

A Mind For Numbers Book Summary, by Barbara Oakley PhD

by Allen Cheng

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1-Page Summary of A Mind For Numbers

Introduction (Open the Door)

A Mind for Numbers is a book that will help you improve your learning skills. It will provide tools to make it easier to learn math and science, as well as other subjects. Barbara Oakley's approach is different from others because she focuses on teaching you how to train your mind so that it can be better at solving problems. You'll also discover that when the analytical side of your mind rests, it comes up with new ideas for solving problems while you're asleep or doing other activities. This applies both to social issues and math equations.

Sometimes, when you're trying to understand something that seems hard to grasp, it's tempting to keep reading and re-reading the same thing over and over again in hopes of making sense out of it. However, Oakley believes this is inefficient as well as ineffective because people tend to forget what they've read a few minutes after they finish reading it. Her methods are simple techniques used by professionals all over the world that can change the way you learn - therefore changing your life.

The truth is, the brain is designed to do complex mental calculations. You're doing that unconsciously when you catch a ball or balance on a ladder. Just apply Oakley's proven techniques and retrain your brain.

Learning Is Creating

Have you ever said to yourself, "Today is the day I'll finally learn this math concept"? Then you spend hours trying to understand it, but nothing sinks in. According to Oakley, part of the problem is that we try too hard — which sets up mental blocks that distract us from learning.

Instead, you should take a casual approach to studying. Glance through the material and walk yourself through it casually before reading it in more depth. Then allow yourself to step away from the material for a while before going back to read it again. This helps your brain organize thoughts as well as create stronger neural pathways when you revisit the information later on.

This technique allows your brain to process material in two different types of networks: focused mode and diffuse mode. Focused-mode thinking is a function of the prefrontal cortex, and it uses rational and analytical approaches to solve problems directly. Diffuse-mode thinking is a function of multiple networks in your brain, and it employs a big-picture perspective to help you gain new insight on a problem. When these two modes work together, the brain moves complex problems back and forth between the two hemispheres and comes up with creative solutions. To put this technique into practice, start in focused mode by focusing all your attention on solving the problem at hand using rational techniques like math or science. Then allow yourself time for distraction so that you can let go of that problem temporarily while you daydream about other things related to it but not actually related to solving that specific problem directly (for example, if you're working out how many people would fit into an airplane's seats if they were stacked one atop another). As your mind wanders from this seemingly unrelated topic back towards solving the original problem again (using math or science), ideas will come more easily because connections have been made between previously unconnected neural pathways in both hemispheres of your brain — allowing those ideas to be generated more efficiently than before.

It is said that both Thomas Edison and Salvador Dali would take a nap while holding something in their hands. It dropped when they fell asleep, startling them awake with fragments of diffuse-mode thinking still swirling in their minds. This could be applied to the problem at hand when they switched back to focused mode.

Another important technique for approaching difficult problems is chunking. Chunking helps you organize information and makes it easier to remember. For example, when you decide to cook dinner, your mind automatically organizes all the necessary tasks that go into cooking a meal.

When we chunk information, we break it down into smaller pieces. We can then remember the smaller pieces and put them together to form a larger picture. When you're working with math or science, focus on the information that you want to chunk. Understand how each piece of that information works so you can easily put it back together again later on when needed. You should also get context for what's being taught because that will help you determine when and how to use this new knowledge in your life. The more chunks of information we have stored away in our minds, the easier it is for us to recognize problems as they arise and identify patterns between different similar problems—and thereby build expertise faster than if we were only relying on rote memorization techniques alone.

Tools, Tips, and Tricks

As with anything in life, good habits are essential to succeeding at whatever you want to learn. Habits save your mind the energy of thinking through every step of a task, which opens up space for other

activities. Think about when you first learned how to drive a car. It seemed hard at first, but once you had practiced enough and developed the right habits, it became easy and almost automatic.

You can use your habits to achieve your goals. You should reward yourself when you work on something for a certain amount of time, which is called learned industriousness and will help keep you motivated to complete tasks that might be boring or unpleasant. It's important to develop these habits so you can stay focused when there are unpleasant things that need to get done.

