*Learning on Steroids:*

# The Branch Method

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Learning new concepts can be difficult because each concept builds on each other.

Math is a great example of that. Let's say you need to learn vector calculus. In order to understand vector calculus, you need to understand calculus and matrix mathematics. In order to understand calculus, you need to understand algebra. In order to understand algebra, you need to know arithmetic.

So, if you were to start learning vector calculus, but you didn't understand exponents (part of arithmetic) you'd fail miserably. The material you'd be given wouldn't offer any hints as to how to do exponents, and failing to understand that fundamental step means that every link in the chain is confusing.

While that's an extreme example, I'd like to argue that a less intense version of that problem is the main reason students fail to understand a subject. One of the fundamental links in understanding is either missing, or simply not strong enough to bear the weight of all the concepts hinged on it.

## Using the Branch Method to Tackle Difficult to “Get” Ideas

Much of holistic learning works when you already roughly “get” an idea. Metaphors and visceralizations are only possible if you already have a gist of how an idea works. If you don't understand something at all, then your metaphors probably won't resemble the idea.

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In other words, these concepts work best at the explore phase of holistic learning. They're great for going from getting the gist, to intuitively understanding an idea. They're also great for reinforcing your memory, so you won't lose the ideas you recently learned.

They can't, however, help you make that first step toward understanding. If you are truly dumbfounded by an idea, then those methods won't help you too much.

You can use the branch method to fill that gap and start on the road to understanding a more complicated idea. You can also use the method to help decipher where you've gone wrong when an idea doesn't make sense to you.

# How to Use the Branch Method

The first step of the branch method is to write the core idea you're struggling to understand on a piece of paper. This is the trunk. The method will then involve progressively "branching" the trunk into more foundational concepts.

Let's use the example of learning calculus. Let's say here, the concept you don't get is the power rule for finding the derivation of a simple polynomial function. (Such as $f() = x^2$ )

*Power Rule*

The next step is to use a textbook, lecture notes or reference material to piece together a technically accurate explanation of

the trunk concept. This will be you first branching of the idea to try to move it to simpler terms. Here's one I pulled from Wikipedia.

*Power Rule* -> The power rule states that for every natural number $n$, $f'() = nx^{n-1}$ for each term in the polynomial

If you have multiple pieces of starting information on your notes for the power rule, you can branch those off too, starting multiple branches. For this example, you might have a definition, you may also have a proof, a formula or a graph/chart that you could use as initial branches.

The initial branches are the information that you either understand already, or have been given (but don't yet understand fully).

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The third step is to branch these initial branches again, into simpler explanations and concepts. Replace all the technical language with simpler language that you could relate to someone who hadn't studied your subject.

For my power rule example this could be:

*Power Rule* -> $f'() = nx^{n-1}$ ~> $f'()$ ~> The derivative of $f()$
~> $nx^{n-1}$ ~> Multiply x by the exponent and decrement the exponent by one

You can then repeat this third step over and over again until you've branched all the ideas, and you understand the ends of every branch intuitively. This repeated simplification will take a

succinct idea and most like expand it into many more simple ideas, but the goal is to reinforce all those implied understandings given by the complicated concept.

I could have taken the branches in my example even further:

*f'()* -> The derivative of *f'()* -> A derivative is the slope of a function -> The slope is how quickly it increases or decreases

Obviously infinite branching of this kind isn't necessary. But if you branch down sufficiently until all the leaves of your branching are extremely easy for you to understand, it's way easier to work backward to the more complicated idea.

# Difficulties in Branching

Branching, of course, is easy if you already "get" an idea, like I used with the power rule example. I understand the power rule, so creating a branching diagram wasn't too difficult. Things can get a bit more confusing when actually implementing the tactic.

The best way to start is to gather as many resources you can use as initial branches. This means, if you don't get an idea at all, you should probably have at least 4-5 starter explanations you can work off of. Look online, grab definitions from Wikipedia, sites like Khan Academy, go to the library and pull out textbooks, or ask a friend to explain the idea to you.

