efficient mental processing"

(LORI, items description), and in many other features specific and unique to digital media. Collaboration among various subject matter experts or other professionals seems necessary in order to ensure validity of results (Wiley, 2000c, Vargo *et al*., 2002). Working in teams and sharing information may bring stability and confidence. Cook-Sather claims that “conversations and collaborative relationships … took constructivism to a new level. … the conceptualization of learning included other players in the educational context, specifically librarians and information technologists” and that “they were inspired to work together early on and throughout the pedagogical planning process so that different constituencies could contribute their perspectives at various stages, not just at the end.” (2001). It is hoped that the collaborative rating of learning objects will also bring quality assurance.

Realizing the importance of having different perspectives, a collaborative filtering system (Malone *et al.,* 1987) was designed, implemented and evaluated by the GroupLens project group and applied to Usenet news in 1992 (Konstan, *et al*., 1997). It was further developed by Recker, Walker and Wiley (2000b), where this technique was employed to enable users to share ratings, opinions, and recommendations about resources on the Web. Recker *et al*. suggested extending the Learning Technology Standards Committee (LTSC) standards. As opposed to the technical aspects of object description defined by the LTSC standard, which they call ‘authoritative’ metadata records, Recker *et al*. proposed the introduction of ‘non-authoritative’ metadata records which would capture the context of use of the learning objects. Any user could contribute a metadata record for a particular

learning object; so as a result, it could have multiple ‘non-authoritative’ metadata records (Recker, *et al*. 2000).

The other way of sharing and disseminating of knowledge and resources is by creating different communities of people with similar interests and ideas. Scardamalia and Bereiter talk about knowledge building through computer-supported intentional learning environments (CSILE), where collaboration is the means for knowledge advancement (1994, 1996). They argue that existing educational computing tends to support knowledge reproduction, rather than knowledge building (1993). The authors developed CSILE to support and encourage knowledge building at schools, but it is easily applicable to other virtual environments. Building on their foundation, Wiley and Edwards (2002) go further to investigate self-organizing social systems, such as Slashdot (http://slashdot.org/). They point out the features of these communities, which are not primarily created as learning environments, which turn them into very active learning sites. In these settings, learning objects acquire a completely new dimension; learning objects appear spontaneously when a given situation creates a necessity for them; this is followed by a real-time peer review enriched by narrative description and discussion.

Professional development

Using technology has made teachers and professionals change their instructional practices (Baker et al., 1996). Windschitl and Sahl (2002) pointed out that a number of studies had illustrated that the teachers who use technology tend to become more constructivist in their pedagogy, (Becker & Ravitz,1999, Means, 1994, Mehlinger,

1996), but they wanted to explore how and why that happened. They claim that professional development should focus more on effective teaching and the changing role of the teacher in a web-based environment than on improving teachers' computer skills. In addition, development opportunities will happen through conversations and knowledge sharing. Cook-Sather described a workshop organized to explore the role change in academic settings (2001). She realized that acquiring technology and "techno-pedagogy" would take some time, and that it would also require constant support. Spector (2002), on the other hand, focused on repository creation inside institutions. He expressed concern that teaching and learning resources would stay unused unless instructional designers and developers were properly trained.

Conclusion

The literature review established the basis for the research project. It included the four critical factors in designing learning and teaching material for the online environment: the student's cognitive process, the four types of interaction, the challenges presented by the evaluation process and quality assurance, and the importance of those three elements in the instructional design. Learning objects were defined and described from a variety of perspectives. The literature review pointed out the difficulty learning object repositories have with respect to the quality control of the stored learning objects. One of the few existing tools for learning object evaluation, LORI, was described. A broader perspective was taken on team work and the increased need for collaboration in the various professions working in

educational technology. Lastly, literature dealing with professional development and teacher training was explored. A lot of researchers have recognized the differences that exist between the traditional and technology mediated learning. It seems, though, that more attention needs to be paid to training teachers to meet the demands of the changed circumstances.

A quantitative study has been conducted, exploring the functionality and effectiveness or the collaborative assessment method using LORI (Vargo *et al.,* 2002). The research presented in this paper was a continuation of this study, focusing on the educators' perspectives on learning object evaluation. The purpose of the study was to demonstrate how the participants perceive this process in respect to three key points: collaboration, reusability, and professional development. Research data was obtained through a survey conducted with the subjects prior to the evaluation process, through data collection during the evaluation process, and through follow-up interviews.

CHAPTER III

METHODOLOGY

Introduction

This study was designed to obtain faculty and other educational practitioners' opinions and perspectives regarding the quality and reusability of learning objects. The researcher was interested in how those who are involved in technology-based distributed learning perceive different repositories as a source of learning resources. However, the study was focused only on the issues of quality assessment as the basis for selecting and using learning objects from the repository.

This chapter provides a background to the study, a description of the participants and the applied research design, an explanation of the data collection process and analysis.

Background to the Study

Having been involved in the first testing of the Learning Object Review Instrument, and later on in the revision of the document, the researcher became interested in the issue of learning object quality assurance. Not only should subject matter experts or content providers be involved in and knowledgeable about the assessment, as has been the case until now, but so should all other professionals involved in the online learning process. The researcher was curious to find out what differences, if any, might exist in the perception of the quality of a learning object and if they might differ depending on the participant's background (e.g. web developer, media specialist, programmer, student, etc.).

The purpose of this study was to contribute to a better understanding of how educational practitioners choose various types of digital learning resources and how they identify the key elements for their selection. The results were expected to indicate weak points, lack of knowledge and the need for additional training in the area of their professional development.

The study had two broad objectives: to observe faculty attitudes to learning objects, and to see how those attitudes are demonstrated in practice. To achieve its purpose, the research project examined the following questions:

1. What critical factors determine the selection of educational material?
2. What criteria do educators use, if any, for selecting and evaluating learning objects?
3. Does collaborative evaluation increase the validity of learning object evaluation in the view of the participants? Does it automatically translate into an increase in the quality of the objects and their reusability?

A number of research strategies were applied in order to answer these questions. The educators' comments on learning objects and the criteria for the selection of digital teaching material were examined. Subjects were asked to participate in a learning object evaluation process using the convergent participation model. Interviews were conducted after the process to investigate if any changes appeared in instructors' perceptions regarding the above issues. A review of current literature on learning objects and faculty development was

executed to examine the innovative solutions to the research questions, if any, that have occurred in the process of conducting this study.

Approval from the Ethics Committee was obtained before starting with any research activities.

Participants

The subjects for this study included different educational practitioners: instructors/teachers in higher education, instructional designers, librarians, web developers, programmers, media specialists, students and others. They were selected systematically to ensure representation of different professions related to online academic learning. The only limitation in the selection of the participants was that subjects should have had some experience in online teaching and learning (either practical or theoretical). To make the evaluation process more relevant to the participants and more similar to a real life situation, subjects were selected for the most part from the area of Languages and Literature areas. The same broad criterion was applied to the learning objects selection for the assessment.

Initial contact with the subjects occurred at the beginning of January 2003 (Appendix A). Twenty-three out of twenty-four potential participants responded and signed the consent form (Appendix B).

Research Design

Survey questionnaire. The participants were given brief introductory survey questionnaires to complete (Appendix C).

The survey questionnaire was structured and organized into several main groups:

a) questions related to demographic and professional characteristics;

b) questions related to participants' perceptions of learning objects (their major features);

c) questions related to participants' attitudes toward creation, selection and reuse of learning objects; and

d) questions related to participants' perceptions of the need for professional development in relation to technology-based learning.