One technique to improve focus is the Pomodoro Technique. First, set a timer for 25 minutes and agree not to get distracted during that time period. Remove all distractions as far away from you as possible and inform people around you not to interrupt you until the timer goes off. When distraction arises, train yourself to ignore it by avoiding looking at those distractions or thinking about them. Afterward, reward yourself with free time for creative thinking because researchers have found that putting yourself "on the clock" creates a mild amount of stress which makes it more likely that you'll succeed in high-pressure scenarios like taking tests or giving presentations.

To reduce anxiety and improve your expertise, you can give yourself mini-tests while learning. Research shows that testing improves what you know by letting your mind form connections between different pieces of information. Mini-tests also help you recognize when you're on the right track to a solution because they put pressure on your mind to recall information. Testing helps your mind get used to working under pressure so it performs well in any situation.

Enhancing Your Memory

Did you know that pausing and reflecting are important elements of learning? Oakley says that once you've learned something, it's good to step away from the material for a while so your mind can make new connections. You could go for a walk or talk with a friend. These activities allow your unconscious mind to make new connections between information.

Another way to improve your memory is by visualizing things. Oakley uses the image of a flying mule to remember Newton's second law, $F = ma$. It stands for Flying Mule and leaves it up to you what A stands for. In any case, this strange image makes it easier to remember the formula, and a new chunk is born.

Songs and rhymes can also help you remember information. You know the alphabet song, for example, and maybe you use other songs or poems to remember historical dates and figures. Songs, rhythm, or motion will activate many parts of your brain when learning new things so that it's easier to recall them later on.

A word of caution: A memory aid is not the same as knowledge. It can help you remember things, but true knowledge requires you to be able to synthesize and apply information in a coherent way.

Sculpting Your Brain

One of the best ways to learn is to simplify and personalize the subjects you're studying. Take abstract ideas in math and science, bring them to life in your mind by creating imaginative narratives that remind

you of important principles. For example, Einstein imagined himself as a photon! There's no end to how creative you can be when learning new things.

It may seem silly, but many great scientists have a similar approach to their work. They imagine the tiny things they study as giant versions of themselves and interact with them in that way. This enables them to fully engage with these objects while studying them.

Finally, never underestimate the value of brainstorming with others. Einstein and Niels Bohr are a perfect example of how brainstorming can help you come up with new ideas and challenge your thinking to make breakthroughs. In fact, that's why they were so successful in their work together. They challenged each other to pursue new avenues of thought by bouncing ideas off each other and explaining things well when they already understood them.

There are many effective ways to make it easier for your brain to learn math and science.

Conclusion

As you've learned from this summary, there are many useful techniques for increasing your math and science skills. Toggle between focused attention and diffuse attention when studying. Learn to chunk information into small pieces that can be accessed quickly and easily when needed. Avoid distractions by using the Pomodoro technique, which allows you to relax while still working efficiently at a steady pace. Make time to pause so that your mind can absorb new information and synthesize it with what is already known. Remember that patience is key in reshaping one's brain, as well as persistence; long-term learning requires periods of relaxation or creativity as well as times of focused attention.

Full Summary of A Mind For Numbers

Overview

Even though Barbara Oakley hated math and science in her youth, she found that it was critical to pursue her dream career. She learned how to excel at these subjects by developing easy-to-apply methods and fun tricks.

You will also learn why naps are important, how to plan your time effectively and why you shouldn't necessarily want to be a genius.

Big Idea #1: The human brain has two ways of thinking: the focused and the diffuse modes.

Some flashlights have two settings: they can focus a narrow beam or spread light out.

Our brains work in a similar way. They can switch between two ways of thinking: focused mode and diffuse mode. Focused mode is when we concentrate on information that's already embedded in our minds, while the diffuse mode helps us think creatively by generating new ideas. The brain uses these

modes together to solve problems using rational and analytical thought or creative thinking, respectively.

For example, you use focused mode thinking when you multiply numbers. If you're studying a language, you might use it to incorporate the verb conjugation that was taught last week.

We have two modes of thinking. The first is focused mode, where we pay attention to one thing and do it well. We use this when we want to be productive. The other way of thinking is called diffuse mode, which happens when we relax our focus and let our minds wander a bit. This helps us get a big-picture understanding of things around us or ideas in general.