Once you have 4-5 good starter branches, start decomposing them into simpler parts. This may reveal your knowledge isn't great on one of the simpler components. If you're trying to figure

out sparse matrices but you haven't really gotten the idea of a data tree down, then your branching will help show this.

## Go Beyond the Easy Branches

The strength of this method isn't just from creating a web of explanations. Rather, it's in going beyond the initial branches and exploring the ideas beyond the point where they seem easy. The goal of the branch method isn't to simplify ideas to the point where you can understand it, but to simplify it to the point where someone who knows far less than you could understand it.

The logic behind over-branching is the same as behind the 5-year old method. When you over-simplify, you strengthen the foundational concepts, which adds strength to your understanding of the whole.

If I were to apply this tactic on my now-forgotten knowledge of how to do Chi-Square tests in statistics (unfortunately, holistic learning doesn't fix the use-it-or-lose-it tendency of studying), I wouldn't just go through core parts of that idea, I'd burrow deeper and branch back to simple z-scores and confidence intervals, which I'm already comfortable with.

## Leaf-to-Trunk Branching

Branching doesn't need to be unidirectional. You can also go from the painfully simple concepts and branch back into the trunk. I would do this when I'm aware of all the requirements for understanding an idea, but I'm not quite sure how they match up with the formal definition yet.

For my power rule example, I could know that part of understanding the rule is understanding derivatives. Creating a

little branch that reaffirms my prior knowledge:

derivatives -> function giving slope of the line -> calculates how quickly another function is increasing or decreasing

I could use this to refresh my memory of the prior pieces of information which I could then connect back to the power rule.

*Power Rule* -> Used for polynomials -> $f'() = nx^{n-1}$ -> is the derivative for $f'() = x^n$ -> derivatives

## Horizontal Branching

When you make branching steps, you can move vertically, trunk-to-leaf – moving from complicated ideas into their simpler components – or you can move horizontally, branch-to-branch by

adding metaphors, pictures or analogies. These don't need to be reducing the ideas, but they can be a way for you to explain it to yourself.

For this example, I could horizontally branch off derivatives by drawing a diagram of a function and its derivative to remind myself what I'm dealing with.

## Finding Explanations that Work

Branching can't create knowledge out of thin air. If you don't understand an idea, it needs to be a process of constantly switching between creating branches and going back to your notes and reference books to fill in the gaps. Any lack of understanding means that your branches will be incomplete. Either you'll realize you don't understand the simpler concept, or

you don't understand how the two connect. In either case, you need to go back to the books and fill in the blanks.

If you're left with a persistent blank in your branching, you have two options:

1. Go back and strengthen the leaves.
2. Research deeper until you find an explanation that works.

## Strengthening the Leaves

With technical classes, a lack of familiarity with a prerequisite idea can make it almost impossible to understand the core idea. You may want to refresh yourself by doing some basic questions with the early ideas, solve a few problems until you can more easily think about the more difficult branches.

# Researching Deeper

The other approach to perpetual blanks is to find better explanations that work. With almost any topic, you have several, if not dozens, of sources you can use:

1. Lecture Notes
2. Textbooks
3. Teacher assistants
4. Tutors
5. Online tutorials
6. Alternative books/guides
7. Youtube videos

Most of the time you're stuck on understanding a concept it is simply because the first few explanations you've been handled are

lousy. But that doesn't mean you need to settle for them. Going back and hunting down other sources can make those initial branches much easier to work with.

## Implementing the Guide

My suggestion for training this tactic is to go through it several times with ideas you already understand fairly well. Use it for the topics in your courses you already “get”. Then, when you feel ready, start using it on the harder subjects you need more help with. By moving up progressively, you won't have to struggle with the dual problem of a difficult concept and a completely new tactic.

Good luck on this technique, I'll see you on the other side!