Chapter 5
The Value of Metacognition and Reflectivity in Computer–Based Learning Environments

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ABSTRACT

The purposes of this chapter are threefold: to explore the research on and relationships among metacognition, reflection, and self-regulated learning; to analyze students' experiences with metacognition, reflection, and self-regulated learning activities in computer-based learning (CBL) courses; and to provide strategies that can be used in a CBL environment to promote students' metacognition, reflection, and self-regulation. A review of underlying frameworks for and prior study findings in metacognition and reflection are presented. Case study findings are also described and form the basis for the suggested strategies. The value and implications of using such strategies are also offered. Finally, future research should address the teaching of metacognition and reflection in CBL environments with an emphasis on real world application.

INTRODUCTION

Metacognition, reflection, and self-regulated learning are terms that are commonly used in education circles. These skills are critical to students' success in the learning process, and it is widely recognized that students who self-regulate their learning and are in tune with their metacognitive and reflective skills perform better than those who lack those skills. It is often assumed that learners naturally acquire these abilities over time. However, students need specific, explicit instruction on how to develop these abilities. Students should also be presented with a variety of opportunities via specific course activities to practice these skills in context.

The importance of designing a course experience that promotes metacognitive, reflective, and self-regulation behaviors is even more crucial in the computer-based learning (CBL) environment in which students need to take even greater control of their learning. The purposes of this chapter are threefold: to explore the research on and relationships among metacognition, reflection, and self-regulated learning; to analyze students' experiences with metacognition, reflection, and self-regulated learning activities in CBL courses; and to provide strategies that can be used in a CBL environment to promote students' metacognition, reflection, and self-regulation.

BACKGROUND

The ideas of metacognition and reflectivity, though not formally titled, have been topics of interest and practice for millennia. In the Greco-Roman era, Plato, Socrates, and Aristotle all emphasized the importance of self-examination and its result: self-knowledge. During the middle ages, Thomas Aquinas developed a sophisticated theory of self-knowledge developed on a foundation of self-evaluation and self-awareness (Cory, 2013). The 20th century, however, ushered in a more refined understanding of self-examination and knowledge. William James, John Dewey, Lev Vygotsky, and Jean Piaget each contributed significant advances associated with a modern approach to metacognition and reflectivity (Dewey, 1910; Inhelder & Piaget, 1958; Fox & Riconscente, 2008). During the past few decades, metacognition and reflectivity have become common terms in educational psychology and specialized topics for research and discussion. While closely related, they have followed largely separate paths in formal research.

John Flavell first used the term metacognition in the mid 1970's, indicating that it involves thinking about one's own cognitive processes. He stated that metacognition involves two aspects:

awareness and control of cognitive processes (Flavell, 1976). Later, Flavell (1979) proposed a model for metacognition based upon two areas: metacognitive knowledge and metacognitive experiences. Metacognitive knowledge describes what is known about the factors that affect cognition, and metacognitive experiences describe the way people make conscious efforts to improve learning. He further divided metacognitive knowledge into three categories:

1. **Person Variables:** One's ability to identify their strengths and weaknesses in the learning process.
2. **Task Variables:** One's ability to identify the cognitive processes required to complete a task. Example: A student estimates the time required to read a particular journal article.
3. **Strategy Variables:** One's ability to identify the strategies that they must apply in order to accomplish a task. Example: A student determines they will need to use a dictionary to look up unfamiliar words to understand the content of a technical journal article.

The professional community has also recognized the importance of metamemory, the knowledge of one's memory, as another component of metacognition (Cavanaugh & Perlmutter, 1982). More recently, Fogarty (1994) developed a three-stage framework to assist teachers in developing student metacognitive processing, which includes planning, monitoring, and evaluation. Currently, researchers recognize and study three major factors of metacognition (Dunlosky & Metcalfe, 2009). They are:

1. **Metacognitive Knowledge:** Conscious knowledge that pertains to one's cognition.
2. **Metacognitive Monitoring:** Assessing the progress of a particular cognitive activity.
3. **Metacognitive Control:** Management of an ongoing conscious activity.

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