The diffuse mode is also important in math and science. Diffuse mode can help you gain new insights into problems that you have been struggling with.

When you're trying to understand something new, focus on the big picture. Don't get stuck in one thing and try to figure it out.

This sentence has three errors. The first two are easily noticeable when you're reading it carefully.

But the third error? The third error – that there is no third error – only becomes clear when we look at the sentence abstractly. Focused and diffuse thinking both have their purposes.

Big Idea #2: Focused thinking, diffuse thinking and sleep are all fundamental for successful learning.

We switch back and forth between two modes of thinking. One is focused, the other diffuse. We can't be in both at once, but we can move from one to the other quickly.

We can learn a lot from different teaching styles. Sometimes it's important to understand the basics of something, and sometimes it's best to solve problems with that knowledge.

To solve difficult problems and learn new concepts, we need to focus on them for a while. Then, when we're not thinking about the problem anymore, our unconscious mind will work on it in the background. When we go back to that problem again, the solution will be there waiting for us. This is because our conscious mind sends information to our unconscious mind so it can process it and send us back results when necessary.

Sleep is also important for learning. You can't keep exercising your muscles all the time because they need to rest. When you take time off in between workouts, you build strong muscles over time.

Sleep is important for learning. If you don't sleep enough, your brain will be overloaded with toxins that impair thinking and memory. Sleep also keeps the brain healthy so it can process information more effectively. Also, if you review material just before sleeping on it, there's a higher chance of dreaming about it and understanding the material better in your dream state than when awake.

So, if you get frustrated with something, try to think of it in a different way. Or, take a nap.

Big Idea #3: Chunking and recalling learning material is necessary for gaining expertise.

The human mind has incredible abilities. It can see the forest and not trees, so we don't have to process each individual tree.

Learning is important for children. It helps them become more knowledgeable and better at math and science. Chunking is an important part of learning, which we use when we first start to learn things like math and science.

Chunks are small units of information that are connected by their common meaning. For example, the letters p, o and p can be put together to make the word pop.

When we break down information into smaller pieces, it's easier to remember. The brain doesn't have to keep track of every detail or sub-point; it can just remember the main idea.

As we learn, we build up our mental libraries of concepts. This helps us solve problems more quickly. We also start to recognize certain types of problems and can use what we know about them to solve the problem faster.

While you're learning, it's important to keep practicing what you've learned. You do this by recalling the information in your mind. Recall is when you remember the main ideas of something that you've learned. It helps build new knowledge and understanding of a topic.

The best way to build chunks is by first understanding the basic ideas and then practicing going over them. You need to understand them in context of other information you already know.

When solving a math problem, you can't just look at the answer. You must understand why it's correct and how to get there.

So, when you're studying for a test or just trying to learn something new for fun, don't just read the material. Work through it by solving problems and asking questions. This will help you retain more of what you've learned.

Big Idea #4: Focusing on the process instead of the product will help you defeat procrastination.

If you didn't practice for a marathon, your calves would be in pain. Similarly, if you don't study math and science, then you can't compete in them.

Procrastination is a temptation that we can all succumb to because it offers temporary relief from an unappealing present. We procrastinate on things that are boring, difficult or make us uncomfortable. If you want to go far in math and science, you've got to take control of your procrastination by making sure you have short study sessions with long periods for the information to "settle in".

Therefore, one needs to spread out his/her learning over a long period of time. One cannot learn it quickly at the last minute.

In order to avoid procrastination, we should focus on the process of learning rather than the outcome. The process is what you do in order to learn something – for example, studying for 20 minutes. The product is what you get out of it – an assignment that you finish.

When you focus on the process of learning, rather than the end result, you'll be less stressed and more relaxed. You won't put so much pressure on yourself to get something done quickly because you'll be focused on how it's done.

This also helps prevent procrastination. Sometimes, we avoid trying to reach a product because it's too challenging or we fear failure. This is procrastination.

As you become better at avoiding procrastination, it will be easier to enjoy learning new things.

Big Idea #5: Mental tricks are powerful tools that help you learn.

David Allen, a management specialist, once said that the highest-performing people he knows have installed the best tricks in their lives. Mental tricks are simple but effective ways to learn something.