The subjects responded to the questions and rated items on a Likert scale of 1 to 5 ranging from "not important" to "very important".

Convergent participation model and learning object evaluation. To achieve objectivity in the learning object selection, all learning objects were taken from an existing repository, MERLOT (http://www.merlot.org), from the education section. They had been selected by the researcher and distributed to the participants for evaluation. The Learning Object Review Instrument (LORI) developed by Nesbit, Vargo, Belfer and Archambault (2002), (J. Vargo *et al.*, 2002) was used in this research as the assessment tool.

The evaluation of the learning objects was done in two phases: individual and collaborative. In Phase I, the evaluators used LORI to individually measure nine separate qualities of learning objects on a scale from one to five (Appendix E). During Phase II, the participants (groups of three or four) met synchronously in a moderated discussion using a conferencing system on the Web, MSN chat room which was available to all participants. During the discussion the subjects

participated in a team review. Four (out of eight) randomly assigned learning objects were discussed. The convergent participation model used in this research was explained in detail by Nesbit, Belfer and Vargo (2002).

The team members were systematically assigned by the researcher. The selection was based on their profession. Originally participants were to form groups of four for the online discussions. However, due to the different availability of the participants, the final structure of the groups was as follows:

1. Blue Team: 4 participants (an instructional designer, a college instructor, a university professor and a librarian)
2. Green Team: 3 participants (a graduate student, a university professor, and a media specialist). The fourth assigned member was an instructor, a Mac user.
3. Yellow Team: 3 participants (an instructional designer, a graduate student, and an instructor). The fourth assigned member was an educational consultant, a Mac user.
4. Red Team: 2 participants (an instructor, and a programmer). The third assigned member was a teacher from Japan who could not participate due to the time difference.
5. White Team: 3 participants (an educational consultant, a programmer and a graduate student)

The researcher selected four learning objects for the discussion. The selection was based on which of the eight randomly assigned learning objects in the individual evaluation provoked the largest disagreements among the team members. The

researcher considered that it would be of more interest to discuss the items where subjects had disagreed rather than the learning objects where the scoring was relatively equally distributed. However, there were some exceptions, as explained later in the text. Before the online meeting, each participant was provided with the results of his/her own group. The example of the Team rating sheet where a subject could compare his/her scorings to the scorings of the others is given in Table 2. Each item was rated on a scale from one to five or N/A.

Table 2

Individual Ratings of Four Learning Objects Selected for Collaborative Evaluation: Yellow Team

Learning Objects	**1 LIT Gloss**				**3 Shakespeare**				**5 Digital Dante**				**8 T/S Relation**			
Categories/Participants	116	P2	P3	P4	116	P2	P3	P4	116	P2	P3	P4	116	P2	P3	P4
1. Content Quality	N/A	4	1	5	N/A	4	3	1	5	4	5	5	4	3	4	3
2. Learning Goal Alignment	3	3	2	5	1	3	1	2	5	4	4	5	4	3	4	5
3. Feedback and Adaptation	3	2	1	5	1	2	1	1	5	3	1	1	4	3	2	5
4. Motivation	3	3	3	5	3	4	4	3	5	5	5	5	5	3	3	5
5. Presentation Design	2	4	2	3	2	4	2	2	5	4	5	5	5	3	4	5
6. Interaction Usability	3	4	4	5	2	4	4	5	5	4	5	4	5	4	3	4
7. Accessibility	2	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1
8. Reusability	2	4	2	4	2	4	2	N/A	5	5	4	4	4	2	4	N/A
9. Standards Compliance	N/A	1	N/A	N/A	N/A	1	N/A	N/A	N/A	1	N/A	5	5	1	N/A	N/A

Each individual participant could see his/her scoring indicated by the assigned research number, for example in the first column number 116. The other members were identified as P2, P3 and P4. The four learning objects selected for collaborative evaluation were given in the heading row of the table, hyperlinked to their corresponding websites. The subject P4 in this example could not participate in the discussion due to technical difficulties. Macintosh computers are not compatible

with MSN. Unfortunately, the researcher only discovered this when the subject tried to access the chat-room.

The researcher visually reviewed the results submitted by team members and made a selection of LORI items for each learning object that would be reviewed during the online session. The one-hour meeting did not allow participants time for a detailed discussion on all nine items for all four learning objects. The shaded areas in Table 3 (the researcher's copy of the team rating) illustrate the discussion focus for LO1 (content quality, leaning goal alignment, feedback and adaptation, and reusability), LO2 (content quality, learning goal alignment, feedback and adaptation and interaction usability), LO3 (feedback and adaptation, motivation, and accessibility) and LO4 (feedback and adaptation, presentation design, accessibility and standards compliance).

Table 3

Individual Ratings of Four Learning Objects Selected for Collaborative Evaluation: Yellow Team (the researcher's copy)

Learning Objects	**1 LIT Gloss**				**3 Shakespeare**				**5 Digital Dante**				**8 T/S Relation**			
Categories/Participants	116	108	114	119	116	108	114	119	116	108	114	119	116	108	114	119
1. Content Quality	N/A	4	1	5	N/A	4	3	1	5	4	5	5	4	3	4	3
2. Learning Goal Alignment	3	3	2	5	1	3	1	2	5	4	4	5	4	3	4	5
3. Feedback and Adaptation	3	2	1	5	1	2	1	1	5	3	1	1	4	3	2	5
4. Motivation	3	3	3	5	3	4	4	3	5	5	5	5	5	3	3	5
5. Presentation Design	2	4	2	3	2	4	2	2	5	4	5	5	5	3	4	5
6. Interaction Usability	3	4	4	5	2	4	4	5	5	4	5	4	5	4	3	4
7. Accessibility	2	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1
8. Reusability	2	4	2	4	2	4	2	N/A	5	5	4	4	4	2	4	N/A
9. Standards Compliance	N/A	1	N/A	N/A	N/A	1	N/A	N/A	N/A	1	N/A	5	5	1	N/A	N/A

Where all members rated an item equally as in LO3 (motivation), the questions about this learning object's features were more general, such as: "Why did you find it

motivating? What makes a learning object motivational? How important is motivation?" etc. Some items, for example feedback and adaptation, were discussed for all or at least two of learning objects.

Interviews. Semi-structured interviews were conducted after the learning object evaluation process with a selected number of subjects (Appendix D), and recorded. The researcher interviewed representatives of different professions.

Interviewees were asked to comment on the learning object evaluation process, the convergent participation model, and changes in their personal perception regarding these issues. Some of the questions used in the questionnaires at the beginning of the research were asked again during the interview to see if any changes in opinion had occurred. The participants were provided with complete privacy in relation to the study and the obtained results. All data was kept private during the study and data analysis, and will be destroyed five years after the research is completed.

All subjects were assigned research numbers, so that anonymity was completely protected, and privacy assured. Subjects' participation was voluntary.

Instrument

The Learning Object Review Instrument was designed in 2002 (Vargo *et al*.), but it has undergone a number of revisions. Originally, the LORI contained ten items for evaluation. In version 4.0 (2003), it was revised to include nine. Some minor changes were made in the wording of the item descriptions.

The description of items given in the LORI document (Belfer *et al*., 2002), and the instructions for rating sent to the participants by email, are presented in Table 4.

