

*Fostering Logical Thinking, Empathy, and Creativity by Reading Literary Texts:  
A Neuroscientific Approach*

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**Abstract**

This paper aims to show that reading literary texts is an effective means of fostering logical thinking, empathy, and creativity, all of which are essential for students to be good citizens in the world, persons who can appropriately address various and concrete issues, understand other cultural values, and solve unpredictable problems in a flexible manner in today's globalizing world. Drawing on the studies of neuroscience regarding these three abilities, the current paper elucidates the correlation between their enhancement and reading literary texts. Neuroscience demonstrates that the brain region concerned with the inherent human capability of empathizing with others' emotions, which is called the "theory of mind," becomes active when a reader of a literary text becomes immersed in characters' inner worlds. Scientists also show that the left brain is specialized for logical analysis of detail, whereas the right brain is specialized for holistic, freely associative thinking and hence facilitates the moment of creativity. Given these findings, reading literature in the classroom proves a productive educational method: by reading literary texts in three different ways—that is, by examining the details of a text with close reasoning, by becoming steeped in characters' mental states, and by dynamically grasping the whole fictional world, which often includes conflicting ideas, —students can activate the brain regions related to logical thinking (the left brain), empathy (the theory of mind), and creativity (the right brain), thereby improving their abilities to cope aptly with problems, to understand others' feelings, and arrive at creative solutions.

Keywords: teaching literature, citizens of the world, neurobiological effects of reading, analytical reading, immersive reading, holistic reading

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## Introduction

Today, both in Japan and abroad, literature, or more generally the humanities and the arts, tend to be disappearing in curricula. In 2015, the Ministry of Education, Culture, Sports, Science, and Technology, Japan, published a document titled “National Universities’ Reform Plans,” suggesting that national universities should decrease or even nullify the number of faculties and departments of the humanities and art, leading to fierce opposition from the scholars in these academic fields as well as other disciplines. This Japanese educational tendency is part of the worldwide trend of undervaluing the role of humanities in education. Nussbaum (2010), a philosopher in the United States, succinctly points out the adverse situation in which the humanities presently finds itself: “The humanities and the arts are being cut away, in both primary/secondary and college/university education, in virtually every nation of the world. Seen by policy-makers as useless frills, at a time when nations must cut away all useless things in order to stay competitive in the global market, they are rapidly losing their place in curricula, and also in the minds of parents and children”(p. 2). Standing against the educational torrent of disregard for the humanities, Nussbaum insists on the importance of the liberal arts at every level of education, forcefully arguing that they can create good citizens of the world who have the abilities to think critically and to sympathize with others.

In spite of Nussbaum’s grave concern about the humanities being on its way to extinction in education, so far there has not been any serious discussion regarding the relevance of the humanities for pedagogy among the scholars of these disciplines. Although forums to treat the issue of the humanities in education have sometimes been organized by major academic conferences, such a topic has never sufficiently engaged the attention of the majority of researchers. As Batker, Osucha, and Rohrbach (2017), the editors of the pedagogy issue of *American Literature*, forthrightly remark in its introduction, “Why we teach what we teach is just as important as why we study what we study but is seldom discussed as a field-defining issue” (p. 213).

Nevertheless, as the current toward “cut[ting] away” of the humanities in education is being promoted with increasing strength in society, the discussion about the importance of teaching the humanities in the classroom has gathered more urgency. Nussbaum skillfully counteracts the educational movement toward dismissing the humanities from classrooms by demonstrating the pedagogical value of the humanities with a particular accent on how these disciplines enable children to obtain the abilities needed for critical thinking and sympathizing with others. Partially overlapping with Nussbaum’s argument, the essays collected in the pedagogy issue of *American Literature* also tend to emphasize that teaching literature is a productive critical practice that fosters students’ abilities to discern and actively tackle the problematic aspects of their societies, such as class/gender/race inequalities.

While agreeing with Nussbaum and the writers discussing pedagogical issues in *American Literature* in that the educational value of the humanities lies in how it fosters critical thinking, this paper aims to elucidate the importance of teaching the humanities, or more particularly literature, from a different perspective, thereby arguing against the currently prevailing view of the humanities as useless, apparently rendering it unnecessary in education. That is, this paper will demonstrate that reading

literary texts can foster not only critical thinking but also logical thinking, empathy, and creativity, and these three abilities, like critical thinking, are essentially required for students to be good citizens of the world.

