The 5 Elements of Effective Thinking

Edward B. Burger
Michael Starbird

The 5 Elements of Effective Thinking

Edward B. Burger and Michael Starbird

PRINCETON UNIVERSITY PRESS
PRINCETON AND OXFORD

Published by Princeton University Press, 41 William Street, Princeton, New Jersey 08540
In the United Kingdom: Princeton University Press, 6 Oxford Street, Woodstock, Oxfordshire OX20 1TW

press.princeton.edu

Library of Congress Cataloging-in-Publication Data

Burger, Edward B., 1963–
The 5 elements of effective thinking / Edward B. Burger and Michael Starbird.
p. cm.
ISBN 978-0-691-15666-8 (hardcover : alk. paper) 1. Thought and thinking. I. Starbird, Michael P. II. Title. III. Title: Five elements of effective thinking.
BF441.B9247 2012
153.4'2—dc23 2012014372

British Library Cataloging-in-Publication Data is available

This book has been composed in AppleSymbols, Baskerville 10 Pro, John Sans Heavy Pro, John Sans Text Pro

Printed on acid-free paper. ∞
Printed in the United States of America
10 9 8 7 6 5 4 3 2 1

Contents

Preface
Thinking Makes the Difference

I think, therefore I am.

—René Descartes

The root of success in everything, from academics to business to leadership to personal relationships and everything else, is thinking—whether it's thinking disguised as intuition or as good values or as decision making or problem solving or creativity, it's all thinking.

So it is not a surprise that thinking more effectively is the key to success for students, professionals, business leaders, artists, writers, politicians, and all of us living our everyday lives. Doing anything better requires *effective thinking*—that is, coming up with more imaginative ideas, facing complicated problems, finding new ways to solve them, becoming aware of hidden possibilities, and then taking action.

What *is* a surprise is that the basic methods for thinking more clearly, more innovatively, more effectively are fundamentally the same in all areas of life—in school, in business, in the arts, in personal

life, in sports, in everything. The other surprise is that those methods of effective thinking can be described, taught, and learned. They are not inborn gifts of a special few. They are not so esoteric that only geniuses can master them. All of us can learn them and use them, and that is what this book is about.

We, the authors, did not begin our careers with the goal of discovering strategies of effective thinking. We began our careers teaching the abstract ideas of mathematics. But over the years we came to realize that what actually makes a difference are a few habits of thinking that people can apply in everyday life—methods that are not mathematical at all. This book offers thought-provoking ways to provoke thought. These strategies have inspired many people in all walks of life to become more successful, and we hope that you too will create success through effective thinking.

Introduction
Elements of Effective Thinking, Learning, and Creating

I know quite certainly that I myself have no special talent. Curiosity, obsession and dogged endurance, combined with self-criticism, have brought me to my ideas.

—Albert Einstein

A wondrously romantic belief is that brilliant students are born brilliant and brilliant thinkers magically produce brilliant ideas: *A+*, the star student aces the exam; *click*, Edison invents the lightbulb; *liftoff*, the Wright brothers soar into the sky; *abracadabra*, J. K. Rowling apparates Harry Potter; *yea*, the Founding Fathers resolve the Bill of Rights; *whoosh*, Ralph Lauren turns heads on fashion's runways; *eureka*, Einstein teases his hair and relativity falls out. We can all marvel at these fanciful visions of leaps of genius, but we should not be fooled into believing that they're reality. Brilliant students and brilliant innovators create their own victories by practicing habits of thinking that inevitably carry them step-by-step to works of greatness. No leaps are involved—a few basic strategies of

thought can lead to effective learning, understanding, and innovation. More importantly, *you* yourself can master and apply those strategies. This book presents practical, proven methods of effective thinking and creativity that lead to inevitable success in life.

We, the authors, are teachers. We have taught hundreds of thousands of students and adults how to think more effectively. Countless times we have encountered individuals with potential and watched the drama of life's transformation unfold—or not. Anne and Adam struggle with ideas, understand the basics, learn from mistakes, ask questions—and thrive. Fiona and Frank, with the same native talent, start at the same place, but they memorize without understanding, fear error, avoid uncertainty—and do not succeed. This book is about what makes the difference.

Education does not stop with the end of your formal schooling. Even if your formal school days are long past, you are still a student and, hopefully, will always be one. You can choose to learn habits of thought that will help you to meet the ongoing challenges of life—personal, professional, and societal.

Imagine Marie Curie, Albert Einstein, and William Shakespeare as students. Today we know them as famous geniuses, but when they were in school, they didn't walk around wearing a "FUTURE GENIUS" button. Instead, they just looked at the world differently by applying habits of mind that allowed them

of thousands of lifelong learners. So when we offer illustrations from our school experiences, we hope that you will view them literally if you are in the classroom (as either a student or a teacher), or metaphorically if you now find yourself outside the ivy-covered walls of the academy. When Aesop wrote "The Tortoise and the Hare," he was not aiming exclusively at the turtle market. Throughout life we frequently face challenges analogous to taking tests, earning grades, and understanding course material. Instead of taking formal tests, we encounter daunting questions from employers or even family and friends; instead of earning grades, we are judged in the workplace and in social settings; instead of understanding course material, we regularly need to master new skills and absorb new knowledge to keep up with a rapidly changing world. All our stories have direct relevance to you and your life.