Table 4
LORI Rating Description

LORI item	Low Quality – 1 point	High Quality – 5 points
Content Quality: Accuracy, balanced presentation of ideas, and appropriate level of detail.	The content is inaccurate, incomplete or biased. Cultural, ethnic, or racial groups are not represented in a balanced manner.	The content is free of error and presented without biases or omissions that could mislead learners. Cultural, ethnic, and racial groups are represented in a balanced manner.
Learning Goal Alignment: Alignment among learning goals, activities, assessments, and learner characteristics.	There are no goals apparent or they don't match the assessments, content, activities, or target learners.	Learning goals are clear, appropriate, and aligned with what's in the object. The object provides all of the tools needed for the learner to achieve the goals.
Feedback and Adaptation: Adaptive content or feedback that can tailor the information to the needs of each learner.	The learning object is exactly the same for all learners and does not provide feedback on how well the learner has grasped the material.	The learning object keeps information about the learner so that it can adapt to meet the learner's needs and to provide useful feedback.
Motivation: Ability to motivate and stimulate the interest or curiosity of learners	The learning object content is irrelevant to its target audience or its attempts to be interesting distract from the main purpose.	The learning object is highly motivating and relevant to learners. The learning object's examples are realistic and use multimedia (e.g. audio, video, animations, etc.). Learners are likely to be more interested in the topic after working with the object.
Presentation Design: Design of visual and auditory information. The learning object is easy to read; information and options are easy to find.	The display is difficult to read or hear, missing important information (e.g. labels on buttons, etc.), or distracting (e.g. flashing colors, etc.).	The learning object is easy to read; information and options are easy to find.
Interaction Usability: Ease of navigation, predictability of the user interface, and the quality of help features.	It's not clear how to move around within the learning object or learners can't get where they want to go.	Moving around within the learning object (navigating) is easy and intuitive. Learners don't have to hunt for the "right" button.
Accessibility: Support for learners with disabilities. (e.g. problem with vision or hearing)	The learning object does not have captioning for videos or transcripts for audio files. Graphics would be unclear to those who are colour blind, etc.	The learning object presents the same information in multiple ways (e.g. through text and narration, etc.) and allows multiple forms of input (e.g. through keyboard or

		voice commands, etc.).
Reusability: Ability to use the Learning Object in different contexts (e.g. different courses or schools)	The learning object contains references to outside materials (e.g., "As you saw last year…" or "See Course XYZ" or "…the handout available in room 123"). The object requires specific software to run.	The learning object is self-contained and could be used by different people in different courses/schools. The object will function with any commonly-used browsers or operating systems.
Standards Compliance: Adherence to international standards and specifications regarding metadata (data about the object).	The learning object is not compliant with any of the relevant international standards.	The learning object adheres to all relevant international standards.

Data collection

Survey questionnaires were distributed either by email or in person and returned in the same way. Data was collected over a two-week period. Twenty-three completed questionnaires were returned to the researcher.

During the first phase of the learning object evaluation process, individual rating was done asynchronously within a period of a few weeks. The participants were provided with the LORI document, which assisted them in understanding LORI items and the scoring process, and with eight rating sheets for eight learning objects. They used nine categories for each LO, simply highlighting (bolding) their selection on a scale of one to five or N/A (non-applicable). Completed rating sheets were returned to the researcher by electronic mail.

The focus groups created by the researcher were scheduled to participate in online discussion during the following few weeks, depending on the participants' availability for synchronous meetings. Each session lasted no more than an hour.

During phase I and II of the learning objects evaluation process, a pattern of participant attrition appeared. The individual evaluation was done by eighteen

subjects out of twenty-three. Reasons for attrition occurred mostly because of participants' inability to devote their time to this process due to their other professional responsibilities and engagements. Two participants went on a business trip; two participants were appointed to a new position and had to devote their time to their new circumstances; one participant got sick. Familiarizing themselves with the instrument (LORI), as well as doing the actual evaluation took considerable time to complete, more than 1.5 hours for most of them. Fifteen of them took part in online discussions. The reasons for non-participation in online discussions varied. Two participants had a Mac computer, which was not compatible with Microsoft Network, and one subject could not participate because of the time difference.

The interviews were conducted with five subjects selected by the researcher according to their professional affiliation: an instructor with a rich experience in online learning, an instructor with very little experience in online learning, an instructional designer, a librarian, and a graduate student. Individual interviews were recorded. The interviews lasted 15 to 30 minutes.

Data Analysis Strategies

The survey questionnaire responses were looked at in relation to four main groups of questions. Only one question from the first group was analyzed and commented on, that is, the data about participants' occupation. The other responses did not seem relevant for the research at this point. The second part of the analysis included a comparison of the participants' answers about learning object quality and the LORI items. The third group of answers to open-ended questions on the criteria

for selection and the reuse of learning objects were aggregated and ordered by frequency. Lastly, the subjects' rating of the importance of specific features of learning objects were counted and presented in a table.

Individual evaluations were analyzed using SPSS for descriptive statistical analysis.

The coding of the transcripts of the focus group meetings, as well as of the interviews, was done in a Word document without using any specific software for qualitative analysis.

CHAPTER IV

RESULTS

Introduction

The purpose of this study was to identify the challenges educational practitioners face when designing, developing or selecting learning objects. The focus here was on the process of selecting learning and teaching resources and on the selection criteria educational practitioners used to make their choices. The Learning Object Review Instrument (LORI) (Belfer, *et al*., 2002), a tool for evaluating learning objects, was used to explore participants' perceptions regarding the attributes appropriate to a learning object. In addition, the participants were asked to comment on both an individual and collaborative evaluation process. To achieve its purpose, a number of research strategies were employed. The participants were firstly approached with a brief survey questionnaire, which was designed to gather basic demographic data and information on the subjects' familiarity with learning objects. Next, the participants were asked to evaluate eight selected learning objects, individually and collaboratively in focus groups. Lastly, a number of subjects were interviewed, to acquire information on the learning objects evaluation process they experienced.

Survey Questionnaires

Demographic data. The questionnaires were designed to aggregate information about the participants' familiarity with learning objects and their perspectives on the quality of learning objects. It was interesting to notice that the first part, which was structured to collect the simple demographic data, became an illustration in itself of

the diverse skills and knowledge required of those working in the field of online learning. As a response to the simple question about occupation, half of the participants put more than one title. Such multitasking illustrates how working in technology-based learning requires one to move away from narrow specialization. The subjects' responses are shown in Table 5, the primary profession presented first.

Table 5

Participants' Responses on Survey Questionnaire about their Occupation

Research Number	Profession
101	Instructor (primary)
102	Instructor
103	Instructor (primary)
	Instructional designer
	Other
104	Student (primary)
	Other
105	Instructor
106	Instructor
107	Other (primary)
	Instructional designer
108	Instructional designer (primary)
	Instructor
	Media developer
	Other
109	Librarian (primary)
	Student
110	Librarian (primary)
	Instructor
	Instructional designer
111	Media developer (primary)
	Instructional designer
	Programmer
112	Instructional designer (primary)
	Programmer

	Other
113	Instructor
114	Student
115	Programmer
116	Instructor
119	Instructor
120	Instructor (primary) Instructional designer
121	Instructor
122	Instructor (primary) Instructional designer Other
123	Instructor
124	Programmer
125	Programmer

* "other" includes professions such as: project manager, educational consultant, course manager, etc.

