Chapter 4
Eliciting Thinking Skills with Inquiry Maps in CLE

Alexandra Okada
The Open University, UK

ABSTRACT

The first aim of this chapter is to present the contributions drawn from the study exploring the use of inquiry maps in academic research for eliciting thinking skills. The second objective of this work is to highlight the potential collaborative learning environments (CLEs) have to enable students to learn different mapping techniques and to help them share ways in which they can apply inquiry maps to elaborate their scientific projects. While the study is informed by qualitative research methodology, it employs quantitative data to describe the fieldwork: an online course, which was organized by the author. The participants were lecturers and research students from different countries: Brazil, United Kingdom and Portugal. Findings indicate six kinds of inquiry maps that can be applied in academic research and may contribute to developing thinking skills such as, critical thinking, content thinking and creative thinking.

INTRODUCTION: INQUIRY MAPS FOR ACADEMIC RESEARCH IN CLE

Information literacy is a vital skill for research students in the digital age. Students need to know how to locate, evaluate and use information effectively in their academic courses and in their workplace. They also have to be able to structure the stages of their investigation, and integrate theory and data. Mapping software tools can help them construct meaning from the information selected through search engines, news feeds, course content and research literature.

Knowledge Cartography (Okada, Buckingham Shum & Sherborne, 2008) is one of the most promising resources for these challenges. Through knowledge maps, learners can integrate information with graphical representations of key components and connections. Concept mapping helps students represent and visualize concepts that they know and

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do not know (Cañas & Novak, 2008). Mapmaking scaffolds different forms of reasoning about arguments (Van Gelder, 2002), engaging students in meaningful learning (Novak, 1998) and critical thinking (Jonassen, 2000; Jonassen, Beissner, & Yacci, 1993).

This chapter presents how mapping techniques and software tools (e.g. Cmap Tools, Nestor Web Cartographer, Compendium and Freemind) can be used by PhD students to connect knowledge during their research projects. In this study, we denominate "inquiry maps" as a range of six kinds of knowledge maps for developing academic research:

1. Research map for designing a research project.
2. Reference map for collecting references in the literature.
3. Reading map for selecting key ideas of papers´ content.
4. Theory map for organising key concepts and definitions from the literature.
5. Fieldwork map for structuring key data from a corpus of documents.
6. Writing map for integrating key arguments for an essay.

The term "inquiry maps" is used in this work to denote graphical representations of knowledge during a research process. The thesis of this study is that these inquiry maps play an important role for eliciting thinking skills by helping researchers identify, connect and interpret key issues, ideas, concepts, data and arguments. Knowledge mapping software, in which learners can construct, examine and transform their thinking, acts as mediating inquiry tools. These tools for representational guidance mediate learning interactions and thinking by providing learners with means to represent emerging knowledge graphically (Suthers, 2003; Roschelle, 1994).

This work also describes a collaborative learning environment (CLE) that employed inquiry maps for research students and educators to learn software tools and apply mapping techniques to develop their research projects. Another purpose for this CLE was engaging participants in sharing their inquiry maps and improving their ways of mapping with peers. These collaborative interactions and feedback about the process of inquiry mapping might lead them to develop thinking skills and improve their inquiry projects. In the CLE analysed in this study, we used three kinds of maps application:

1. Personal map for participants introducing themselves in the CLE
2. Learning path map for participants accessing and visualising activities and content.
3. Portfolio map for participants accessing and visualising their individual and collective productions.

In order to explain each of the above map models, examples were selected and analysed from a CLE created during an online course – *Using Software for Qualitative Research*. This course was offered at the University of PUC-SP in Brazil from 2004 to 2005. The number of participants was 35 research students and 20 lecturers from Brazil, Portugal and The United Kingdom.

This study, thus, aims to address the following research questions:

- What are the contributions of applying inquiry maps to academic projects?
- What are the benefits of using CLEs with diverse mapping techniques for participants?
- What are the challenges of using inquiry maps to elicit thinking skills?