DIALOGIC LEARNING: A SOCIAL COGNITIVE NEUROSCIENCE VIEW

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Abstract. This paper represents an exploration of the educational value of dialogue as a teaching strategy in contemporary classrooms in light of recent evidences grounded in knowledge produced by social and cognitive neuroscience research. The relevant literature suggests that dialogue is a unique feature of humans and no other animal is able to dialogue as they do. Humans are biologically wired for dialogue and interaction with one another in socially and culturally shaped contexts. This dynamic interdependence of social and cognitive processes plays a critically important role in construction of knowledge and cognitive development. It is also well established that social processing in the brain is strongly interrelated with the processing of emotion. Children therefore, are social learners who actively construct meaning and knowledge as they interact with their cultural and social environment through dialogue. In conclusion, recent advance in cognitive and social neuroscience is providing a new basis for the communicative conception of learning in which authentic interaction and dialogue are key components. This suggests new avenues of research that need to empirically investigate the role of dialogue on students' mind and brain development.

Keywords: Dialogue, Dialogic Learning, Neuroscience and Education, Pedagogy.

1. INTRODUCTION

Educators have long known that schools are social contexts and social interaction is a major force in children's development. Evidence from social neuroscience is shedding new light on the neural underpinnings of such social functioning and its relation to learning inside and outside the classroom (Blakemore, 2010; Immordino-Yang, 2011). In light

Corresponding Author Dr. Ali Nouri Department of Educational Sciences, Malayer University, Iran E-mail: a.nouri@malayeru.ac.ir of these understanding, several studies have devoted to exploring the potential contributions of recent advances in social and cognitive neuroscience research for educational theory and practice (Immordino-Yang and Damasio, 2007; Meltzoff et all, 2009; Immordino-Yang, 2009; 2011; Lieberman, 2012). These studies strongly verify the profound importance of social interaction on human learning and emphasize the value of recurring social components of learning in making the curriculum and managing the process of teaching.

Taken together, these studies have shown some success in identifying the neurobiological processes of social learning and its potential implications for the school curriculum and classroom practice. Nevertheless, neuro-cognitive bases of "dialogic learning" (Van der Linden and Renshaw, 2004; Wegerif, 2011) - as a form of social learning- is still largely unknown.

By this in mind, this paper takes into account to explore the state of dialogic learning in light of recent evidences that mainly grounded in knowledge produced by cognitive and social neuroscience research. Such interpretation represents some facts that are necessary for a more comprehensive understanding of the state of dialogue in education, and in shaping further investigation in this area.

2. THE NEUROSCIENCE BASES OF DIALOGIC LEARNING

Dialogic learning throughout this paper is referred to teaching through dialogue as well as for dialogue in which dialogue is not simply treated as a means to the end of knowledge construction but more importantly treated as an end in itself (Wegerif, 2011).

A comprehensive understanding of dialogic learning requires integrating knowledge (IJCRSEE) International Journal of Cognitive Research in Science, Engineering and Education Vol. 2, No.2, 2014.

from a variety of disciplines in the natural and social sciences. In this endeavor, we need to explore the neural and biological underpinning of dialogue and synthesize with our educational and psychological understating in this area. To this end, this paper aimed to drive a set of notable insights from the neurobiological underpinning of dialogic learning based on converging evidence in cognitive and social neuroscience. Among a variety of insights which deserve to be highlighted in this review are the following:

2.1. Humans are biologically wired for dialogue and communicating with one another

Recent research in "evolutionary educational psychology" (Geary, 2002) provided us with much evidence that early humans primarily learned through social interaction. In this perspective, humans are social beings and their brains develop in social and cultural contexts. They are innately preprogrammed to learn from and about others through social interaction (Geary, 2008). Our social nature defines what makes us human, what makes us conscious or what gave us our large brains (Adolphs, 2003). The success of social interaction, according to Frith and Frith (2001) depends on the development of brain systems that are geared to processing information in the social domain. On this view, we have a social brain that evolutionary developed to learn through shared experiences. One consequence of these evolutionary pressures appears to have been the development of a large scale network in the brain. In support of this idea, there is a correlation across primate species between the size and complexity of their social communication and the relative volume of neocortex. Among primates, humans possess both the highest encephalization ratio and live in the largest groups (Adolphs, 2003; Lieberman, 2012).

Furthermore, recent findings show that infants and young children are born with a biological propensity for social interactions. They have an intense interest in people and their behavior and possess powerful implicit learning mechanisms that are affected by social interaction (Meltzoff et all. 2009). Drawing on a set of studies, Meltzoff et all. 2009 reported that young infants are predisposed to attend to people and are motivated to copy the actions they see others do. Their studies also demonstrated that human infants more readily learn and reenact an event when it is produced by a person than by an inanimate device. Furthermore, Cacioppo et all. (2007) reported that, attachment and communication in human children are so important that infants respond to faces and attempt to elicit a response soon after birth.