Learning object quality. The second part of the questionnaire tried to examine the participants' perception of what a good learning object is. Careful analysis of the responses revealed the relationship between the answers and LORI items. Table 6 illustrates this resemblance.

Table 6

Similarities between LORI items and subjects' responses on characteristics of a good learning object

LORI items	**Responses**
Content Quality:	*Accurate content,* *Relevant content* *Congruent with the course content* *Content important*
Learning Goal Alignment:	*Effective for improving learning outcomes;* *Clear learning outcomes* *Clear outcomes* *Multidimensional and foster critical thinking skills* *Desired learning outcomes*

	Instructional objectives important
	Usable by the learner to actually learn something
	evelops higher level thinking attributes
Feedback and Adaptation:	*Easy customized, flexible*
	Customization
	Accessible to multiple learning styles (audio/visual);
	Interactive
	Designed so that the learner could self-pace his learning
	Able to edit it
	Self-correcting
Motivation:	*Motivating*
	Relevant educational experience
Presentation Design:	*Visually appealing,*
	Visually stimulating and appropriate to the Concepts being presented; concepts presented clearly and unambiguously
	Makes excellent use of digital resources (i.e. cannot be accomplished easily with pens, books, etc.)
	Sound basis/design in pedagogy
	Integrity theme
	Importance of learning strategies/activities and assessment
	Pref. pictures
	Appropriate social content
Interaction Usability:	*Effective*
	Appropriate use of media and computation
	Easy to use
	Interactive
	Easy of use
	Encourages learner to be active when using it – active LO not "passive"/boring requires no thinking
	Well designed interface, web based, interactivity well developed
	Dynamic
	with few or no instructions
	Accessible to multiple learning styles
Reusability:	
	reusable, granular, able to be recontextualised in multiple ways; able to be com
	Reusable, scaleable
	"extractable" so that it can be used in various learning environments, reusable

	-used in different
Standards Compliance:	*Clear metadata tags,* *Able to be picked up and re-used by different systems* *easy to find and use*

There are only two aspects of evaluation that the subjects mentioned, but are not so explicitly identified in LORI;

1. Two participants expressed their opinion that learning objects should be a) “free” and/or b) “cheap”. Different opinions exist on the price of available learning objects, but there is obviously a tendency to value open source models. The basic idea behind initial open source models was very simple: the source code for a piece of software is available to programmers. They can read it, modify and distribute the source code as they like. In this way the software evolves. “People improve it, people adapt it, people fix bugs. And this can happen at a speed that, if one is used to the slow pace of conventional software development, seems astonishing” (Open Source ™). This model has expanded to other areas, including not only software products, but content as well. Different web-based communities promote different types of open sources (Slashdot, Linux.com, FreshMeat, GeoCrawler, DevChannel, Animation Factory etc.) but the number of sites has been increasing daily. The discussion on open sources or legal protection of intellectual property can be considered part of the reusability category.
2. One subject said that a learning object should be “reviewed by others who have used it”. This statement points nicely to one of the conclusions of this research;

that is, it indicates the necessity of having learning objects evaluated and having that evaluation available to all potential users.

Learning object selection. The third part of the survey questionnaire had questions related to the participants attitudes toward the creation, selection and re-use of learning objects. The questions were: “How would you make a selection? What would be your criteria?” The following responses were aggregated (ordered by frequency):

Table 7. Key factors for learning object selection	Frequency
Meeting learning goals/outcomes/objectives	10
Adaptability	6
Other people’s recommendation/personal experience/credibility	5
Usability	5
Flexibility	4
Availability	4
Accessibility	4
Content quality	4
Motivation	3
Interactivity	3
Reusability	2
Standards	1

Cost	1
Intellectual property issue resolved	1

According to these responses, it could be concluded that the most important issue for selecting learning objects is to know exactly what the learning goals are, and to find the resources that will meet those goals. The relatively equal "status" of all other criteria indicates that they **are** equally important, and that learning objects should be viewed as a complex and multidimensional structure. Furthermore, evaluating only a limited number of learning object features means neglecting other characteristics.

Rating scale. The last part of the survey questionnaire required the subjects to give a numerical rating on a Likert scale of 1 to 5 ranging from "not important" to "very important". The results are presented in Table 8, the number in the cell showing the frequency of responses.

Table 8

Learning object features ratings (not important/very important/unsure)

	1 not important	**2 a little important**	**3 quite important**	**4 very important**	**5 unsure**
Have an esthetic value?	**4**			6	1
Be designed for learning	2			13	1
Have accurate content?	1			**17**	0

Support learning goals?	0	13	1
Be motivational?	2	6	0
Be easy to navigate?	3	14	0
Offer feedback?	1	6	3
Be reusable?	1	11	1
Comply to standards?	0	5	**5**
Be accessible?	0	**17**	0

As shown in the table, four participants considered esthetic value not to be important for the quality of learning objects; seventeen considered the accuracy of the content and the accessibility to be the most important; and the largest uncertainty was in the area of standards (five subjects).

When the participants were asked whether they would use a learning object created by someone else, only one subject's response (out of 24) was "no". That is what educators do: collect from various resources, deconstruct in order to reconstruct (Wiley, 2002a).

Professional development. Despite the fact that the majority of subjects (16) had participated in learning object creation, less then half of them (10) see themselves as experienced in technology-based learning and only 13% of the participants stated that the professional training in this area would not be necessary. See Table 9.

Table 9

A necessity for professional training in relation to experience in online learning

Subject number	Participated in LO creation	Experienced in online learning	Needs professional training
101	Yes	No	Yes
102	No	No	Yes
103	Yes	No	No
104	No	No	Yes
105	Yes	Yes	Yes
106	Yes	Yes	Yes
107	Yes	Yes	No
108	Yes	Yes	Yes
109	No	No	Yes
110	No	No	Yes
111	Yes	No	Yes
112	Yes	Yes	No
113	Yes	Yes	Yes
114	Yes	No	Yes
115	Yes	Yes	Yes
116	Yes	No	Yes
119	No	Yes	Yes
120	No	Yes	Yes
121	No	No	Yes

122	Yes	No	Yes
123	Yes	No	Yes
124	Yes	No	Yes
125	Yes	Yes	Yes
Percentage	74%	43.4%	87%

Convergent Participation Model and Learning Object Evaluation:

Phase I - Individual Evaluation

The longest period of time during this research project was devoted to individual evaluations of learning objects. The subjects were asked to visit eight websites/learning objects selected from the MERLOT repository, and evaluate them using the provided rating sheet (Appendix E). Nine features of learning objects were assessed on the scale from “Low” – 1 point, to “High” – 5 points. Eighteen participants completed and returned the scoring sheets.

Due to the nature of this research and the focus on the qualitative aspect, the quantitative analyses were not performed in detail.

Using SPSS software, the researcher performed the descriptive statistical analysis.

Descriptive statistics.