Logical thinking is first of all needed for students to deal with an issue, because logical analysis is the most fundamental method of understanding. In fact, students need the ability to think logically in order to examine closely and comprehend precisely, and thereby appropriately address various concrete problems emerging in today's globalizing world. To be certain, as the humanities scholars often emphasize, nurturing critical thinking is extremely important in education. However, critical thinking cannot function well without rigorous analysis, and it is only after this basic practice of comprehension that one can think critically.

Second, students also need to feel empathy for others in order to understand other cultural values and cope with the diversity of the world. Although my argument is here akin to Nussbaum's insistence on the importance of fostering sympathy in education, the word "empathy" is deliberately used, and is not exactly the same as Nussbaum's "sympathy." Nussbaum uses the word "sympathy" more frequently than "empathy" in her argument for the need for cultivating imagination, and these two words, for her, signify the same thing, that is, the ability to imagine others' inner worlds. However, "*empathy*," in its word origin, suggests the act of throwing oneself *into* others' mental worlds, pointing towards a stronger identification with others than "*sympathy*," which suggests the act of feeling *with* others. Hence, I intend to use "empathy" to argue that it is this extremely strong feeling of being one with others that literature can actually foster, thereby effectively highlighting the vigorous force of literature to create competent citizens capable of navigating through, or even merging *into* the multicultural world.

Third, students need to be creative in order to solve unpredictable problems born out of the multi-faceted, swiftly changing current of today's globalization in a flexible manner and with new combinations of ideas. Logical thinking and critical thinking are reality-based, concentrating on a particular, concrete issue, whether the goal is accurate comprehension or active assessment with the use of one's own perspective. By contrast, creative thinking appropriates imagination, fantasy, and free and broad association, sometimes ignoring logic, thereby arriving at unusual, even seemingly unrealistic, but surprisingly superb solutions. Fostering not mere fantasy but creativity is hard work, because a creative solution, hitting the target more appropriately than an exclusively logical solution, cannot be achieved without the exquisite mixture of logic and illogic, and hence it demands that the brain should work in a highly complex manner. However, as I will show later, creativity can be nurtured by a particular way of reading literary texts.

In the following section, I will elucidate *how* teaching literature can be an effective means to educate students to be good citizens of the world, people who are able to think logically, empathize with others, and be creative. I will argue that three types of readings of literary texts can enhance these three abilities: analytical reading can improve logical thinking; immersive reading can increase empathy; and holistic reading can augment creativity. In demonstrating the educational usefulness of literature in this manner, I will draw on the studies of neuroscience regarding logical thinking, empathy, and creativity, and elucidate the correlation between the

enhancements of these abilities and reading literary texts from the perspective of biological science.

### **Analytical Reading and Logical thinking**

First, I will show how analytical reading can nurture logical thinking. Analysis is usually central to reading in the classroom. For example, The Common Core State Standards (2010), a major educational reform plan in the United States that has been adopted by many states, emphasizes the importance of reading in the classroom, encouraging students to read works of literature along with works of different kinds, such as non-fiction and informative texts. According to this educational standard, to read is to analyze: “Read closely to determine what the text says explicitly and to make logical inferences from it. . . . Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.” Here, the Standards claim that students should analyze the details of a literary text to determine logically what the text conveys explicitly, but that students should also analyze closely and determine connotative, figurative meanings. Connotations and metaphors usually evoke indeterminably multiple meanings and many readers feel that such ambiguity is the very attraction of literature. Nevertheless, the Standards demand that students analyze and determine even such subtly suggestive meanings of a text. This educational policy has not been positively appreciated among the humanities scholars. As is seen in Ender and Lynch’s survey of the humanities’ researchers’ various responses to the Standards in *PMLA* (2015), they often question the kind of reading that the Standards encourage students to practice, regarding it as the activity of forensically hunting for the “true meaning” (p. 541) of a text, thus rendering it a set of mechanical skills. From this perspective, this reading never fosters “creative dreamers” (Ender & Lynch, 2015, p. 544). However, creativity never emerges from mere dreaming or fantasizing. As neuroscientists argue, when one is trying to be creative, one needs to “concentrate but at the same time let the mind wander” (Kandel, 2012, p. 483), that is, one needs both the rigorousness of analytical thinking as well as free imagination. This is perhaps because concentration on the details of a target problem leads to the generation of numerous strands of thought—numerous brain circuits for processing information, which enable the brain to play freely and broadly with multiplying ideas. Thus, close and rigorous analysis produces a fertile ground for triggering the moment of creativity. I have observed that thinking analytically is the basic form of understanding; moreover, it is an important “*preparatory phase*” (Kandel, 2012, p. 483) for reaching a creative solution.

