Different Approaches – Common Implications: Brain-Based And Constructivist Learning From A Paradigms And Integral Model Perspective

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SYNOPSIS

INTRODUCTION

Brain-based learning, a recent approach in the educational literature, is related with the structure and the relation of the functioning of the brain with learning. The pioneers of this approach (Caine & Caine, 1994) have come up with principles about brain and learning. Another recent approach, constructivism, is also concerned with teaching and learning and has brought innovative perspectives to the field of education. Although these brain-based and constructivist learning approaches appear as separate domains in the educational literature, when examined closely, it emerges that they have similar fundamental principles. In a limited number of studies related with these two approaches, there is only a cursory mention of their similarities stating that constructivist learning models are brain-compatible (Gülpınar, 2005). The purpose of this study is to closely analyze brain-based and constructivist learning approaches, to reveal their relationship, and in light of paradigms and the integral model, to elaborate on the meaning and importance of this relationship for the field of education and educational research.

A) BRAIN-BASED LEARNING

Brain-based learning draws upon the functioning of the brain and takes into consideration the rules of the brain for meaningful learning. According to Caine and Caine (1994), the brain is like our other organs, and one of its most important jobs is to learn. It has an unlimited capactiy for learning. For learning, the functions of the brain are very important. Brain-based learning is interested in knowing how the brain works and in discovering the ways of maximum learning (Carolyn, 1997).

Brain-based learning distinguishes between surface and meaningful knowledge. According to this approach, although memorization can be very important, meaningful

knowledge is critical for being successful. Making connections among knowledge (including previous experiences) is essential in meaningful learning. In other words, brain-based learning is centered on meaningful learning in the context of lifelike, enriching experiences and on providing students with the safety and opportunities to meaningfully learn.

Caine and Caine (1994) suggest twelve principles of brain-based learning that serve as the theoretical foundation of the approach. These are the following:

1. The brain is a parallel processor.
2. Learning engages the entire physiology.
3. The search for meaning is innate.
4. The search for meaning occurs through patterning.
5. Emotions are critical to patterning.
6. The brain processes parts and wholes simultaneously.
7. Learning involves both focused attention and peripheral perception.
8. Learning always involves conscious and unconscious processes.
9. We have at least two different types of memory: A spatial memory system and a set of systems for rote learning.
10. We understand and remember best when facts and skills are embedded in natural, spatial memory.
11. Learning is enhanced by challenge and inhibited by threat.
12. Each brain is unique (pp. 87-96).

B) CONSTRUCTIVIST LEARNING

Although the constructivist theory of teaching and learning has become influential in education in recent years, it is not a new approach. According to a number of scholars, Socrates is among the first constructivists (Erdem & Demirel, 2002; Nola, 1998). According to Nola, in Socrates' view the students do not directly acquire knowledge but learn after a process of reasoning.

In the constructivist approach, the students are in the center of the teaching and learning process. The students learn by themselves in a social setting. They construct knowledge with stimuli from their surroundings and these constructs are mostly related with the way they perceive the environment. The tenets of constructivism can be summarized as following:

1. Individuals base their knowledge on their already existing conceptual frameworks. A learner's previous experiences with the world and life (physical, social or imaginary) represent a conceptual frame reference for giving meaning to new phenomena (Taylor, 1993).

2. For constructing science --individually or socially—more than a theory, data and instruments is needed. Although individuals are free to develop argumentations to some extent, the experiences of the society with theories, data and instruments affect decisions of what should be accepted as data and what should not, what can be a strong evidence and what cannot (Grandy, 1998).

3. The role of the teacher is mediating learning. Relevantly, the focus needs to be on the learner, and the classroom environment should be much more interactive than a traditional classroom.

4. The teacher as a mediator provides quality experiences to learners for meaningful learning. A constructivist approach involves providing experiences for learning in certain directions (i.e., viable knowledge) impossible without the guidance of a teacher.

5. Constructivism suggests that learning is a socal process of giving meaning to experiences in light of the already known (Tobin & Tippins, 1993).

6. In the classroom the teacher should provide the students various opportunities such as writing, drawing, using symbols and the language appropriately to express their previous knowledge. Time for reflection is also essential during the course of a lecture.