Taken together, if social communication is a driving force during hominid evolution, then children should have a strong and inherent motivational bias to engage in social activities and the forms of social communication that were important during hominid evolution (Geary, 2002). According to this view, learning with others is usually more effective than learning alone, and reflective dialogue is central to this social process (Goswami, 2008). The interactive interpersonal nature of dialogic learning helps to develop new knowledge and scaffold individual learning (Wegerif, 2007). These new insights therefore would support recruiting more dialogue-based and cooperative learning opportunities in making the curriculum and designing the process of teaching and learning.

2.2. The transmission of information between humans mediated by dialogue

Humans are not the only species who their learning is affected by social interaction, but they are only social beings who are innately preprogrammed and biologically wired to form communication with others and themselves through dialogue. Dialogue therefore, is a unique feature of humans and no other animal is able to dialogue as they do. In such a view, dialogue must be understood as a "part of our historical progress in becoming human beings" (Shor and Freire, 1987, p. 13). In a recent study, Goldin et all. (2011) investigated the universality of a kind of dialogue that Socrates (469-399 BC) conceptualized more than 24 centuries ago. They adopted a remarkable lesson of geometry by which Socrates intended to teach Meno's slave to discover how to generate a new square with twice the area. Fifty-eight educated adults and adolescents were asked a series of 50 questions identical to those posed by Socrates. Their study showed a remarkably consistent between participants' answers and those offered by Meno's slave. More interestingly, the vast majority of participants produced the

same mistakes that Meno's slave made. Their results imply that the Socratic dialogue is built on a strong intuition of human knowledge and reasoning which persists more than 24 centuries after its conception.

While dialogue relies heavenly on oral language, it can and should not exclusively be reduced to verbal communication. There are multiple forms of representation in which humans naturally interact with self, others and their surrounding world motivating a flow of meaning (Wegerif, 2007). Bereiter and Scardamalia (2005) made this point very clear when they regard the dialogue as a form of literacy and describe it as "the ability to engage productively in a discourse whose purpose is to generate new knowledge and understanding". This dialogic understanding according to Wegerif (2007) provides us with a way to appreciate how different modalities of representation can work together and how different levels and types of dialogue can be integrated into flows of meaning.

In this regard, dialogic learning can be considered as one of the most influential approaches in teaching and learning which both teachers and students co-construct their knowledge and represent their understandings by actively engaging in a challenging discourse.

2.3. Dialogue plays a critically important role in construction of knowledge

Educators have long known that construction of knowledge and cognitive development is strongly influenced by social and cultural factors. Vygotsky (1978) has deeply shown this importance of social and cultural contexts in learning and cognitive development. Basing on Vygotsky, the dynamic interdependence of social and cognitive processes is essential in construction and reconstruction of knowledge. The prime example of this is his conception of the "zone of proximal development". He defines the zone of proximal development as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86).

In addition, recent research in cognitive science indicates that cognitive development,

both in the long and short term, is the continual building of new knowledge by integrating, differentiating, and consolidating facts, concepts, skills, and relationships about the physical and social world according to culturally defined strategies (Fischer and Immordino-Yang 2002).

Neuroscientists now confirm that the learning brain has a highly robust and well developed capacity to change in response to social demands. For instance, Maguire et all. (2000) showed that grey matter volume in posterior hippocampus of taxi drivers was significantly higher relative to those of control subjects' and that the grey matter volume correlated with the amount of time spent as a taxi driver. Posterior hippocampus is a region of the brain known to be essential for memory and navigation. Kandel (1998) also emphasized on the important contribution of social interaction on changes in the structure and function of the human brain. He noted:

Just as combinations of genes contribute to behavior, including social behavior, so can behavior and social factors exert actions on the brain by feeding back upon it to modify the expression of genes and thus the function of nerve cells... These changes not only contribute to the biological basis of individuality but presumably are responsible for initiating and maintaining abnormalities of behavior that are induced by social contingencies. (p. 460).

In her influential paper, "A tale of two cases: Lessons for education from the study of two boys living with half their brains" Immordino-Yang (2007) presents the story of compensation for basic skills in two adolescent boys, Nico and Brooke, both of whom underwent surgery to control severe epileptic seizures. During these surgeries, Brooke lost his entire left hemisphere and Nico lost his entire right hemisphere. Her study highlights the remarkable importance of the organizing role of emotional and social experiences in brain development. In her subsequent article, "The Stories of Nico and Brooke Revisited: Toward a Cross-Disciplinary Dialogue about Teaching and Learning", Immordino-Yang (2008a) has concluded that "both boys' motivations to comprehend and produce affective prosody reflected their desires to engage effectively in the social context. They wanted to talk and be talked to, and they wanted to accomplish this in a culturally and socially appropriate manner" (p. 51). New data also indicate that early mastery of language requires learning in a social context to acquire the language spoken in their culture (Meltzoff et all, 2009.). In this sense, social factors are the key influences in developing our learning and development. Students thus are social learners who actively construct knowledge and meaning as they interact with their social and cultural contexts.