This analytical reading is closely tied to the workings of the left brain, because many scholars agree that logical analysis of details is the specific work of the left brain. Neuroscientist Kandel (2012) observes that “the left hemisphere is specialized for analytic organization, . . . being oriented to detail” (pp. 474-475); physicist Kaku (2015) stresses that “the left brain is more analytical and logical” (p. 37); and The Nobel Assembly at the Karolinska Institute (1981) states that “the left hemisphere is concerned with logical analysis of details.” This view of the left brain stems from Roger Sperry’s Nobel-winning research, which showed that the left and right brains have different, specific functions through experiments on so-called “split brain” patients whose connections between both brain hemispheres, termed *corpus callosum*, had been severed due to the surgical treatment for a special kind of epilepsy. Isolated,

each brain hemisphere revealed its own characteristic nature: while the left brain was analytical and logical, the right brain dynamically grasped complex relationships (Kaku, 2015; Kaufman et al., 2010; The Nobel Assembly, 1981). Therefore, if the left brain is thus specialized for logical analysis of details, analytical reading is most likely to activate the left brain and thereby enhance logical thinking. This possible result is important for students, because this thinking is the fundamental form of understanding, and students need it in order to minutely examine and accurately comprehend in order to appropriately deal with various concrete situations of today's globalizing world. Moreover, as we have seen, logical thinking is required for being creative. Although creativity is also indispensable for students to survive the present world, they first need to be analytical in order to be creative.

However, there is no doubt that logical thinking alone is not sufficient for students to be good citizens of the world. They need other abilities such as empathy and creativity, and these two abilities can be nurtured by two other kinds of reading—immersive reading and holistic reading. Now we will proceed to look at these two readings.

### **Immersive reading and Empathy**

Immersive reading is the immersion of oneself in fictional characters' inner thoughts. Perhaps when we open a book for the first time as young children, all of us read it in this way. Even as adults, many of us find immersion into the mental states of fictional characters to be the most enjoyable sort of reading. In fact, most students in my "Art and Neuroscience" course agree that when reading fiction, they primarily enjoy becoming one with characters and experiencing the fictional world as if it were another reality. Some of them even confessed that they became so deeply steeped in their novels that they continued to read all night without having dinner and without thinking about anything else. These experiences of both children and adults in reading fiction suggest that the immersive fiction reading is quite a natural type of behavior for us. It is indeed natural, because this reading is closely linked to our inherent tendency to empathize with others (Zunshine, 2006).

