# Chapter 15 Learning in the Digital Age with Meaning Equivalence Reusable Learning Objects (MERLO)

Masha Etkind Ryerson University, Canada

**Ron S. Kenett** *KPA Group Ltd., Israel & University of Turin, Italy* 

> **Uri Shafrir** University of Toronto, Canada

### ABSTRACT

In this chapter we describe a novel pedagogy for conceptual thinking and peer cooperation with Meaning Equivalence Reusable Learning Objects (MERLO) that enhances higher-order thinking; deepen comprehension of conceptual content; and improves learning outcomes. The evolution of this instructional methodology follows insights from four recent developments: analysis of patterns of content and structure of labeled patterns in human experience, that led to the emergence of concept science; development of digital cyber-infrastructure of networked information; research in neuroscience and brain imaging, showing that exposure of learners to multi-semiotic inductive problems enhance cognitive control of inter-hemispheric attentional processing in the lateral brain, and increase higher-order thinking; research in evolutionary dynamics on peer cooperation and indirect reciprocity, that document the motivational effect of knowledge of being observed, a psychological imperative that motivate individuals to cooperate and to contribute to the common good.

DOI: 10.4018/978-1-4666-9634-1.ch015

#### INTRODUCTION

The chapter describe pedagogy for conceptual thinking and peer cooperation that enhances higher-order thinking, deepen comprehension of conceptual content, and improves learning outcomes, through three interactive learning processes:

- Interactive Concept Discovery (InCoD) with conceptual curation and CONCEPEDIA (Shafrir & Etkind, 2011).
- Meaning Equivalence Reusable Learning Objects (MERLO) Cooperative/ Interactive/Formative/Diagnostic (CIFD) assessments (Etkind, Kenett, & Shafrir, 2010; Etkind & Shafrir, 2011; Shafrir & Etkind, 2006).

Development of learners' meta-cognitive skills: peer cooperation; knowledge of being observed; self-evaluation; reflection (Nowak & Highfield, 2011; Donovan & Bransford, 2005, p. 407-415).

## BACKGROUND

Traditional learning assessments often include structured items that focus on information and on application of procedures, such as true/false and multiple-choice questions. Results of such assessments demonstrate memory of facts, and correct execution of multi-step problem-solving procedures: 'what is taught in schools emphasizes veridical, rather that adaptive, decision making. Most course work – and the resulting tests – ask students to search for the unique answers to concrete and unambiguous questions' (Sousa, 2009, p. 30). Such learning assessments are situations where the student's mind is being used as a storage-and-retrieval system, a task for which it is not particularly well adapted (Box, 1997, p. 49). In contrast, assessment of conceptual thinking includes unstructured items - inductive questions that focus on the meaning of conceptual situations: 'this sets the mind free to do what it does best - be inductively creative' (ibid).

The importance of conceptual thinking skills is now recognized as a cornerstone of effective learning, understanding facts and ideas in the context of a conceptual framework (Bransford, Brown & Cocking, 2004), as ways of thinking that explore patterns of equivalence-of-meaning in ideas, relations, and underlying issues. Conversations among content experts often reveal a common trend to clarify statements by re-formulating the issue under discussion from alternative points-of-view that share equivalence-of-meaning. These spontaneously formulated statements of complex issues are often encoded in alternative representations in different sign systems (e.g., text; images; diagrams; equations) that illustrate different aspects of the conceptual situation under discussion.

Meaning equivalence is a construct that denotes commonality of meaning across representations: a polymorphous - one-to-many - transformation of meaning. The related construct of representational competence is the ability to trans-code equivalence-of-meaning in multiple representations within and across sign systems (Shafrir, 1999; Sigel, 1954; 1993; 1999). Learning assessments based on meaning equivalence with unstructured items capture this important aspect of conceptual thinking.

Pedagogy for conceptual thinking and peer cooperation has evolved since 2002 through sequential stages of development, testing, validation, and implementation (Etkind, Kenett, & Shafrir, 2010; Etkind & Shafrir, 2011). Our experience in implementing the approach, ranges from educational systems to industrial organizations and health care services. Specifically these efforts included the Ontario Institute for Studies in Education of University of Toronto (OISE/ UT); Faculty of Engineering and Architectural Science at Ryerson University; Russian Academy of Sciences - Ioffe Physico-Technical Institute, St. Petersburg; Independent Learning Center (ILC) of 22 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/learning-in-the-digital-age-with-meaningequivalence-reusable-learning-objects-merlo/140750

## **Related Content**

#### Perception of Social Media Use by Distance Learners in Nigeria

Airen Edale Adetimirinand Jide Ayoola (2020). *International Journal of Online Pedagogy and Course Design (pp. 37-47).* 

www.irma-international.org/article/perception-of-social-media-use-by-distance-learners-in-nigeria/248014

#### Life Skills for Personal Well-Being

Jishamol Thomasand Sheeja Ramani Karalam (2024). *Applications of Service Learning in Higher Education (pp. 35-44).* 

www.irma-international.org/chapter/life-skills-for-personal-well-being/342772

#### **Expert Systems**

Chuleeporn Changchit (2008). Encyclopedia of Information Technology Curriculum Integration (pp. 316-322).

www.irma-international.org/chapter/expert-systems/16724

## Rethinking Distance Education in the Era of Industry 5.0 and Its Integration With Social and Emotional Learning

Shantanu Trivediand Saurav Negi (2023). *Exploring Social Emotional Learning in Diverse Academic Settings (pp. 337-347)*.

www.irma-international.org/chapter/rethinking-distance-education-in-the-era-of-industry-50-and-its-integration-withsocial-and-emotional-learning/321397

#### Graduate Students' Perceptions of the Benefits and Drawbacks of Online Discussion Tools

Jessica Deckerand Valerie Beltran (2016). *International Journal of Online Pedagogy and Course Design* (pp. 1-12).

www.irma-international.org/article/graduate-students-perceptions-of-the-benefits-and-drawbacks-of-online-discussiontools/142806