Chapter XIX
The Design of Learning Objects for Pedagogical Impact

Tom Boyle
London Metropolitan University, UK

ABSTRACT

This chapter argues that good design has to be at the heart of developing effective learning objects. It briefly outlines the "knowledge engineering" approach to learning objects based on metadata and packaging. The knowledge engineering approach, however, ignores the issue of how to design and develop pedagogically effective learning objects. The chapter concentrates on the central issue of the design and development of learning objects. The first part of the chapter outlines and illustrates key design principles. The middle part of the chapter examines how these can be embedded in an "agile" development methodology for developing learning objects. The following section shows how effective designs can be captured and made available in a tool to support the authoring and repurposing of learning objects. Finally, the chapter examines the wider picture linking learning objects and learning designs and points to the challenge of "layered learning design."

"The use of learning objects promises to increase the effectiveness of learning ..."
– Duval et al. 2003

INTRODUCTION

Strong claims have been made for the pedagogical impact of learning objects. The bulk of the work on learning objects has been based on an approach that emphasises the description (through metadata) and interoperability of learning resources across computer systems. This is embodied in the international standards for metadata (IEEE, 2002) and content packaging (IMS, 2007). This chapter argues that high quality design and development of learning objects is crucial before we get to issues of metadata and software packaging. The primary

message of the chapter is good pedagogical design is at the heart of effective learning objects.

This chapter thus focuses on the issue of the design and development of reusable learning objects. The term "learning object" has been subject to considerable ambiguity in interpretation. The chapter clarifies the definition of learning objects that underpins the work described in the paper (the issue of clarification of the different meanings applied to learning objects is revisited later). The chapter then discusses two types of design principles: pedagogical design principles—to create effective learning experiences—and structural design principles to enhance the potential for reuse. The design principles are illustrated with several examples including the "learning objects for programming" project which won a European Academic Software award (EASA) in 2004.

The middle section of the chapter then examines how these design principles can be embedded in a full learning object development life cycle. It outlines the development methodology evolved by the CETL in reusable learning objects (Boyle, Windle, Leeder, Wharrad, Alton, & Cook, 2006). This emphasises a flexible, agile approach which covers the key life cycle functions from problem identification, through design, to production and evaluation.

The chapter then moves on to discuss the principles underpinning the development of a new, second generation of learning objects. In particular, it points to an increased emphasis on the pedagogical patterns (or learning designs) inherent in learning objects as the primary focus for reuse. It describes work in developing a model of "generative learning objects" (GLOs), which makes explicit these embedded designs. This work is realised in an authoring tool developed to enable tutors to create and repurpose learning objects based on these reusable design patterns.

The chapter culminates by examining the relationship between this work and wider approaches to reusable learning design. This discusses how major areas of work in learning design (AUTC Learning Designs, 2002; Dalziel, 2003; Harper & Oliver, 2002) may be related to the GLO work within a consistent conceptual framework.

The chapter refers extensively to the work of the Centre for Excellence in Teaching Learning (CETL) in reusable learning objects. This centre was set up in April 2005 with funding from the Higher Education Funding Council for England. It is a partnership or three universities: London Metropolitan University, the University of Cambridge, and the University of Nottingham. It has incorporated the work of the partners carried out prior to the advent of CETL, and further developed these areas extensively. The design principles, methods, and tools described in this chapter are incorporated in the work of the centre. The CETL Web site provides access to specimen learning objects and to the supporting methodologies and tools, mentioned in this chapterer, as these become publicly available (CETL-RLO, 2007).

APPROACHES TO "LEARNING OBJECTS" AND ENHANCED LEARNING

The quote at the beginning of the chapter by Duval, Hodgins, Rehak, and Robson (2003) expresses an aspiration that learning objects should increase the effectiveness of learning. Different strategies may be adopted to achieve this aim. One major focus has been the development of international specifications for learning objects. The central specifications are IMS Content Packaging, SCORM, and the IEEE Learning Object Metadata (ADL, 2006; IEEE, 2002; IMS, 2007). The IMS content specification provides a standard way of packaging learning objects so that they may be transported across software systems. The learning objects may then be unpackaged and reused within the client learning management system. The primary aim of IMS Content Packaging is thus to deal with the issue of interoperability. SCORM extends the IMS work by providing