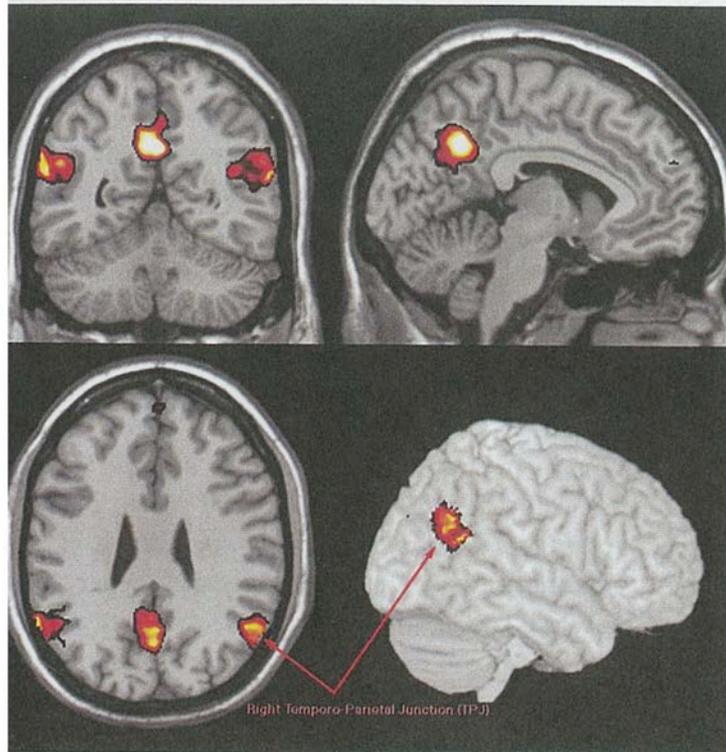


Figure 1: The Main brain region responsible for the theory of mind is the temporal-parietal junction. Source: Kandel, 2012

Immersion into others' inner thoughts is called "empathy." Neuroscientists argue that empathy is a unique, innate capability of human beings, demonstrating that human beings have indeed a neural mechanism for empathy, which they call "theory of mind" (e.g., Gallagher & Frith, 2003). As the figure 1 shows, the main part of the theory-of-mind network is located in the temporal-parietal junction (red) including the temples and the upper back part of the brain (Saxe & Kanwisher 2003/2005; Kandel, 2012). The brain region associated with the "theory of mind" becomes active when one empathizes with others' feelings, and it is also activated when one immerse oneself in fictional characters' feelings. Immersive fiction reading stems from the human instinct of empathy and it also arouses that impulse. Both are interactive.

There have been numerous studies of neuroscience and experimental psychology targeting the correlation between increase in empathy and reading literary fiction (e.g., Bal & Veltkamp, 2013; Kidd & Castano, 2013; Mar, Oatley & Peterson, 2009). For example, Tamir and his group (2015) offer a brain imaging sample that demonstrates that the brain area concerned with empathy becomes activated when one reads fiction and empathizes with characters. That is, the brain imaging in the figure 2 shows that when one reads the literary passages describing characters' mental states, the brain regions related to "theory of mind" become active. These regions (orange and green), technically called the dorsomedial prefrontal subnetwork, are the inner part of the front of the brain. Although the main brain region responsible for the "theory of mind" is the region around the temples and the upper back part of the brain, this inner part of the frontal area of the brain is also considered a part of the theory-of-mind mechanism. Moreover, the people undergoing the brain scanning and reading the passages containing characters' mental states also exhibit stronger morality and considerations for others in moral judgment tests than the people who do not read

such passages.

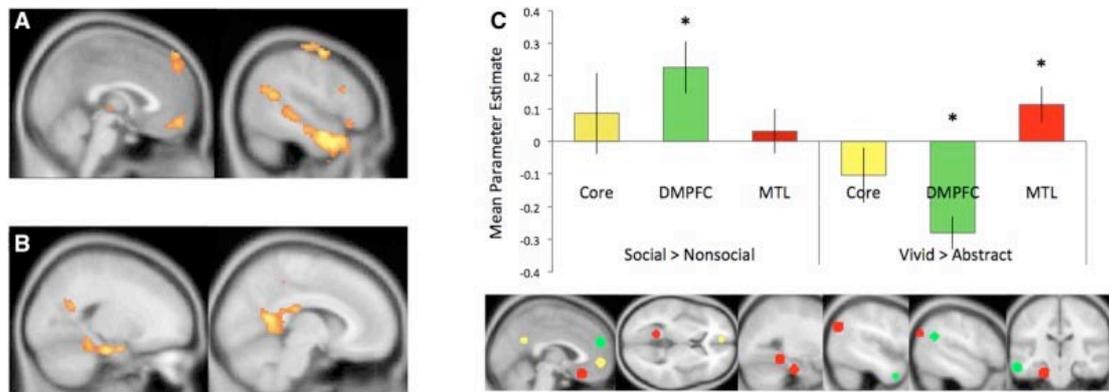


Figure 2: Immersive reading activates the brain regions involved in the theory of mind.  
Source: Tamir et al., 2015.

These two results of brain scanning and moral judgment tests suggest that immersive fiction reading can stimulate the brain region involved in the “theory of mind” and enhance empathy with others. Given these findings, we will see that immersive reading, like analytical reading, is important for students to successfully survive the globalizing world, because immersion into fiction can foster the ability to understand other cultures, thereby aiding in living harmoniously with them.

