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Influences and Implications of Affective Neuroscience in Children's Learning and Education

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Abstract: Recent research of affective neuroscience has shown that human emotion derives from neural network and system. How individuals feel, express and moderate emotions are grounded by affective neuroscience. However, the influences of affective neuroscience and emotions are usually neglected by educators in children education. Based on the brain as a platform, emotion is tightly associated with attention, motivation and cognition, influencing children's learning process. Emotion involves in the process of evaluating, reasoning and analyzing, which means different emotions used in learning may result in different performance. Thus, educators should focus more on the function of emotion in children education. Besides, "emotional thinking" can help educators understand that emotional and cognitive factors are interwoven, which interplay on learning. Therefore, affective neuroscience helps teachers and parents better understand the way in children's learning and cognitive process.

Key words: affective neuroscience; emotion; children education; learning

1. Introduction

Emotion is a psychological and physiological state, which involves feelings, thoughts and behaviors. By facial expressions and body actions, individuals can express their emotions and feelings. Human beings experience different emotions in daily life. To be specific, emotional changes are reflected in different contexts and environment. In fact, emotions have significant impacts on working or learning states. Adults usually can control and regulate well their emotions during working. However, children and adolescents may not have enough abilities to deal with their emotions. In other words, they are more likely to be guided and influenced by their emotions. In the past several decades, theories related to cognition, like cognitive-developmental theory, are widely applied in education. On the contrary, the functions and awareness of emotions are usually ignored in educational contexts. Moreover, children's emotions are different from adults' because many mechanisms related to emotional processing and modulation are immature. Emotions also involves neurobiology, cognition and social processing, which has profound impacts on children's learning. Thus, it is necessary for educators to focus more on children's emotion in learning contexts.

2. Influence Factors in Children's Emotional Development

For every individual, brain is working and changing through the whole life. According to dynamic system theory (DST), the basic function of human brain is to keep the balance between organisms when responding to the fluctuations

between intrinsic and extrinsic. This means human brain keeps working and changing throughout the whole life. However, changes in childhood are significant and profound. Compared with adults, the brains of children and adolescents are immature and quite different from the brains of adults. For example, although newborn infants and children have the approximate number of neurons as adults, the synaptic connections between neurons would reach a peak in childhood and then decline (Mosier, 2013). In other words, adults have a fewer number of these synaptic connections than children, while newborns have the less. Thus, raising from neurobiology, children's body regulation and sensation in emotional processing and regulation may be different from adults. For emotional reactivity of aged 10 to 22, a whole-brain analysis has found a linear effect of age in two areas, which are "a positive relationship with the fusiform gyrus and a negative relationship with the ventromedial prefrontal cortex" (McRae et al. 2012). In terms of emotion regulation, they point out "linear increases in activation with age in a left ventrolateral PFC region, the left inferior frontal gyrus."

3. The Influences of Affective Neuroscience in Children's Learning

Emotion can be considered as one of the key elements in children's learning. Based on affective neuroscience, emotion processing and reactions in learning involve a series of neural responses that influence the way learners internalise and acquire knowledge. To be specific, the neural system of emotion shapes a rudder that can guide learners to utilize effective experience and skills to solve a problem (Immordino-Yang & Damasio, 2015). Via regulation and stimulation of attention (Posner & Rothbart, 2005, cited in Immordin-Yang, 2011), motivation and cognitive processing, emotions help student recruit brain networks supporting experience and skills (Immordino-Yang, 2011), which means emotions facilitate students' learning with neural changes.

Emotions have vital impacts on reasoning and decision making. The patients who have suffered from ventromedial prefrontal cortex do not lose their competencies in knowledge acquiring, knowledge accessing, or logical reasoning. However, they are unlikely to make a good decision. To be specific, they cannot judge an issue based on moral, social-cultural and emotional aspects. These abilities are not associated with intelligence quotient, but are linked to the emotional mechanisms and affective neuroscience. Immordino-Yang & Damasio (2015) explain that the damage of ventromedial prefrontal cortex results in the loss of certain emotional reactions as well as specific social emotions like compassion, embarrassment, and guilt. These emotions can help individuals arouse the appropriate experience to reason and make good decisions. For example, why we know that sometimes some negative verbal words should not be said in the public? If we say these kinds of words to others in the public, they would feel embarrassing.