7. Generating questions may be a way of initiating conceptual conflict and seeking answers to those questions may start the process of resolving the conflict. Establishing interactions for group discussions, answering questions with peers, explaining a certain scientific content, finding and explaining differences in understanding, generating new questions, designing research and solving problems may play a significant role in learning.

8. According to the constructivist approach one of the most important roles of the teacher is evaluating learning. Rather than being in the form of reward or punishment at the end of the teaching, evaluation should be regarded as a part of the teaching process itself.

C) COMPARING THE BRAIN-BASED AND CONSTRUCTIVIST LEARNING APPROACHES

In this section, the principles of the brain-based and constructivist learning approaches are analyzed on a comparative basis. When examined closely, in essence, the brain-based learning approach emphasizes the following principles:

• Meaningful learning occuring through patterning in spatial memory, one of the two memory systems.

• Each brain and physiology being unique and the effect of this uniqueness on learning.

• The brain being a parallel processor and processing parts and wholes simultaneously.

• Learning involving both conscious and unconscious processes and environment conditions affecting the unconscious.

• The significance of the affective factors and learning being enhanced by challenge and inhibited by threat.

On the other hand, the constructivist learning approach is based on the following cornerstone principles:

• Learning being a socal process of giving meaning to experiences in light of the already known.

• Learning based on the conceptual frameworks of the individual, which are constructed through previous experiences with the world and life.

• Using lectures carefully and embedding various opportunities such as writing, drawing, using symbols and the language appropriately to express previous knowledge, and providing time for reflection.

• Teaching influenced by culture, other learners, social, economic, political factors as well as parents, directors and teachers.

• Teachers considering the needs of learners and interacting with them, evaluation not being in the form of judgement.

When examined closely, it is possible to say that these two approaches have common principles. We summarized these common prinicples including implications for education as five cornerstones. These five principles are *meaningful learning, individual differences in learning, mutltiple representations in learning, personal and environmental factors in learning,* and *affective components in learning.*

DISCUSSION, CONCLUSIONS AND IMPLICATIONS

Like in the constructivist approach, in brain-based learning the construction of knowledge, meaningful learning, encouragement of students to construct knowledge based

on their previous experiences, is encouraged. According to both approaches, individual differences may exist both in the construction and interpretation of knowledge. These differences should be taken into consideration during the teaching and evaluation processes.

In this study, the brain-based and constructivist approaches were analyzed comparatively and the relationship between them as well as the parallelism were expressed in terms of five overlapping principles (Figure).
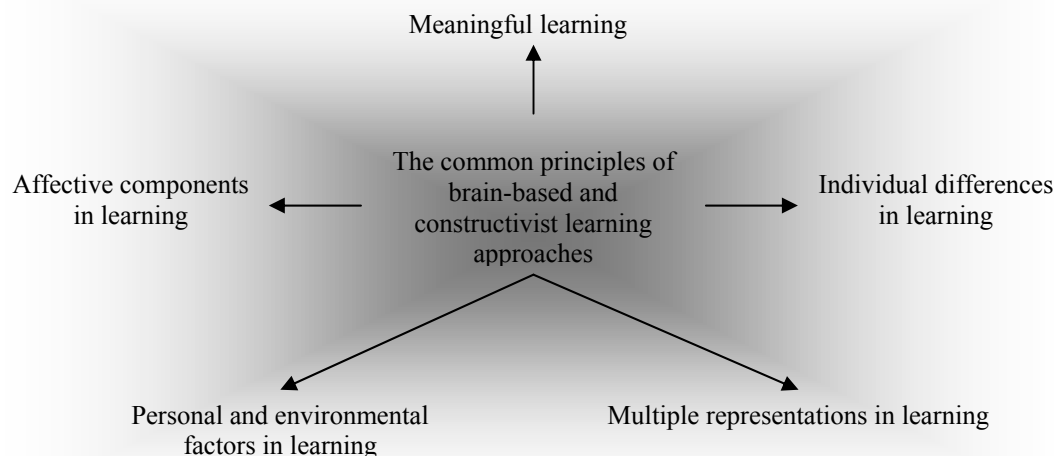

Meaningful learning

Affective components in learning

The common principles of brain-based and constructivist learning approaches

Individual differences in learning

Personal and environmental factors in learning

Multiple representations in learning

Figure 1. *The overlapping principles between brain-based and constructivist learning approaches.*

According to our analysis, brain-based learning is overlapping with constructivist learning to a great extent. Approaching this issue with a critical perspective, Bruer (1999) argues that brain-based learning does not offer anything different than constructivist learning. This study supports Bruer's argument to a great extent. However, a different perspective has been employed. It is possible to say that rather than being a conflict, this overlap is quite meaningful in the field of education, both in theory and in practice.