### Holistic reading and Creativity

Now we will look at the third, holistic reading. In contrast to analytical reading that focuses on details and the logicity of a text, holistic reading embraces whole fictional worlds that might contain conflicting ideas and messages. Indeed, literature often shows contradiction and inconsistency, which many readers consider as its attraction. Connotations and metaphors produce such an intriguingly ambiguous aspect of literature or more concretely the coexistence of multiple, often conflicting meanings, but here I will focus on a whole literary text rather than on individual words and expressions. I will take up a major American novel, Mark Twain’s *Adventures of Huckleberry Finn*, to show that the whole world of a literary text often conveys opposing ideas and messages.

*Adventures of Huckleberry Finn* can be read both as a story of freedom and as a story of the impossibility of freedom. The novel’s hero Huck—Huck is a nickname of Huckleberry Finn—is an outcast child: he escapes from society to enjoy freedom on the raft going down the Mississippi River. Nevertheless, Huck is also always involved in the social world haunted by racism, class inequality, and the clash of opposing parties. Huck’s quest for freedom comes to a climax when he becomes willing to break social rules by deciding to “go to hell” (p.168) to save the fugitive slave Jim. However, after this climactic scene, the reader finds that Jim’s owner, not Huck, sets Jim free: Huck cannot actually rebel against society to save Jim. Thus, the whole novel describes both Huck’s quest for freedom and its impossibility. An analytical reading would focus on the details of the particular phase such as Huck’s freedom and ignore other parts contradicting the theme of freedom. However, a holistic reading

grasps the whole world of the novel and entertains the coexistence of logically incompatible stories in it.

This holistic reading can activate the right brain, because, since Sperry's demonstration of the isolated right brain's peculiar world wherein, as we have seen, the complex aspects of things are dynamically grasped, it has been widely recognized among neuroscientists that the right brain is also holistic, and broadly associative, and capable of freely linking various, apparently unrelated ideas (e. g., Kandel, 2012; Kaufman et al., 2010). Mark Jung-Beeman (2005) forcefully articulates this view by focusing on the different cellular forms of two brain hemispheres (Figure 3). Jung-Beeman maintains that the left brain is highly sensitive to narrowly focused semantic areas, whereas the right brain concerns itself with large, diffusive, and overlapping spheres of information (a, b). This is because the neurons (brain cells) of the two hemispheres have different shapes: neurons in the right brain possess longer dendritic branches (receivers) and more synapses (pathways) of incoming information than those of the left brain (c, d). This enables the right brain to "receive a broader and more overlapping field of inputs" (Jung-Beeman, 2005, p. 514) than the left brain.