Negative emotions and emotional problem may adversely affect children's learning process. Recent researches show that the increase in activation in amygdala may lead to anxiety disorders. Children with learning anxiety usually have problems in attention. Compared with their peers, these children maintain a shorter attention span, resulting in behavioural problems when learning, which keeps them from performing well in classrooms (Goswami, 2006). However, learning anxiety can be treated by a set of interventions. After some training, these children can recover from learning anxiety disorders and extend their attention in class. Moreover, negative emotions like fear and stress can negatively affect learning. Effective learning is unlikely to occur, if children are in the conditions of fear and stress (Goswami, 2006).

4. Emotion and Cognition

Cognition is deemed to a main field that impacts children's learning. Information processing, encoding and storing are usually used to explain the way of acquiring new knowledge. However, as a part of the retrieval system, emotion informs our thinking processes such as memories, intuitions and inklings (Hawkin, 2017). This means emotion has basic impacts on cognitive learning. In other words, emotions guide the learning process based on existing experience. Immordino-Yang & Damasio (2015) have called these as "emotional rudder", which can help learners identify and mediate relevant

knowledge. This rudder has significant and decisive impacts on children learning.

However, it may be conscious in cognitive processing sometimes (Immordino-Yang & Faeth 2010). For example, in the initial period of applying specific physical equations, learners do not know which kinds of questions are matched and which are unmatched. In this stage, emotions play an evaluative and reasoning role when applying the new physical equations. This means emotional effects are conscious in the initial stage because emotions guide their choices. Through repeated trial and error in application, learners have realized what situation is available and what is not available. Thus, in the later stages, related emotions become unconscious. However, emotions still implement their functions in learning. In other words, emotional rudder is indispensable in the whole process of cognitive learning. Thus, the loss of emotional rudder may cause troubles in cognitive learning abilities like evaluation, analysis and reasoning, which impedes effective learning.

5. Children's Emotion in Educational Contexts

The role of emotion in children education is multi-dimensional. Goal adoption, one of the aspects in motivation, is influenced by affective states (Linnenbrink & Pintrich, 2002, cited in Linnenbrink, 2007). For example, the children who have experienced pleasure in recent lessons usually try to approach the learning goals instead of avoiding goals. However, the children who have suffered from sadness may be negatively affected when they achieve the goals. In other words, these children may consider they do not have enough abilities and resources to reach the goal, leading to poor performance in learning. Goal-orientation is one of the crucial elements that can promote children's learning processes and performance. Moreover, emotions also affect children's engagement in classrooms. Positive emotions promote students participate more in classes, while negative affective states reduce their engagement in learning.

Moreover, children's emotions tend to be more unstable because the function and mechanisms of their brains are immature and keep developing. This means educators are required to pay more attention to students' emotional changes. In daily classes, teachers usually find that children are happy, joyful and even excited at the beginning of class, but in the second half of the class, students become very negative and not interested in the class. One of the main reasons is that children may lose their interests and attention in the lesson. Besides, when doing homework, parents also reflect that their children usually become impatient and anxiety gradually. These all mean that children's emotions keep changing during learning. However, teachers and parents sometimes neglect children's emotional changes and even force them to keep learning. This may lead to a backlash. Thus, to enhance the children's learning efficiency, educators are expected to keep a relaxed and warm learning atmosphere for children. If necessary, they can change the learning environment based on children's emotions. Besides, understanding children's emotion can help teachers and caregivers realize children's learning preference. To be specific, studying dispositions assist teachers to assess their teaching methods whether those are suitable and effective.

6. Conclusion

In summary, affective neuroscience is the basic precondition and foundation of emotion, which influences human emotional development, expression and regulation. For children, their abilities of controlling and modulating emotions are limited because their brains keep developing. This means they tend to be emotionally unstable. Also, educators should realize emotional changes and difference in children's learning because emotions are linked to attention, motivation as well as cognitive processing. Besides, emotional thought is the overlapped part between emotion and cognition, having significant impacts on children's learning. In a word, emotion involves many areas, leading profound influences on children's learning. Therefore, both teachers and parents need to recognize the crucial function of emotion and affective neuroscience in children education.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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