These findings are suggestive with respect to the forms of social learning such as dialogue that will most aid knowledge construction and cognitive development. These results are consistent with the behavioral research supporting the impact of dialogic learning on students' cognitive abilities. More specifically, the results of a recent study indicated that the dialogic learning condition, compared to the non-dialogic, resulted in a more positive effect on the critical thinking competences of the students, both in terms of generative fluency of reasoning and quality of value orientation (Frijters et al, 2008).

Therefore, as far as the thought and knowledge is created and developed in an inter subjective approach (García, 2012), school curriculum needed to provide learning opportunities for social interaction in which the active construction of knowledge can flourish.

2.4. Dialogue is a key element for emotional involvement

In addition to the interrelations between social and cognitive development, social processing was found to have substantial impact on the emotional brain. Findings from brain research are consistent with the view that early social experience plays a critical role in the development of basic affective processes. Based on these findings, early adverse experiences such as disruption of the mother-infant relationship can cause severe adverse effects on the neural and behavioral development of the child (Cirulli et all. 2003). It has also well established that cognitive processing in the brain is closely interrelated with the social processing of emotion. The structures of the brain that are most involved with functioning of social events are also extensively connected with processing and regulating of emotional states (Hari and Kujala, 2009; Adolphs, 2003).

Furthermore, social neuroscience findings indicate that humans have individual mirror neurons that allow them to regulate their social interactions (Rizzolatti and Craighero, 2004). Mirror neurons are networks in the brain which are activated both when we perform an action and when we observe the same class of actions performed by someone else. Thus, mirror systems are essentially networks in the brain where systems for perception, and systems for action, converge and feed into one another (Damasio and Meyer, 2008, as cited in Immordino-Yang, 2009). In this way, mirror systems, at the most basic level enable the internalization of the goals of another's actions, including actions that belie emotional states, onto the substrate of one's own self (Immordino-Yang, 2008b). It means that we are constantly reading each others' actions, gestures and faces in terms of underlying mental states and emotions, in an attempt to figure out what other people are thinking and feeling, and what they are about to do next. This is known as "theory of mind" or "mentalizing" (Blakemore, 2010, p. 744).

These findings validate Bandura's social-learning theory and support this idea that learning is influenced by observation of or interaction with others (Bandura, 1986) and reflect the value of the social relationships in the classroom and the extended school. The key message here is that much of learning is not intended in advance and students learn from teacher's actions, reactions, and interactions with other students. On the ground of these findings, the role of dialogue is becoming more important, as much of social interaction is dependent on it. Accordingly, school curriculum should provide opportunities to engage students and teachers and other members of the school community in professional dialogue to negotiate about their work and other relevant topics as a way of contributing to the creation of a better society. Teachers in this context not only teach, but they also participate in true dialogues with and learn from students (Nouri, 2014).

5. CONCLUSIONS

Dialogue is an interactive process of construction of meaning which has been recognized as a method of learning and thinking about the time of Socrates to the present. There is a range of various perspectives from philosophy (e.g. Buber, 1970; Bakhtin, 1986; Habermas, 1987), psychology (e.g. John-Steiner and Tatter, 1983; Pickering and Garrod, 2004) and education (e.g. Dewey, 1930; Freire, 1970) focused on the significance of dialogue as an indispensable component of the process of both learning and knowing (see Pihlgren, 2008 for a comprehensive review of the theoretical literature of dialogue in education).

There are also an increasing number of

empirical studies increasingly demonstrating the significant impact of dialogic learning on students' thinking and learning (e.g. Frijters et all. 2008; Alfassi, 2009). In almost all of these studies, dialogic learning has been represented as a means to improve learning, memory, decision making, and thinking. And now, recent advances in neuroscience regarding the fundamental role of social interaction in learning are providing a new basis for the communicative conception of learning in which authentic interaction and dialogue are key components.

As a whole, research into dialogic learning is supported by a rich and interdisciplinary theoretical and empirical background and then it can be considered as "one standard way of teaching" (Battro, 2010) which persists more than 24 centuries after its conception by Socrates (Goldin et all. 2010).

Although this conclusion may not be adequate to explain all of the neural bases of dialogue, it provides a useful motivation to establish and legitimate a strong neuroscience foundation for dialogic pedagogy. However, many issues and avenues of research remain to be further investigated in regard to the role of dialogue on students' mind and brain development. It needs empirical research exploring whether and how engagement with different kinds of dialogue may change and develop individual brains. The impact of dialogue on students' attention and motivation should also be taken into consideration. It thus requires encouraging interdisciplinary collaboration based on authentic dialogue among scientists and educators (Nouri, 2013).

Conflict of interests

Authors declare no conflict of interest.

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