Five elements of thinking and learning

The surprising fact is that just a few learnable strategies of thinking can make you more effective in the classroom, the boardroom, and the living room. You can personally *choose* to become more successful by adopting five learnable habits, which, in this book, we not only explain in detail but also make concrete and practical. Here in this section we briefly introduce those important habits to come.

Understand deeply:

Don't face complex issues head-on; first understand simple ideas deeply. Clear the clutter and expose what is really important. Be brutally honest about what you know and don't know. Then see what's missing, identify the gaps, and fill them in. Let go of bias, prejudice, and preconceived notions. There are degrees to understanding (it's not just a yes-or-no proposition) and you can always heighten yours. Rock-solid understanding is the foundation for success.

Make mistakes:

Fail to succeed. Intentionally get it wrong to inevitably get it even more right. Mistakes are great teachers—they highlight unforeseen opportunities and holes in your understanding. They also show you which way to turn next, and they ignite your imagination.

Raise questions:

Constantly create questions to clarify and extend your understanding. What's the real question? Working on the wrong questions can waste a lifetime. Ideas are in the air—the right questions will bring them out and help you see connections that otherwise would have been invisible.

Follow the flow of ideas:

Look back to see where ideas came from and then look ahead to discover where those ideas may lead. A

new idea is a beginning, not an end. Ideas are rare—milk them. Following the consequences of small ideas can result in big payoffs.

These four building blocks are basic elements for effective thinking, and we devised an easy way for you to remember them. You only need to recall the classical elements that were once believed to be the essential parts of all nature and matter. Those elements, which predated Socrates and influenced Renaissance culture and thought, are Earth, Fire, Air, and Water. So to help trigger your memory and enable you to apply these techniques, we associate each classical element with one of our strategies for effective thinking, learning, and creating:

 Earth ↔ Understand deeply

 Fire ↔ Make mistakes

 Air ↔ Raise questions

 Water ↔ Follow the flow of ideas

By mastering these strategies, you can and will *change*. The classical elements of nature included a fifth special element—the *quintessential element*—that was the changeless matter from which all the heavens were made. Ironically, here in our context of thinking and learning, the quintessential element is *change*.

 The Quintessential Element ↔ Change

Change:

The unchanging element is change—by mastering the first four elements, you can change the way you think and learn. You can always improve, grow, and extract more out of your education, yourself, and the way you live your life. Change is the universal constant that allows you to get the most out of living and learning.

In any movie, play, or literary work, media scholars tell us how to determine who truly is the main character of the story—it's the individual who, by the end, has changed the most. Your life is an exciting journey. When you embrace change, you put yourself front and center by intentionally deciding in which direction you wish your life's drama to unfold. In doing so, *you* become the hero in your own life's adventure.

The chapters ahead unpack the previous sound-bite sentences by more fully describing our five elements of effective thinking. Exercises, action items, illustrations, and stories in each chapter turn these elements into a practical way to vastly improve individuals and organizations.

The elements and exercises provide you with an intellectual GPS to help you navigate through life. We have seen countless inspirational examples of people who flourish well beyond their own expectations. These stories feed our optimistic belief that we

all are capable of living our lives far more successfully than we generally do. Our hope is that students will find these elements transformative; instructors will use these lessons to enrich their classes; leaders of society, whether in business, science, politics, or the arts, will employ these strategies to become more innovative; and lifelong learners will apply these principles to better live as ever-evolving students of the world.

We encourage you to revisit chapters again and again—different elements will resonate with you at different times. The more you absorb and practice these elements of thinking, the more you will get out of them.

At the end of this book you will find an invitation to share your own stories of effective thinking at www.elementsofthinking.com. We look forward to hearing from you.

1. Grounding Your Thinking
Understand Deeply

He never did a thing so very bad.
He don't know why he isn't quite as good
As anyone.

—From "The Death of the Hired Man" by Robert Frost

Silas felt the nervous excitement that all students feel as their professor returns graded exams. When Silas saw the red "58%" on the top of his test paper, he was frustrated, annoyed, and bewildered. "I really knew the stuff on the test. I just made a bunch of stupid little mistakes. I really knew it. Really." And he really believed he knew it. Really. Sadly, such unpleasant surprises do not necessarily end after we receive our diplomas. Many people spend their entire careers confidently (and erroneously) thinking they know more and deserve more than their yearly evaluations, salaries, and success seem to reflect.