Table 10

Means and Standard Deviations of the Rating in LORI Scoring Sheets

Means and Standard Deviations N=144		
	Mean	**Std. Deviation**
Content Quality	3.39	1.179
Goal Alignment	3.08	1.318
Feedback	2.65	1.365
Motivation	3.06	1.293
Presentation Design	2.96	1.344
Usability	3.35	1.316
Accessibility	1.87	1.232
Reusability	3.10	1.334
Standard Compliance	2.58	1.605

Convergent Participation Model and Learning Object Evaluation:

Phase II - Collaborative Evaluation

The content of the discussion transcripts was divided into five main categories. The overview of the coding categories and codes are given in Table 11:

Table 11

Coding Categories Overview

Coding Category	Code	Frequency
LORI items		
	Content Quality	10
	Learning Goal Alignment	25
	Feedback and Adaptation	18
	Motivation	18
	Presentation Design	27
	Interaction Usability	24
	Accessibility	15
	Reusability	19
	Standard Compliance	17
LORI instrument		
	Instrument Design	4
	Practical Usage	7
	Difficulties	2
	Comments on Improvements	6
Types of interaction	Interaction	5
Context	Context	17
Technical Support/technical knowledge	Technical Support	4

The responses from each of the categories were coded into several subcategories and counted to measure their frequency. During the online discussion meetings the participants were asked to comment on learning objects in relation to nine LORI items, but as often happens in qualitative research, some other interesting points were raised about such things as the pedagogy of learning, student/teacher relationships, etc., and the essence of change between the traditional face-to-face setting and online learning.

LORI items. The researcher focused participants' attention on those LORI items where they had different or opposite opinions for a particular learning object. Not all the items were discussed in relation to all four selected learning objects, but they were all covered through the four LOs. This category was subcategorized into 9 codes corresponding to nine LORI items: content quality (10), Learning goals alignment (25), Feedback and adaptation (18), Motivation (18), Presentation design (27), Interaction Usability (24), Accessibility (15), Reusability (19), and Standard compliance (17).

As we can see from the results, the main issues in this category seemed to be how content is presented (presentation design – 27 instances) and how technology is used to enhance student learning (learning goal alignment – 25 instances). The participants recognized the difference in approach to various learning environments. No one neglected the value of the content, but everyone emphasized the addition of other opportunities the online environment offers, and the necessity for their explorations:

> Presentation design is important simply because teaching is a profession, not just sharing information (S115)
>
> … diagrams, interactive applications, quizzes, polls, etc… all things that instructors do in class and a simple book cannot deliver. (S115)

Referring to a learning object that was a one-page article, participants commented:

> … why does it need to be online if you're just going to print it and read it? (S104)

> xxx site is just big wads of text, with no visual interest. And I'll add that it doesn't take any advantage at all of online possibilities. It might as well be a printed hard-copy hand-out. (S106)
>
> If anything the text discouraged interactivity. 'See me during office hours, etc. (121)

The alignment of learning goals was viewed as being equally important by the participants. For almost all LORI items, the most frequent comment was "it depends…", but this was especially true when talking about learning goal alignment. The link between learning goals and the context was always brought up. Some of the participants preferred having explicitly stated learning goals and those goals were seen as the 'property' of the creator of the learning object:

> I assume the learning goals were known by the site authors but not necessarily revealed to the user. (S116)
>
> I understand learning goals to be stated according to the instructor's or the learner's agenda. So how can I judge match with learning goals?"
>
> … I had trouble with assessing agreement with learning goals when there were no explicit goals. (S111)
>
> The goals would depend on the context that anyone using it as a teaching tool might have. (S112)
>
> Without such a context, I had less to go on in terms of the alignment of the object with learning objectives. (S108)

Some participants took the lack of listed learning goals as an advantage.

> I don’t think a website has to always align itself with one course or level. I think people with different backgrounds and interests could find something on this site. (S104)
>
> It seemed to be one of those sites that didn’t state learning goals at all, but was a passive resource for a learner to come to and discover their own goals. (S109)

Others simply questioned:

> Who was it aimed at I wonder? (S101)
>
> Does a specific learning objective need to be embedded in the object for learning to be possible? I can see this [site] serving learning quite well. (S108)

Interaction usability was considered a very important feature of a learning object. A good learning object can make the teacher’s and student’s life easier, is gratifying, illuminating. A bad one makes the learning process miserable and frustrating. Even the online conference used in this study proved how true that is. Two participants gave up meeting with the group because they were not familiar with the procedure they needed to follow to connect to the conference. Even though they were given instructions on how to use the MSN chat room, for some people technology simply limits rather than expends their horizons. Some selected learning objects were technically more complex than the others. One of the subjects commented:

> Maybe tech glitches were peculiar to me but I just got fed up and left the site. (S121)

and the other:

> … the visual software, Liquid Motion, showed up as past its expiry date, so that was a bit off putting as well. (S101)

The distribution of reusability code across all five groups was relatively equal (5-3-3-4-4), making this code the most balanced issue in the discussions. It seems that the reusability item somehow results from all the other items. If any of the existing items is of a better quality, the potential for reusability increases. During the online conferences the learning objects were seen either as a simple resource site or as an interactive learning site. Reusability was also divided into two streams: reusability of content, and reusability of framework or tools.

> With a specific course in mind, say a course on modern languages, or some kind of comparative languages course, the content could be reused. (S108)
>
> Reusable… the framework is reusable …. In theory, the framework is easily ported. (S114)
>
> Some LO are designed with very, very specific goals in mind, and so sometimes you just can't reuse them. (S114)
>
> The more inflexible it is, the more difficult it is to apply to different learning environments. Sometimes complexity makes things more inflexible, but some complex things can be very flexible. (S125)
>
> I think an object is good or bad for a particular purpose, the more purposes it can be used for, the more useful it is. (S125)

Very few learning objects offered any kind of feedback and possibility of adaptation.

> It is rare that a complete package will suit multiple contexts, so room for adaptation is quite important. (108)
>
> Quality and consistency in feedback is a problem for today's online students. (S120)
>
> … because it asked questions and responded to answers, I gave it a 4. (S125)

Almost without exception, participants said that motivation is a very subjective category, but not less important than the others.

> I think it is just subjective characteristic, but is a very important element in the design of learning material, the student must feel motivated using the resource, and it may stimulate the perception of the instruction. (S124).

Standard compliance was the category the participants were least interested in. Some of them stated that there was no need for instructors or other educational practitioners to know a lot about the standards. General knowledge would be good, but specifics should be left to the experts in that field. The participants agreed upon the necessity for the existence of standards for easier search and retrieval of learning resources, but not upon the necessity of their personal involvement in metatagging.

> LO certainly should have standards. (S115)
>
> Standards are needed. I am always concerned about access." (S121)
>
> When a professor decides to use more than 100 LOs, and each LO uses its own type of information structure the professor is going nuts.

> … I don't believe instructors should care about standards too much, more likely, the applications they use (LOs) should be well designed that all information being put in (or that comes out) is in a certain standard already. (S115)

Accessibility was a confusing term although it was defined in the LORI document as "support for learners with disabilities. (e.g. problem with vision or hearing)". Usually it was confused with technical capability.

The least discussed item was the content quality, not because it was less important, but because it was generally considered an item that should be evaluated by the content expert.

LORI instrument. There are four codes under this category: design of the instrument (4), practical usage (7), difficulties (2), comments and improvements (6). Most of the participants found the instrument easy to use and the accompanying documentation helpful. Some of the categories were not always clear, which was not due to the instrument itself, but more to the particular concept, such as goal alignment, for example, or motivation. Those participants who had less experience in online learning expressed their satisfaction with the instrument creation. They described it as "eye-opener" that helped them learn what they should look for when searching for digital learning resources, and how they could more easily recognize the quality of any given resource. The most common comment when discussing the difficulties of using LORI was on the standards and accessibility items. It has raised the question of whether those items should be part of the evaluation process, and if they should, whether they need to have a separate status. If instructors were not

specifically involved in, for example, metatagging of resources, or in working with the visually or hearing impaired, how much should they know about the technical specifications and standards that will make that particular learning object usable? Some of them complained that instructors already have “too much on their plate”, and that it would be similar to learning programming languages in order to use a computer. As a suggestion for improvement, some participants mentioned the possibility of being able to add comments. Numbers were not sufficient enough to convince them of the quality of a learning object. Most of them liked the idea of having a place to put “narrative information”. This weakness of LORI had been identified by its creators while this research was in progress, and the new version of the document has addressed these weaknesses and the reviewers use the evaluation instrument capable of gathering ratings and comments.

