1

Some Game Changers

The Brain, Intelligence, and the Role of Metacognition

In a time of drastic change it is the learners who inherit the future. The learned usually find themselves equipped to live in a world that no longer exists.

—Eric Hoffer (2006)

We now face a widely acknowledged need for significant changes in education. Almost every educational system in every developed country is going through some sort of process of evaluation and reformation. There are two primary reasons for this need to change our educational culture. The first is that the world around us is rapidly changing, with globalization and evolving telecommunications technology creating more and more competition for our industry (Friedman, 2005). To maintain our position in this globalized world (and to continue to support the development of emerging nations), we must remain the technological innovators we were in the last century. To do this, we must have a steady supply of talented young people interested in careers supporting the business and technology of the future. This, in turn, requires an education system that produces students who can think and learn.

The second reason for a change in education is that our view of the human brain and how it functions has led to a new view of human intelligence (National Research Council, 2000). With the change in our understanding of how people learn comes a revision of the idea of intelligence. Perhaps the most revealing recent discovery about the brain is that it is not the immutable organ it was thought to be during the first three quarters of the 20th century.

The brain is changeable and trainable. It changes in two important ways—new brain cells and new synapses can be formed by using it thoughtfully, and its blood supply is strengthened through physical exercise. This ability of the brain to change its structure is often referred to as *plasticity.* Each human brain is plastic; it is in a constant process of reforming itself. As our educational practices come to accommodate this new understanding of the nature of the brain, we will increasingly avoid the unsuccessful practices of the past. By teaching our children how to think and how to understand their own thought processes, we place them in control of their learning from the inside out. The student comes to know how he learns best and is no longer simply at the mercy of an external force, the teacher, directing his learning on the basis of the teacher's best guess about how the student learns most effectively.

We have a long history of teachers making their best guesses about how students learn. There was a time when simple, single measures such as IQ tests and various attainment tests were used to predict the future academic success of children. Students were streamed at an early age into more or less academically complex programs based on those test results. The high-scoring individuals were groomed for university and the professions, while the lower-scoring ones were pointed toward trades or semiskilled careers.

We have many examples of individuals who did poorly at some early point in their educational lives using the standard testing and evaluation procedures but have achieved great things in their adult lives. In a BBC Newsround interview in 2004, Richard Branson described himself as being at the bottom of the class when he eventually left school at the age of 15. He has revealed that he suffers from dyslexia but actually finds this to be an advantage in his dealings with the business world. Because he understands how he thinks, and hence has insight into both his strengths and weaknesses, he is able to judge the language of advertising, for example, ensuring that if he can understand it, then so can anyone. He has learned how to turn an apparent deficit into a real asset. His personal history demonstrates the problems inherent in a system that does not explore deeply

enough the varieties of types of learning and the flexibility and potential of the human mind.

How many students have reached the age of 15 without understanding how they think and learn, simply because this was never taught to them? These students submit to their teachers' best guesses about how they learn, rather than growing in their own understanding and independence as lifelong learners. Too often they leave our schools because our schools have given up on them. The school has provided a rigid, prescribed curriculum where attainment is relentlessly tested for *all* students in the same manner in order to ensure standardization and comparability for accountability measures.

Our schools need to give students the power to explore their unique ways of thinking and help them discover how to make links, how to integrate new learning with things already known, how to create complex and dynamic mental maps, and how to make connections between the emotional and visual areas of their brains. Brains are not standardized. The brain you had when you picked up this book is subtly different from the brain you have now.

It is essential to remain sensitive to the balance between teaching a body of knowledge and developing the skills and attitudes needed to use that knowledge effectively and creatively. Curricula must reflect the importance of developing the habits of skillful thinking, as must training programs designed to make our young people ready for work. If the focus of education is on the acquisition of factual knowledge rather than on the ability to organize and transform knowledge through the application of skillful thinking, we risk developing a generation of "learned" students whose knowledge is inert and may rapidly become irrelevant.

It is important for all involved—students, teachers, and parents—to be aware of these new viewpoints on intelligence because

1. individuals can improve their own processes of learning and thinking;
2. skillful thinking and learning make knowledge more useful and transportable; and
3. we can initiate a lifelong process of continual development of the brain.

The continued prosperity of our society depends on our ability to think creatively and flexibly. These understandings about learning need to underpin our endeavors in any context—the school, the workplace, and the community at large.

New standards of learning are being developed worldwide to accommodate globalization and the changing view of how people think and learn. Often these standards emphasize the vital role of thinking skills. For example, the International Baccalaureate (IB) curriculum has an underlying philosophy to promote the education of the whole person.

> The IB approach to knowledge and education may be defined as "liberal education for human rationality." The primary goal of this form of education is to develop critical thinkers since the moral, social and political issues of the world often engage emotions and passions as well as intellect. Rational thinking is considered necessary to understand the difference between understanding, belief, feeling and truth. Opening up and developing the mind is the key to developing the powers of intelligence and rational thought. (Sobulis, 2005, p. 2)

Implications of the New View of Intelligence

The model of education most current teachers were taught under was developed at the beginning of the 20th century and was intended to prepare workers for the Industrial Revolution. We now need to prepare people for the 21st century—for the Information Age. This is a time that values deep conceptual understanding and innovative thinking.