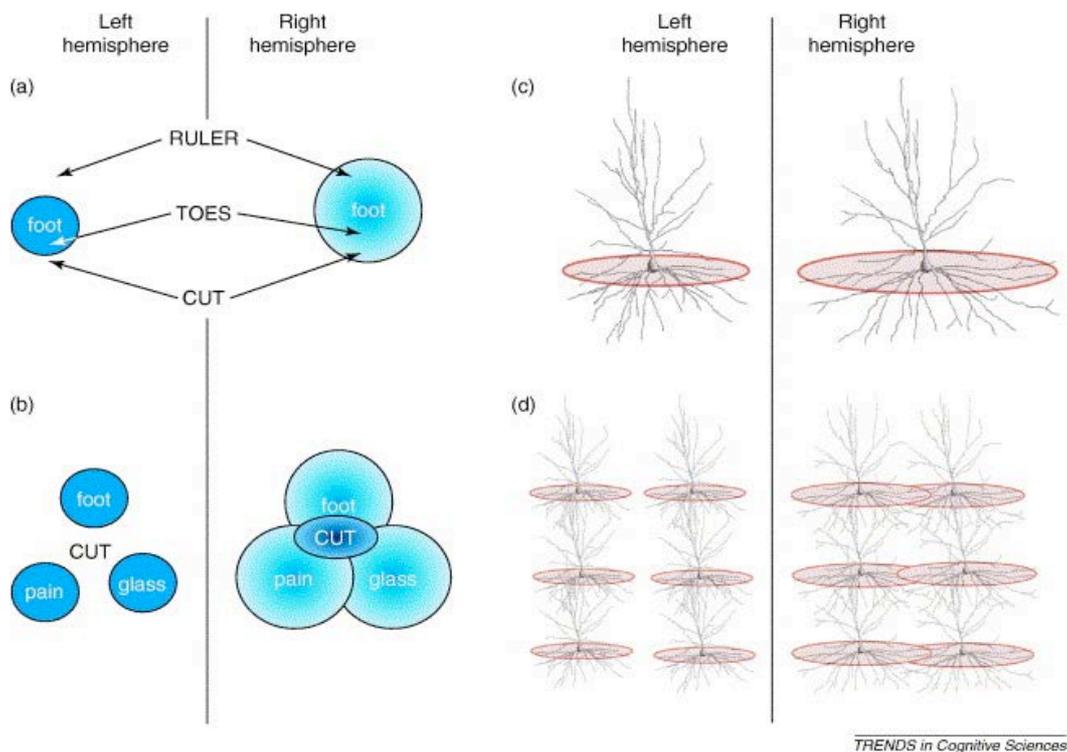


Figure 3: Neurons of two brain hemispheres have different shapes.  
Source: Jung-Beeman, 2005

It is this right brain with its broadly associative power that can facilitate the moment of creativity (Kandel, 2012; Kozbelt et al., 2010). In fact, the figures 4 and 5 show that the right brain becomes active when one gains insight. The graph in figure 4 indicates that the part of the right brain marked in red and yellow, which is termed the right anterior superior temporal gyrus, is more greatly activated at the moment of insight than at the moment of non-insight (Bowden et al., 2005; Kandel, 2012). The red line in the graph jumps at the moment of insight; yet the blue line, indicating the right brain's activity when it does not gain any insight, shows no significant change.

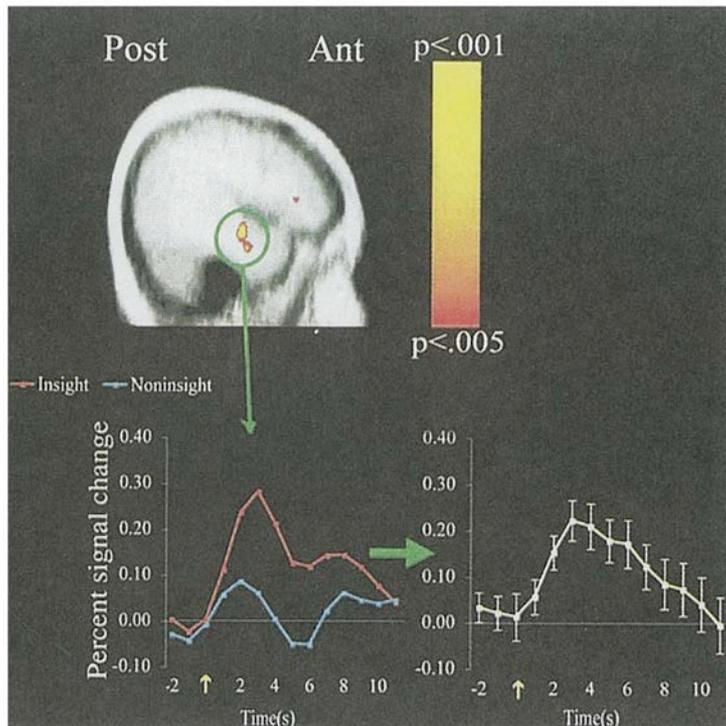


Figure 4: The right brain at the moment of creative insight (1)  
Source: Kandel, 2012

The figure 5 also signifies that the same part of the right brain shows high-frequency activity—that is, a strong response—when one gains insight (Jung-Beeman et al., 2004; Kandel, 2012; Kounios & Beeman, 2009). Thus, the right brain’s power to make unusual combinations of widely distant, even incompatible ideas leads to the emergence of creativity, and if this is the case, holistic reading can activate the right brain and increase creativity, because it also entertains the combinations of incompatible meanings that permeates the whole fictional world, playing with “Janusian thinking” (Ward & Kolomyts, 2010, p. 101).