Types of interaction. Although this element could be part of LORI’s “Interaction usability”, it is viewed as a separate issue. The importance of interaction was discussed at the beginning of this paper, where four different types were distinguished: student interaction with an instructor, student interaction with another student, student interaction with the content (Moore, 1989), and student interaction with the interface (Hillman et al. 1994). This word “interaction” kept appearing throughout the conferences as a theme of technology-mediated learning.

> Interactivity is what a teacher can bring to a situation…
>
> How interactive is it?
>
> It seems to be a reference, more than an interactive tool…
>
> Interactivity in online education…

Yes, interactivity is vital…

Students should have the maximum amount of interactivity possible…

If anything the text discouraged interactivity…

… students who really don't know how to interact with professors.

Context. It was not a surprise that this issue has emerged as crucial for learning object assessment and reuse. Learning concepts occur in a context and are understood as part of that context. Constructivism is based on the idea that new knowledge is acquired by making connections with previous knowledge, and situating a new concept in a familiar context. Therefore, the idea of complete decontextualization of learning objects and making them completely independent, pre-packaged, and transferable LEGO blocks does not seem to work well, as Wiley pointed out in a number of his papers. The most frequent comment to almost all the evaluated features was: "Hard to say without more sense of a context in which to use it" (S108).

Technical support. Working with technology requires a certain level of technical knowledge. The learning process will not be successful if the only quality an instructor possesses is expertise in the content that he/she provides. On the other hand, knowing everything that is included in creating an online course is impossible and overwhelming. Collaboration between different professions is required.

> Instructors can put tools together from an academic point of view, but they need technical experts to bring the interactivity to reality and make it flow logically to the students. (S115)

> Yes, technical support is vital! …. I would say that a weakness in our colleges in the US is not enough technical support for teacher and students. (S120)
>
> The teachers need to know what's available to them technically first, then come up with ideas about LOs. (S115)

The collaborative assessment process was implemented in this research to prove that it is more reliable than the individual evaluation of learning objects. It was expected that the subjects would make some changes in their ratings and modify their rating sheets. That did not happen. When informed about the online evaluation process and given instructions for online conferences, the participants were encouraged to change their ratings. During the online discussions several of them stated that the opinion of other members in the group made them realize that the ratings should have been different in certain categories. However, no one sent the revised rating sheets to the researcher. The reasons for that could be twofold: 1) the research process had already been long and exhausting so the participant perceived modifications of their ratings as additional unnecessary effort; and 2) the researcher was not clear enough in emphasizing the importance of changes due to the collaborative assessment process. Despite the lack of data related to changes in subjects' opinion on specific learning objects, all of them stated that the collaborative phase was especially useful and helpful in the evaluation process.

> It's helpful to hear what everyone else thinks about the LOs. The evaluation process was very solitary, and I second guess some of my choices. (S114)

Individual Interviews with the Subjects

Interviews were conducted with five participants, representatives of different professions: a university instructor, an ESL teacher, a librarian, an instructional designer, and a student. The responses were grouped into five categories:

1. individual evaluation
2. collaborative evaluation (effectiveness)
3. evaluation team (who should be involved/should you know the members of the team)
4. evaluation process
5. professional development

Individual evaluation. For most of the interviewees this was the first in depth encounter with learning objects and learning objects evaluation. Therefore, it took them a longer time to do the individual evaluation. They had to familiarize themselves with the instrument. It was a learning process as well.

> I went with one idea of what learning object was. I wasn't sure I was right. After using LORI I was more confident (S114).

Most of the time, the confusing category was related to standard compliance. They were not sure what the standards were and sometimes the rating regarding standards was a pure guess.

> I quickly read about it and realized that this was a term new to me. It took me way longer than to someone who is more familiar with what it is (S116).

For the participants who had experience with learning objects and were already involved in different evaluation processes and systems, individual evaluation was not sufficient. They needed a context.

> The absence of narrative field I found quite problematic. In the absence of any qualitative data, I wouldn't use the instrument. (S108)

They found the instrument helpful, but only as an optional aid to evaluation:

> Different categories are helpful in allowing me to track some of the different characteristics I've been looking at for particular learning resources. Some categories are less useful than others. It is useful for organizing my thoughts around. (S108)

Collaborative evaluation. Everyone liked this phase of the research. The biggest advantage for the participants was the presence of people with different backgrounds and different expertise.

> It is an excellent idea, very effective. It should be more reliable than individual evaluation because there are more perspectives. The more knowledgeable people who do the evaluation, the more confidence I will have in the quality of learning objects. (S106)

Working in a team brought new knowledge. Some opinions were changed on the basis of other member's arguments.

> I changed my opinion. After S108 talked about LO3 I realized that he was right. It's good to have different perspectives. (S114)
>
> I believe in collaborative just about anything no matter what. I realized that I have just accepted it as his is how you evaluate, this is very

> good, it is well organized, it make you look at things you might have not be thinking of otherwise. When I listened to others, I said: Oh that's not so great. O, yeah, there is a problem here. So, it was very valuable for me. Working in teams opens the lines of communication between people working in group. (S116)

Meeting online and discussing certain characteristics of learning objects immediately led participants to build context. People started making value statements, and suggesting on how to use the learning object.

> Collaborative evaluation led us to different conclusions than what we did individually. (S116)

Evaluation team. According to the responses to the questions about the evaluation team, the team has to include members coming from different areas of expertise. The diversity of perspectives was considered valuable. The principal members should be subject matter experts and an instructional designer. Two of the interviewed subjects suggested having a larger student involvement in the process. It was realized that it might not be possible to engage a student in learning object evaluation during the course development phase, but that it could happen some time along the way.

> A student that knows nothing about learning objects. Our standards were more professional. A student only cares whether he/she can use it. (S114)

All participants expressed their wish to know the members of the team that have evaluated a certain learning object. That information would be useful for their decision.

Evaluation process. The interviewees with less previous knowledge on learning objects found the evaluation process to be a valuable experience. They enjoyed being introduced to learning objects and to the convergent participation model.

> I learned a lot. You opened up a whole new world for me including why I have troubles talking to instructional designers, because now I understand that we are really coming from different directions. (S116)

For those who had more experience with learning objects and the online learning environment, LORI was useful in a different way. It structured the discussion, but did not necessarily assist the evaluation process itself. Once again the participants brought up the need for a column for comments and narrative description, as quantitative measurements only provide part of the picture. More than numbers, what illustrates the quality of a learning object is personal experience, and the information which was considered most valuable centered on where a learning object worked best for someone, what pieces of it could be used for what, and where the weaknesses were.

Professional development. The interviewed subjects pointed out the difference between two learning environments: face-to-face and online. Most of them had rich experience in academic settings so they were accustomed to judging and evaluating textbooks and books for courses, but not to choosing digital material.

The necessity for professional development and training exists on a continuing basis.