First of all, in a sense, the brain-based learning approach provides an account of many constructivist learning principles. It tends to explain the methods used for teaching in a cause-effect relationship. The approach does this by relating brain research with implications for education (Caine & Caine, 1994). There are claims that educators have been using these teaching strategies for years without knowing about brain-based learning. However, "it's also true that if educators don't know why they do what they do, their actions are less purposeful and professional" (Jensen, 2000, p. 76).

Secondly, brain-based and constructivist learning approaches have emerged out of two different fields but had commonalities in their implications for education. In both approaches, the research providing base for the implications has been done in different disciplines and with different methodologies within different paradigms. While the core of the brain-based learning approach consists of brain research in neurosciences, the essence of the constructivist learning approach is research in philosophy, psychology and education. In other words, these two approaches stem from two different paradigms, quantitative and qualitative, the assumptions of which are different and which may be perceived as in conflict. Quantitative paradigm requires that quantitative methods such as experiments are used, qualitative paradigm suggests methods such as interviewing and participant obesrvation in traditions like phenomenology and ethnography (Jacob, 1987).

Although the qualtitative paradigm has developed as a counter paradigm to the quantitative, the fact that these two paradigms perceive reality differently does not mean

that they oppose each other. Their difference does not form any hierarchy. Instead of arguing the dominance of one over the other, taking the powerful aspects of both to advance the sciences would result in the efficient use of time and reasoning. As Creswell (1994) and others (i.e., Oliver-Hoyo & Allen, 2006) have used it, *triangulation* in research often requires that quantitative and qualitative approaches are combined. According to Creswell, triangulation is used to neutralize any bias that may originate from particular data sources, methods, and researcher by employing other data sources, methods, and researcher. In triangulation, it is expected that findings overlap.

As pointed out earlier, brain-based learning approach is supported with quantitative research based on objective epistemology in the disciplines of neuroscience and cognitive neuroscience. On the other hand, constructivist learning approach relies heavily on in-class qualitative research based on interpretative epistemology. As revealed in this study, the two approaches overlap significantly in their principles and findings. This overlap leads to between-paradigms triangulation and yields important messages for transformation in education.

Bruer's (1999) assertions that "deeply held theoretical assumptions in both fields supported a view that mind and brain could, and indeed should, be studied independently" (p. 649) and that neuroscience cannot directly inform education (Bruer, 1997) need to be reconsidered when triangulation is considered as quality criteria in research. In fact, the combination and integration of different paradigms becomes very important in terms of being informative.

On the other hand, Ken Wilber, a contemporary American philosopher, elaborates on an *Integral Psychology Model*. According to Wilber (2000), postmodern reality is a reflection of an "all-level all-quadrants" approach including both the premodernity and modernity. The four quadrants in this model consist of "I," "we," "it" and "its" and represent the "intentional/subjective," "cultural/intersubjective," "behavioral/objective" and "social/interobjective." Wilber argues that integral psychology requires that research is coordinated and integrated in all levels and all quadrants. According to him, phenomena could be best understood through the *Integral Model*. An integral model approach results in interdisciplinary research including science, history, anthropology, philosophy, education, psychology, politics, and the like. Considering the two approaches to learning in the center of this work, the brain-based and constructivist learning approaches complete all of the quadrants of the *Integral Model*. Brain-based learning research having its basis in the neurosciences spans the two "objective" quadrants, while stemming from philosophy and psycholgy and supported by in-class qualitative work, constructivist learning research can be primarily considered in the two "subjective" quadrants.

Looking from the integral perspective, the two approaches to learning operate from different dimensions, but integrally their implications become meaningfully stronger in the educational field. An implication would be that the model offers a stronger theoretical basis for contemporary educational reform. An integral approach to education would be more promising instead of only brain-based or constructivist approach for the anticipated outcomes. Also, the Integral Model may serve as a powerful and holistic theoretical perspective to educational research.

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