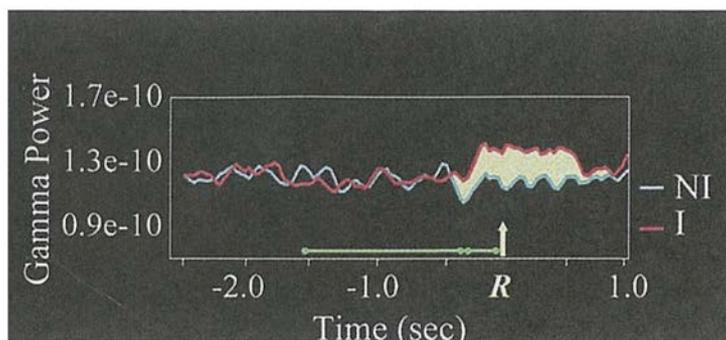


Figure 5: The right brain at the moment of creative insight (2)  
Source: Kandel, 2012

Thus, by reading literary texts holistically, students can foster the ability to think creatively. No one denies that creativity is as important for students as logical thinking and empathy, or that it may be even more urgently needed than the other two

abilities. In the face of the increasing unpredictability of the present world, students need to be able to think flexibly and creatively and to solve diverse, unfamiliar problems with unconventional combinations of ideas.

However, there is no doubt that holistic reading as a source of creativity is more difficult to practice as compared to the other two readings. Immersive reading may be the easiest task among the three readings, because we are inherently inclined to empathize with others. Moreover, analytical reading is not hard to practice. Analysis is a basic skill at comprehension that can be systematically acquired in school. On the other hand, the ability to grasp a whole fictional universe including numerous inconsistencies cannot be obtained by merely following an instinct or through mechanical training. Holistic reading first conducts rigorous analysis of the details of a literary text, thereby engendering myriad possible interpretations, and then, far from disregarding the readings that contradict the apparent main theme of a text, enjoys navigating through the vast sea of multiplying and conflicting meanings covering the whole fictional field. This reading can be said to be an extremely skillful, expert reading. However, this reading can be achieved with the help of analytical and immersive readings. With the increase of empathy with characters, one desires and endeavors to understand the fictional world more deeply. Carrying out a thorough, logical analysis would lead to the generation of numerous possible explanations of a text and thus to the full enjoyment of the complexity of the whole literary work. Therefore, what is required in teaching the three readings that I have shown so far is to connect them together. Even if the most desirable result is for students to achieve the holistic, expert reading and thereby gain the ability to think creatively, the most effective way to enable them to attain that goal is to teach them to read the same literary text in three different ways, to become a simultaneously analytical, immersive, and holistic reader.

## **Conclusion**

I have proffered the possibility that three types of readings of literary texts, that is, analytical reading, immersive reading, and holistic reading, can activate the brain regions related to logic (the left brain), empathy (theory of mind), and creativity (the right brain), and thereby increase these three abilities. From this perspective, teaching literature in the classroom proves a useful and productive educational method: by reading literary texts, students can gain the abilities crucial for a good citizen of the world. As I have observed in the introduction, literature, or more generally, the humanities and the arts, are vanishing in curricula both in Japan and abroad. However, as I have explored with the help of the arguments and data from neuroscience, literature can have an important educational value. Far from being cut away, literature should be given more importance in the classroom.

Regarding future directions of this research, it will be necessary to obtain more evidence for the correlation between reading literary texts and the enhancement of logical thinking, empathy, and creativity. I have argued that reading literary texts can improve these three abilities. Although in order to strengthen my argument, I have employed evidence and data from the studies of neuroscience, it will also be necessary to gain evidence for myself by conducting psychological tests and interviewing participants, and, if possible, by performing fMRI (functional magnetic resonance instrument) experiments and examining the brain images of participants.

Moreover, it will be necessary to explore more fully the particular relation between reading fiction and creativity. There are numerous neuroscience investigations into the link between reading fiction and the increase of empathy, whereas studies on the causal relation between reading literary texts and the activation of the right brain as a source of creativity are very few. Given this trend, I will focus mainly on the possibility that reading fiction can stimulate the right brain to produce the moment of creativity in order to enrich this research field that has not yet been sufficiently explored.

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