

## Chapter 12

# A Systematic Review of Research on Collaborative Learning with Concept Maps

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### ABSTRACT

*This chapter reviews research about the collaborative use of concept maps for learning. Although decades of research have produced some understanding of the cognitive effects of using concept maps in individual learning, theories about their effects in collaborative learning are less firmly established. The review incorporated a systematic literature search, analysis of dependent variables as effect sizes, and discussion of representative studies. Students who learned collaboratively by constructing concept maps outperformed those who learned from other activities such as studying texts, outlines, lists and lectures. However, no effect of studying pre-constructed concept maps in collaborative settings was statistically detected. There was homogeneity across the subsets of studies investigated. The review concludes with suggestions for future research in learning with concept maps in collaborative environments.*

### INTRODUCTION

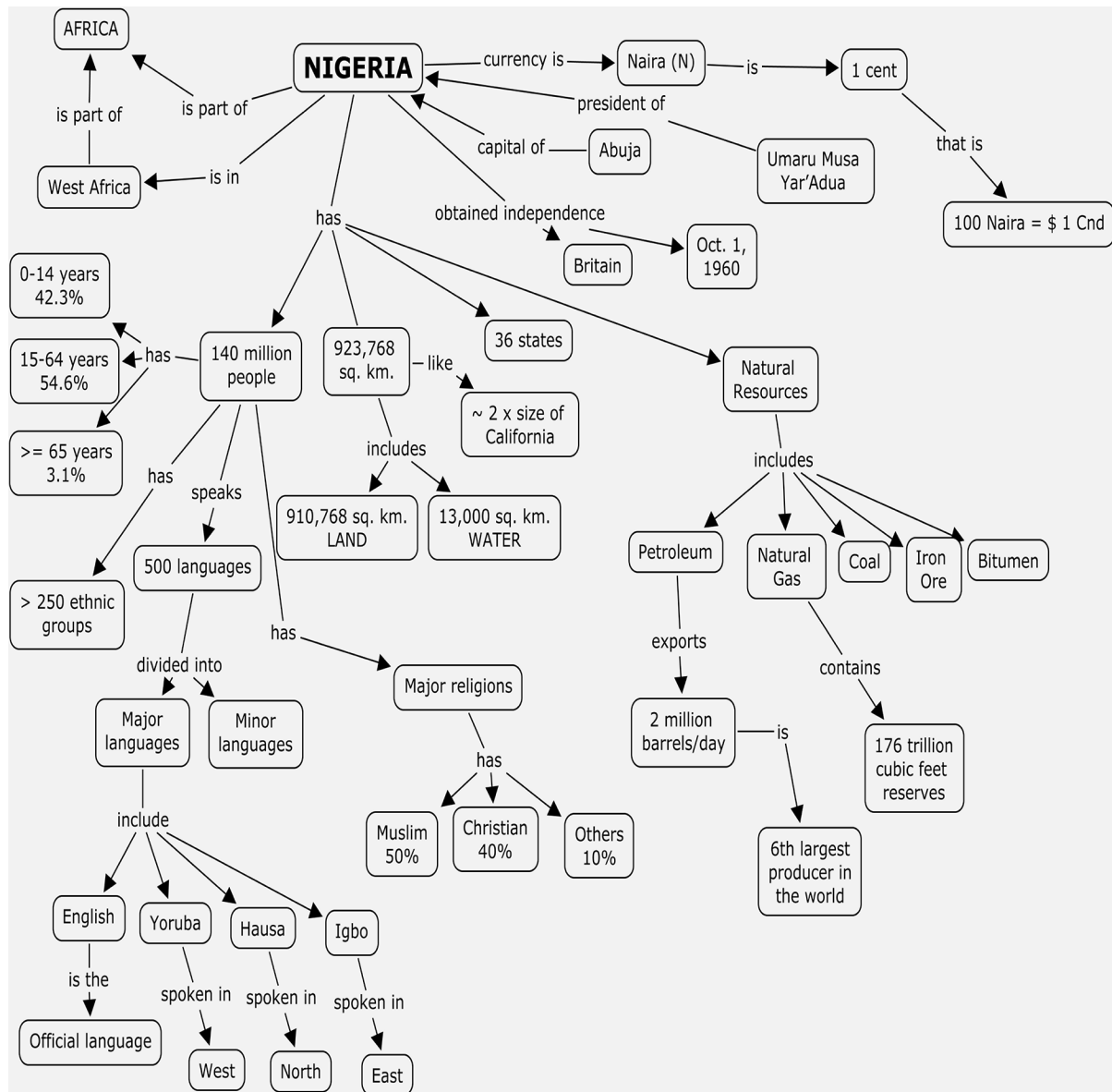
Concept maps represent knowledge as node-link networks that show concepts as nodes and the relationships among the concepts as arrows or links. Researchers and teachers have used concept maps as media for constructive learning activities, instructional presentations, and as shared materials for co-construction of knowledge (Cañas et al., 2003). Researchers have suggested that concept maps may

also serve as an effective learning medium when implemented as interactive software (Cañas et al., 2003; Novak, 2002). An example of a concept map is shown in Figure 1. The map in Figure 1 has links that are directional and labeled with a relational term, but the maps used in educational research sometimes have non-directional, unlabeled links.

Dansereau and his colleagues (e.g., Hall, Dansereau, & Skaggs, 1992; Lambiotte & Dansereau, 1992; McCagg & Dansereau, 1991) have used the term ‘knowledge map’ to refer to a type of concept map with directional links labeled

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Figure 1.



by symbols such as P (part) or C (characteristic), drawn from a fixed set of relations. Figure 2 shows the same information in figure 1 displayed using a knowledge map.

Research on the instructional applications of concept maps has proliferated since they were first used as educational tools in the early 1970s. Figure 3 shows the growth of research literature on concept maps over the past three decades.

A period of rapid growth from 1985 to 1990 followed the publication of Novak & Gowin's (1984) *Learning How to Learn*, which presented a comprehensive argument for the educational use of concept maps.

When used for learning, concept maps can be (a) created by instructors and presented to students (Cliburn, 1986; Lambiotte & Dansereau, 1992), (b) constructed by students (McCagg &

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