> We always have to be developing systems for assessment as long as it is seen as a tool not as a procedure. (S116)

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Discussion of Results

The summary of the results is presented here. They have been organized in terms of the three research questions:

1. What critical factors determine the selection of educational material?
2. What criteria do educators use, if any, for selecting and evaluating learning objects?
3. Does collaborative evaluation, according to the perception of the participants, increase the validity of learning object evaluation? Does it automatically translate into an increase in the quality of the objects and their reusability?

The results obtained from the survey questionnaires illustrate that the main criterion educational practitioners use for selecting learning objects is meeting prescribed learning outcomes. Whatever is planned to be undertaken, the first step is to identify needs and to set goals: What do I need and what do I want to achieve? (Briggs, 1981, Dick, 1996, Rossett, 1987). If a learning object leads students in the direction they should go in order to acquire knowledge, then the learning object has fulfilled its purpose. Everything else becomes less relevant. Although the subjects identified learning goal alignment as their main criterion for LO selection, they struggled with rating the learning objects in relation to this particular item. It was difficult, as they said, to evaluate the goal alignment out of the context. Most often, the goals are not explicitly stated or specified within the LO itself. An evaluator should either try to guess what the creators of a learning object had in mind, or to

imagine a context where that learning object could be successfully implemented. Not everyone found this task easy. To some subjects it was more difficult to visualize the context with no clear instructions. Others found it challenging, but also inspirational because they could be as creative as they liked.

It is interesting to notice that in rating of the most important features of learning objects, the content accuracy, together with the accessibility, share first place, but when considering the criteria for learning object selection, the content validity was rated far behind meeting learning goals. A high score on the important/not important scale may be explained with the fact that educational practitioners were concerned with the accuracy of the content given the amount of inaccurate information that could be found on the Web. When selecting a learning object, however, it seems that other aspects of learning objects came to the forefront. It may not necessarily mean that content is not important any more: on the contrary, it could be assumed that the accuracy of the content is understood. If a selection was done by a subject matter expert, the content would be valued subconsciously and simultaneously while looking for other learning object strengths or weaknesses.

In regard to the question on collaborative assessment and its validity, the results show that the participants recognized the value of collaboration in the design of complex online teaching and learning material. Since all have reached the conclusion that one person was incapable of mastering all skills and knowledge required for learning object design, development or even selection, the subjects not only perceived collaboration as necessary, but welcomed different perspectives as well. They considered the teamwork and the input of different expertise a great

advantage. Having a learning object evaluated by a team is not a measure of validity of the process, but it is more **likely** that the assessment will be more valid than if it had been done by an individual. One of the selected learning objects was particularly intriguing and the participants' reactions to it ranged from "there is nothing to say about it except that it is silly" to "I can see a lot of potentials and how it can be used". Collaborative assessment proved valid. It did not show that one evaluator was right and the other wrong, but made everyone in the team aware of the learning object weak points as well as its strengths or potentials. One of the participants stated that the other member made her realize that "it could be actually a very good learning object if you create a context and think of the ways you can use it". The other subject pointed out that the focus group discussion was illuminating, discovering other perspectives and possibilities for the learning objects.

Many researchers and academics discussed the important shift in educational pedagogy from a teacher-centered towards a learner-centered approach (Laurillard, 1993, Marzano, 1992, Norman & Draper, 1986, Soloway et al., 1994), but it has not always been realized in practice. Some of the participants expressed their wish for students' presence in course design, and therefore, their input into learning object evaluation and selection. They realized, however the obstacles of engaging students into the first phase of course design due to students' lack of knowledge and experience. Students' inputs will be valuable after a certain point during the course production, in the process of course delivery - formative evaluation, and at the end of the course – summative evaluation. Some participants were in favour of creating a course together with their students while it was "going live" and modifying it on the

way. If that is the case, the cooperation between instructors and students becomes tighter in selecting and evaluating learning objects appropriate for their course.

All interviewed subjects stated that when selecting a rated learning object from a repository, they would like to know the background and credentials of the members of the evaluation team. This knowledge would help those who are searching for learning objects not only to have more confidence in their selection, but also to understand where the “evaluation was coming from”, what was the taken standpoint. All participants agreed that the evaluation team should have consisted of a subject matter expert and an instructional designer, but that did not restrain them from agreeing that someone’s opinion with web designing background, for example, would present a valuable contribution.

Although quality is very subjective notion, as everyone agreed, evaluation instruments, such as LORI, are important and helpful. As Nesbit said,

> The history of learning technology design suggests that we may never have quality standards for learning objects that are objectively interpretable and universally accepted. Instead our goal is to define a systematic framework for learning object quality that will help a user to weigh the subjective judgments of reviewers as she compares objects in relation to her own requirements. (2003)

Quantitative evaluation of learning objects using a scale from one to five gives some results, but it is only one method of measurement. The quality and reusability of learning objects will depend on many factors, which may not be so transparent or easy to quantify. The rating of a learning object gives an idea about that learning

object, and helps in the searching process. Qualitative evaluation, on the other hand, enriches the impression about the learning object.

Recommendations

Clearly defining research questions and making assumptions about the possible results in a qualitative research is not as easy and simple as in a quantitative study. Researchers often start with one set of ideas/questions, but end up with answers to something not even searched for in the first place (Bogdan & Biklen, 1998, Mason, 1998). This research project started with the three questions listed at the beginning of this chapter, but some other issues have emerged. They are the following:

1. Questions related to LORI instrument, or similar instruments for learning object evaluation
2. Questions related to quantitative vs. qualitative evaluation
3. Questions related to the perspective of a user, and
4. A philosophical question: Can a learning object be evaluated at all as such?

There were two LORI items, accessibility and standard compliance, about which the participants usually had very little to say. The discussion that evolved around these two items was how knowledgeable the educational practitioners should be in these two areas, and what categories for learning object assessment should be built into an evaluation tool such as LORI. According to the results obtained by survey questionnaires, the design of the instrument with nine identified categories, however, seemed to capture all the issues the participants could be concerned about in relation to learning object quality as the basis for their evaluation or selection (see

Table 5). Different features of learning objects are important to different users, as well as to different designers and creators of learning objects. If a learning object has a good metadata description, but no instructional value, is the final “score” going to be average? Similarly, if an educator is interested in the ability of a learning object to provide feedback to students, how can he/she be sure that the four-star rating will guarantee exactly that? A breakdown of evaluation results may show the preferences, and prejudices, of raters in particular aspects of a learning object. There needs to be further study of ways to provide for and facilitate different needs and expectations.

The second recommendation concerns a narrative description that will accompany an evaluated learning object and provide the information about the focus of the evaluator’s attention. A comment or some kind of personal reflection, furthermore, will ensure the contextual background. Hodgins’ had an “epiphany” (2002) on learning objects when he saw them as LEGO blocks, increasing in number, and used in an endless number of combinations. Wiley (2002a) claimed that that analogy did not fit. Imagining them either as LEGO blocks (Hodgins, 2002) or atoms (Wiley, 2002a) gives plenty of room for creative play. For the blocks to be assembled there must be a set standard; for atoms to be combined there must be a correct formula. However, using the appropriate standards and the right formula does not mean that we will like what we get, and that it will be a good quality product. It seems the experience or comment on whether a learning object should be used sometimes helps more than a five-star notification.

