

Chapter 15

Mental Activity and the Act of Learning in the Digital Age

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ABSTRACT

Theories of the mind have been proposed since the Greek philosopher Plato (427 – 347 B.C.) compared memories to etchings on a wax tablet. Just as the resilience of a message etched on a wax table is based on such things as hardness, purity, and depth of the wax, the resilience of our memories are based on factors, such as the significance, clarity and depth of processing. While theories of the mind have been proposed for thousands of years, it has really been in the last twenty-five years that we have truly begun to uncover the complex association between the mind, brain, and thought. With the advent of the digital age including new imaging technologies, we can explore the act of learning like never before. Indeed, the physiology and psychology of mental activity can be the foundation for exploring the act of learning.

INTRODUCTION

Cogito ergo sum, “I think therefore I am,” a philosophical statement by Rene Descartes is a fundamental element of Western Philosophy (Descartes, 1637, p. 52). The proof of our own existence can be found in our ability to contemplate whether or not we exist. Theories of the mind have been proposed since the Greek philosopher Plato (427 – 347 B.C.) compared memories to etchings on a wax tablet. Just as the resilience of a message etched on a wax table is based on such things as hardness, purity, and depth of the wax, the resilience of our memories are based on factors, such as the significance, clarity and depth

of processing. While theories of the mind have been proposed for thousands of years, it has really been in the last twenty-five years that we have truly begun to uncover the complex association between the mind, brain, and thought. The digital age is truly allowing us to explore this association like never before. New imaging technologies are now providing evidence of what occurs in the brain during mental activity.

We have all read stories in the newspaper about research breakthroughs in mental activity including learning and problem solving, yet much of this research has yet to influence our education system and teaching strategies. The purpose of this chapter is to

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1. Explore the physiological and psychological facets of mental activity, and
2. Associate these facets of mental activity with the act of learning.

I believe educators and educational researchers can benefit from the fields of cognitive psychology and neuroscience. It is my belief that a better understanding of the many facets of mental activity will aid in our efforts to optimize the act of learning.

There are two goals of this chapter, one for educators, and one for educational researchers. Firstly upon reading this chapter, I hope educators will have a better awareness as to the relationship between the physical and psychological aspects of learning. Secondly, I hope this chapter encourages researchers to further refine research studies of mental activity to explore the physiological and psychological activities of learning. For example within this chapter, you will read how a biologist has proposed an association between the physiology of our brain, and a popular learning theory. This chapter will start with a definition of mental activity and learning. We will take a brief tour through the history of mental activity. We will then peek inside the body to explore the physiological processes of mental activity and learning. Next, we will investigate the various psychological theories of mental activity and learning. We complete our journey by considering common variables of the many theories of mental activity and learning, and finish with a section on putting it all together.

DEFINING MENTAL ACTIVITY AND LEARNING

Mental activity is individual, subjective and it's going on all the time. It is activity of the mind resulting in a collection of thoughts. As we will see, mental activity is physical, that is, there is a physical process occurring in the brain during all mental activity. There are physical barriers

to mental activity such as age, sex, and various medical conditions. There are psychological factors that can inhibit mental activity such as our own self-concept.

There are a myriad of definitions of learning. For the purpose of the present chapter, *learning* is defined as the act of acquiring new, or modifying and reinforcing, existing knowledge. In many ways, learning is more of a process than an act of collecting information. As I will discuss, learning is physical in that there is a physical change in the brain when we acquire new knowledge. There is also a psychological side to learning. Factors such as self-perception and motivation have been shown to influence our ability to learn new information (Cokley, 2000; Pintrich, 1999).

For the purpose of this chapter, learning is considered a sub-component of mental activity. I propose this relationship as a way to integrate the physiological and psychological aspects of mental activity with the act of learning. I believe this association will help extend our understanding of the many facets of the learning process.

BRIEF HISTORY OF THE STUDY OF MENTAL ACTIVITY

A cousin of Charles Darwin, Francis Galton (1822-1911) expanded Darwin's investigation from the evolution of physical characteristics to the evolution of mental characteristics. He created the first assessments of mental activity which emphasized sensory capacity. Galton believed intelligence was directly associated with level of sensory discrimination. Before his time, the study of mental individual differences had not been considered a subject for serious psychological study. As a researcher of the human mind, he was the first to apply statistical methods to the study of individual differences. His laboratory which was part of the 1884 International Health Exhibition in London, attracted over 9000 participants. He collected a large amount of data and used statisti-

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