Understanding is not a yes-or-no proposition; it's not an on-or-off switch. Silas spent hours studying for his test. But he spent that time memorizing facts

rather than building a deep understanding. He would have earned a higher grade had he invested the same amount of time mastering the fundamentals, identifying essential themes, attaching each idea to that core structure, and, finally, imagining what surrounds or extends the material he was studying. Instead, Silas's strategy was like that of a well-intentioned elementary school student who meticulously memorizes the mechanics of adding two-digit numbers but has no idea why the process works, and, as a result, finds adding three-digit numbers as alien as visiting another planet. Silas's understanding was, at best, thin and fragile. Even tiny variations threw him, because he viewed his job as pinning down a certain number of isolated facts rather than understanding the meaning and connections of the ideas.

When you learn anything, go for depth and make it rock solid. If you learn a piece of music for the piano, then, instead of just memorizing finger movements, learn to hear each note and understand the structure of the piece. Ask yourself, "Can I play the notes of the right hand while just humming the notes of the left hand?" If you study the Civil War, rather than memorizing some highlights—Lincoln was president; Lee was a general; slavery played a role—you can try to understand the background, competing forces, and evolving social values that ignited the bloody conflict. When you make political decisions, instead of focusing

on a candidate's good looks and fifteen-second sound bites, you can objectively learn about the issues and develop your own reasoned opinions.

You *can* understand anything better than you currently do. Setting a higher standard for yourself for what you mean by *understanding* can revolutionize how you perceive the world. The following steps illustrate why a deep understanding is essential to a solid foundation for future thinking and learning.

Understand simple things deeply

The most fundamental ideas in any subject can be understood with ever-increasing depth. Professional tennis players watch the ball; mathematicians understand a nuanced notion of number; successful students continue to improve their mastery of the concepts from previous chapters and courses as they move toward the more advanced material on the horizon; successful people regularly focus on the core purpose of their profession or life. True experts continually deepen their mastery of the basics.

Trumpeting understanding through a note-worthy lesson. Tony Plog is an internationally acclaimed trumpet virtuoso, composer, and teacher. A few years ago we had the opportunity to observe him conducting a master class for accomplished soloists. During the class,

each student played a portion of his or her selected virtuosic piece. They played wonderfully. Tony listened politely and always started his comments, "Very good, very good. That is a challenging piece, isn't it?" As expected, he proceeded to give the students advice about how the piece could be played more beautifully, offering suggestions about physical technique and musicality. No surprise. But then he shifted gears.

He asked the students to play a very easy warm-up exercise that any beginning trumpet player might be given. They played the handful of simple notes, which sounded childish compared to the dramatically fast, high notes from the earlier, more sophisticated pieces. After they played the simple phrase, Tony, for the first time during the lesson, picked up the trumpet. He played that same phrase, but when he played it, it was not childish. It was exquisite. Each note was a rich, delightful sound. He gave the small phrase a delicate shape, revealing a flowing sense of dynamics that enabled us to hear meaning in those simple notes. The students' attempts did not come close—the contrast was astounding. The fundamental difference between the true master and the talented students clearly occurred at a far more basic level than in the intricacies of complex pieces. Tony explained that mastering an efficient, nuanced performance of simple pieces allows one to play spectacularly difficult pieces with greater control and artistry.

two graphs. But if the quantity level is to the left of that intersection, then the price for demand is higher than the price for supply. I don't know what that means. (Note that this student successfully identified a lack of understanding of a basic idea, namely, what the supply and demand graphs represent. He now knows what he should work on first. A firm understanding of that basic idea will allow him to progress further and faster in the future.)

. . . UNDERSTAND DEEPLY ◀

The whole of science is merely a refinement of everyday thinking.

—Albert Einstein

A commonsense approach leads to the core. Many of the most complicated, subtle, and profound ideas arise from looking unmercifully clearly at simple, everyday experiences. Calculus is one of the most influential concepts in history. It has fundamentally changed the way we experience life today—a wide range of technological innovations, from space exploration to plasma TVs, computers, and cell phones, would not exist without calculus. And calculus is based on thinking deeply about simple, everyday motion—like an apple falling from a tree.

In 1665, England suffered an epidemic of bubonic plague. Cambridge University was closed to stem the dreaded disease's spread, so Isaac Newton and the other students were sent home. Newton spent the next two years on his aunt's farm, during which time he formulated the fundamental ideas of calculus and the laws of physics. The famous story about Newton sitting under an apple tree when an apple fell on his head, giving him the idea of universal gravitation and calculus, may be almost literally true. Thinking about the speed of a falling apple can generate the idea of the *derivative*—the profound extension of the basic notion that speed equals distance divided by time. Thinking about how far the apple would fall if you knew its speed at each instant leads to the idea of the *integral*—the abstraction that distance equals speed multiplied by time.

The grandest, most cosmic ideas, such as how the planets move, arise from thinking deeply about an apple beaning Newton. Newton described the universe—the behavior of the sun, planets, and distant stars—using the same laws that describe everyday occurrences like apples falling from trees. The simple and familiar hold the secrets of the complex and unknown. The depth with which you master the basics influences how well you understand everything you learn after that.

Today, when math teachers are asked what makes calculus so difficult to teach, most reply, "My students