You can try to change the environment in which you work. Figure out where you're most productive and what kind of environment helps you do your best work. Some people are more focused at a coffee shop, while others need total silence in a library. Mindfulness training is also helpful to focus on one thing without getting distracted by other thoughts or tasks that come up.

Finally, try to focus on the positive. Focusing on the positive helps you adjust your attitude and feel better about things.

Instead of thinking about how tired you are, think about how good your breakfast will be.

One of the most effective learning tricks is keeping reasonable, achievable to-do lists. This helps you gain control of your habits. So write a brief to-do list once a week or every day and look at the bigger picture by setting priorities for yourself. Keeping a planner journal can also help keep you on track, as well as scheduling time for play so that you're not distracted from getting work done.

Big Idea #6: Memorization techniques can make learning material meaningful, memorable and fun.

People learn information more easily when it's relevant to them. This means that you can make memorization an exercise in creativity.

If you want to remember Newton's second law, which is $f=ma$, where f stands for flying and m for mule. You can create a story in your mind of feeding apples to the mule so that it will fly faster.

One of the best ways to remember things is by using metaphors. A metaphor lets you see one thing in terms of another, so that you can understand it better. For example, if you're trying to learn about electrical currents, it helps to imagine them as water flowing through a pipe. That way, voltage becomes pressure on the water and current becomes flow rate (the speed at which water flows). You can also pretend that you are the concept that you're learning about; for instance, if I'm trying to remember how an equation works, I might pretend I am inside the x or y-axis.

Acronyms are another useful tool in memorization. They help you simplify your learning material by creating acronyms for each word. For example, if you want to remember four plants—garlic, rose, hawthorn and mustard—you can create an acronym out of the first letters of each word: GRHM (Garlic Rose Hawthorn Mustard). You can visualize a GRAHAM cracker when thinking about these plants.

Academics use mnemonic devices to help them remember lists. They make up sentences with the first letter of each word corresponding to a list they need to memorize.

The sentences can form a story. The meaning of that story helps you remember the information better.

Big Idea #7: Practice and persistence are often more important than intelligence.

Sometimes, you might feel intimidated by your peers who are better than you at certain things. However, it's important to remember that there are advantages and disadvantages to being average in some areas.

Some people are smarter than others. They have a longer working memory, which means they can hold more information in their minds at once.

However, smart people can often get lost in their own thoughts and overthink situations. This leads to overlooking simple solutions that are right in front of them.

Practice is often more important than intelligence.

Practice helps us remember things. It connects the information to our long-term memory, where we store thoughts and ideas that can be used later. Without practice, our working memories don't connect as much information with other areas of the brain (like our long term memory), so they aren't as creative or useful in generating new ideas. Practice also allows us to persist in learning about a subject, which leads to more creativity and independent thinking because we are better able to ask questions about problems and find solutions on our own.

Even if you're not the most intelligent person, you can still do well in school. If you work hard and practice diligently, then you'll be able to achieve the same things as people who are naturally gifted.

Big Idea #8: Testing is a powerful learning experience in itself.

Testing isn't just about checking how much we know. It's an important learning process in itself, and studying for tests is very useful.

Testing is an effective way to retain information. It facilitates the retention of knowledge more than merely assessing it. This phenomenon is called the testing effect.

In 2009, two psychologists named Julie Campbell and Richard Meyer conducted a study to research the testing effect. In their study, they found that people learned more when given multiple choice questions after every few slides of information.

When people were tested after the study, those who took tests throughout the presentation performed better than those who didn't. In fact, even if they did poorly on their test or received no feedback at all, they still showed a testing effect.

Testing helps us deal with stress and anxiety. When we're under stress, the body produces cortisol, which can make you nervous or sweaty. However, if you think of that as a good thing because it'll help you do your best on the test (and not be afraid), then it can improve your performance. It's also useful to focus on breathing deeply before a test; this sends more oxygen to the brain and allows you to perform better on tests.

If you practice these techniques, you can deal with stress and anxiety during exams. You'll be able to channel that into productivity. Testing is very useful in learning because it helps us learn more about ourselves and our weaknesses so we can improve on them later.

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