This older view of education is based on the idea of a fixed brain—the concept that an individual inherits a fixed level of intellect from the genetic disposition of his or her parents. Eric Jensen puts this idea decisively to rest:

> It turns out that the "fixed brain" theory is not just dead wrong, but—embarrassingly—it may be doing a great deal of harm. The human brain is so malleable that it can be fixed at artificially low levels by giving it a diet of status quo. (Jensen, 2006, p. x)

The fixed brain idea leads to the notion that each student is, in some sense, an empty vessel, to be filled with knowledge from various trusted sources, and thus suggests that teachers should encourage classrooms in which students are passive absorbers of information. A more constructivist view of education assumes the student will create meaning through active processes of engagement, questioning,

and effective thinking. The teacher in this classroom is neither the source nor the viaduct for all information. The teacher is the facilitator, creating an environment within which students can engage with knowledge at a complex level, manipulating it, transferring it, and structuring a conceptual framework within which new information can be integrated.

This can make teaching a risky business, because it adds a level of unpredictability. Experienced teachers are aware that the taught curriculum does not always match the learned curriculum and may sometimes wonder if the students who wrote the essays being graded had actually been in the same classroom that the teacher had been working with all term.

Whether we are talking about the student in a classroom learning about physics, a worker in an industrial setting mastering a new process, or a child at home trying to come to an understanding about a family dispute, we are dealing with human beings learning new things. This book grows out of two fundamental ideas about learning, both well established by research and validated by practice in formal and informal learning environments.

The first is that *we learn best when we are actively engaged in the process of our own learning*. In emphasizing the importance of engagement in learning, we have in mind not only the experience of hands-on or inquiry-based activities, but more importantly the direct involvement of the learner in *thinking about his or her own thought processes*—that is, metacognition.[1] In order to discuss metacognition, it is necessary to have a language and a structure to describe the various facets of cognition. We will introduce the tools needed to understand and communicate about thinking.

The second fundamental idea is that *individuals are best equipped to approach problems of any sort when they embrace those habits of mind that foster skillful and innovative thinking*.[2] The ability to think skillfully and to reflect on one's thinking is not an innate human characteristic but rather a proficiency that needs to be taught explicitly. We will explore effective techniques for integrating the teaching of thinking into all educational activities, be they in the classroom, on the playground, at home, or in the workplace. In these days of standardized testing, it is worth noting that not only is learning to think skillfully an important life skill, it is a definite asset in taking forced-choice tests.

It is our intention here to encourage the understanding and implementation of these fundamental ideas across the educational enterprise by encouraging parents, school administrators, teachers,

and students to actively think about how they think, teach, and learn and, in that process, to develop and use sound habits of mind.

This book is intended for all educators, administrators as well as teachers, because we believe that skillful thinking transcends the disciplines and classrooms. Lessons learned about how to think in Grade 2 need to be transferred to Grade 3; lessons about thinking in social studies need to be transferable to science. Skillful thinking should be central to every faculty meeting and to every meeting, formal or informal, with parents. In other words, skillful thinking needs to permeate every activity and relationship that is a part of the educational enterprise. It needs to be a part of the culture. A school is also a workplace and a place closely tied to the homes of the children within its walls. Each stakeholder, within the school and at home, will better contribute to the goals of education when skillful thinking underlies every practice.

An essential question for the reader to bear in mind is "What do you want your students to be able to do years after they leave your classroom, school, or home?" In asking this question at conferences and workshops, we find a remarkably consistent set of answers. The valued outcomes of education are the ability to get along with other people, to be self-sustaining, to solve problems, and to continue learning. All of these attributes rest on a foundation of thinking skills.

What we have learned about how people learn also extends well beyond the school environment. While our primary focus is upon the educational environment, it is worth mentioning that if a workplace is to be a dynamic, viable enterprise in a volatile and challenging environment, it is essential that participants at all levels be engaged and understand how learning best takes place. As we strive to make our students ready for work, we would be well advised to keep this in mind. The skills that served us well 10 years ago will no longer suffice. The workplaces that survive and prosper will be those in which skillful, metacognitive thinking underlies the way things are done. Similarly, democratic societies depend for their success on an informed population able to thoughtfully participate in civic processes. The blind acceptance of clichés and jingoistic phrases and the rapid spread of rumors and misinformation can only take place when people have not brought skillful thinking to bear on the things they hear and read.

Perhaps the most important notion to emerge from the shifting paradigm in education is one emphasized repeatedly by Art Costa: "If we treat students as intelligent people, they will become more intelligent people."

THINKING DEEPER: DISCUSSION QUESTIONS

1. During your career as an educator, what significant revisions of education have you seen? You might consider revisions of the curriculum, assessment procedures, and teaching strategies. How would you assess the success of each?
2. Do you know anyone from your own experience whose life path did not follow that which teachers might have reasonably expected? Did things turn out better or worse than expected?
3. What do you want your students to be able to do when they have finished their formal schooling? Identify the three most important goals, and consider where you find evidence of explicit teaching directed toward them in your curriculum.

Endnotes

1. The term *metacognition* is used in many different ways. We use it to mean an individual's conscious thinking about cognition in a constructive manner, that is, thinking about our thought processes with the intention of understanding and improving them.

2. The term *habits of mind* is used in many different contexts. We use it here in two ways. First, in a general sense, as those cognitive dispositions that enables skillful and innovative thinking and second, in reference to a specific body of knowledge developed by Arthur Costa and Bena Kallick.