Third, further research would be beneficial in finding the solution of a context vs. reusability paradox (Wiley, 2002c). Ruyle is in favour of designing and accepting learning objects as self-contained instructional components, “free from instructional connotation” (2000). To explain a learning object that cannot stand alone, Ruyle and Jacobsen use a term “context-contamination” (2003), which might be too strong, and have negative association to chemical/biological contamination. Wiley calls the absence of context or social interaction dehumanizing (2002a). The participants in this research wondered whether a learning object could be evaluated without a context. As Jonathan Levy said, “Context is a holy grail for e-Learning because context varies not only from learner to learner and company to company, but also from day to day” (2002).

The fourth recommendation concerns the differences in user’s views and approaches to learning objects. Many current researches promote self-paced, personalized learning where a student will choose what, where and how he/she will learn. It is a frequent topic in various online discussion forums (IFETS, in May-June 2002). During the research process, the difference in perspectives between those who deliver and those who receive became evident, especially when one of the members in the focus group was a student. Let’s take for example, the issue of adaptability. Although it is said in LORI item description that adaptability means “adaptive content or feedback driven by differential learner input or learner modeling” it is often viewed as a characteristic of a learning object to be adapted by an instructor or instructional designer to serve a particular need. This is what Wiley (2002c) and Ruyle and Jacobsen (2003) call “repurposing” of learning objects.

Special attention must be devoted to evaluation instruments, such as LORI (as a designer), and how to read the results (as a user).

Finally, it would be interesting to see what the status of learning objects would be, and how they would be perceived in the decentralized, self-organizing social systems that Wiley and Edwards described (2002). Further research is needed into exploring the behaviour of learning objects in self-organizing social systems, but situated in an academic environment. Wiley claims that discovering the rules existing in such systems will help in creating new theoretical framework.

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Appendix A: Initial Contact with the Subjects

Introductory Letter

Dear xxxx,

I work as a User Support Specialist at the University of British Columbia and am currently completing my Master's Degree in Distance Education at Athabasca University in Alberta. I am conducting research on educators' perspectives and comments of learning object selection and evaluation and their professional development in regards to specific requirements of technology-based instruction.

The purpose of this study is to identify the challenges educators face when designing, developing or selecting learning objects, to present a model of an existing tool for learning object evaluation, and to describe your perceptions on the instrument reliability after going through the convergent participation model of learning object evaluation.

The study includes three stages: completing a three-page questionnaire, learning object evaluation process, and a 15-30 minute interview. Details about learning object evaluation process will be described to you in person.

Your participation is completely voluntarily. Please sign the consent form (included with this letter) and return it to me in person (Buchanan building B118, UBC), or by

fax (fax # 604.xxx.xxxx). After receiving your signed document, I will send you a questionnaire by email. The completed questionnaire could also be emailed back to me.

The results obtained through this research could be used in various types of professional development programs, to help educators establish valid and reliable standards for teaching and learning material that will enrich the learning process and make it interesting, motivating and inspiring.

The success of this research depends on your participation. I would highly appreciate your support.

If you have any questions or would like further information with respect to this study, please contact me at nboskic@telus.net.

Thank you for your time and your cooperation

Sincerely,

Natasha Boskic

Appendix B: Consent form

CONSENT FORM

Purpose

The purpose of this study is to identify the challenges educators face when designing, developing or selecting learning objects, to present a model of an existing tool for learning object evaluation, and to describe your perception on the instrument reliability after going through the convergent participation model of learning object evaluation.

Study Procedure

- The subjects will be asked to complete a survey questionnaire
- The subjects will participate in the learning object evaluation process. It will include an individual asynchronous evaluation of 5-8 selected learning objects using LORI (Learning Object Review Instrument), and a collaborative evaluation using synchronous text-based web conferences.
- The interviews will be conducted with the participants. They will last no more than 15-30 minutes.

Any information from this research study will be kept strictly confidential. You will be identified only by your research number.

The results from this study might be used for publishing in a professional journal article.

CONSENT

I understand that my participation in this study is entirely voluntary and that I may withdraw from it at any time.

I consent to participate in this study.

_____ _____

Subject Signature Date

Appendix C: Survey Questionnaire

Survey of Educators' Perception on Learning Objects and Criteria for Selection of Digital Teaching Material

PART A

Profession _____

Age _____

Years of experience in academic environment _____

Years of experience in technology-based distributed learning _____

PART B

1. According to you, a learning object is:

A knowledge element

A learning resource

An online material

Any digital or non digital entity

All of the above

I am not familiar with the term

Other: _____

2. Have you ever participated in creating/developing a learning object?

Yes No

3. What are the characteristics a good learning object should have?

_____

_____

_____

_____

4. If you are asked to, how would you make a selection of learning objects for your course?

_____

_____

_____

5. What would be the criteria for your selection?

_____

_____

_____

6. Would you use a learning object created by someone else?

_____

_____

_____

7. Do you think educators should be trained in how to evaluate learning objects?

_____

_____

_____

PART C

Answer the question rating on the 5-point scale

1. not important

2. a little important

3. quite important

4. very important

5. unsure

How important is it for a learning object to:

	1 not important	**2 a little important**	**3 quite important**	**4 very important**	**5 unsure**
Have an esthetic value?					
Be designed for learning					
Have accurate content?					
Support learning goals?					
Be motivational?					
Be easy to navigate?					
Offer feedback?					
Be reusable?					
Comply to standards?					
Be accessible?					

Appendix D: Interview Questions

1. What do you think about the individual evaluation?
2. Did you find the description of categories and rubrics clear?
3. How long did it take you to complete the evaluation of the first learning object? What about the last one?
4. Did you learn something about learning objects using LORI?
5. What are the advantages/disadvantages of a collaborative evaluation?
6. What did you find useful/helpful in the process?
7. Who else do you think should be a part of the evaluation team? Why?
8. Did you have any difficulties using LORI?
9. Did you have any concerns while participating in the collaborative evaluation process?
10. How effective do you think collaborative evaluation is?
11. Is it reliable?
12. Do you think you would have more confidence in the quality of learning objects rated with four/five stars if they were evaluated in this way?
13. Would you check who the evaluators were (if it is a possibility)?
14. Do you think LORI or similar instruments should be a part of professional development program for those involved in e-learning?
15. Would you be interested in participating in collaborative evaluation process again?

Appendix E: Scoring Sheet

LORI (Learning Object Review Instrument)

Scoring Sheet

Name____01456____

Learning object
http://learningobject1

1

1. **Content Quality**: Veracity, accuracy, balanced presentation of ideas, and appropriate level of detail	1	2	X	4	5		NA
2. **Learning Goal Alignment:** Alignment among learning goals, activities, assessments, and learner characteristics	1	2	3	4	5		X
3. **Feedback and Adaptation:** Adaptive content or feedback driven by differential learner input or learner modeling	X	2	3	4	5		NA
4. **Motivation:** Ability to motivate, and stimulate the interest or curiosity of, an identified population of learners	X	2	3	4	5		NA
5. **Presentation Design**: Design of visual and auditory information for enhanced learning and efficient mental processing.	1	X	3	4	5		NA
6. **Interaction Usability:** Ease of navigation, predictability of the user interface, and the quality of UI help features	1	X	3	4	5		NA
7. **Accessibility:** Support for learners with disabilities	X	2	3	4	5		NA
8. **Reusability:** Ability to port between different courses or learning contexts without modification	1	X	3	4	5		NA

9. **Standards Compliance:** Adherence to international standards and specifications	X	2	3	4	5		NA