Writing to think by Norm Murray *Copyright ©2021*

I recently discovered, bought and read a book with a title and description that absolutely captured my imagination, was thoroughly a pleasure to read, but left me feeling empty and dissatisfied as it felt, to me anyhow, that it hadn't lived up to the promise. _Writing to Learn_ by William Zinsser tantalizes with promise, and provides some enlightening and engaging examples of great writing about a diverse range of subjects, but feels more like it is a writing to teach book. Yes, there are within it examples of using writing to help students to learn a diverse range of subject, but where it fails in my mind is that it fails to hand the reader the tool set to go achieve this for themselves.

Now, maybe the author is thinking that this should be something obvious to anyone who has the ability to write, but as someone who loves learning, I was looking for a set of tools or principles that would help me to more deeply engage with the things I was learning and to make them my own. To me, this was the promise of the book, an approach for me to take when engaging with a new subject or idea, to use writing (something I've long felt inadequate about in many senses) to be able to take the pieces of a subject that I can grasp, even if only fleetingly while the book is open or video playing, and be forced to organize them and in doing so, end up discovering more about the subject itself. To me, that is what the idea of writing to learn is about.

Failing to actually get what I was wanting out of the book, I'm going to try to explore the concept I want with at least my own essay.

* Thinking about learning

Perhaps one of the more interesting aspects to consider first comes down to the very nature of learning and thinking itself. What does it mean to learn something? What does it mean to think about, and think clearly about something?

Here's a straight up definition:

learning
/' lə:nɪŋ/
Learn to pronounce
noun
noun: learning

   the acquisition of knowledge or skills through study, experience, or being taught.

Far too much of the educational system through which I progressed was focused on ability to recall information for the test. While memory superficially passed as learning for that process, it doesn't at all equate to what I feel learning really is.

To begin to differentiate between my definition of learning and that dictionary I come to the concept of understanding and manipulation of the concepts.

Let me give you an example that has always been personal to me. In school, taking a history class, I was required to know that the battle of Hastings occurred in 1066. I can still recall that fact, more than 30 years on, but only because it became a tangible example to me of the uselessness of that method of teaching. I know when the battle took place, and somewhat where (I think in England somewhere), but I don't know who fought, why they fought, who won, or what the real impact of that win/loss was to the side. I know a fact, but without the context and the understanding of the event, it is useless to me.

When I seek (without an academic purpose to pass a class) to learn something, what I want is to understand the concept, and to be able to manipulate that concept and apply it in a different context, or to be able to explain it from a different direction by being able to relate it to something a different audience might know. This ability to apply, manipulate, understand and explain the concept is my fundamental. I need to be able to relate this new learning to other things that I know, to see the principles that connect it, to understand what supports it, and to get to some of the things that this implies beyond itself.

So, rather than a concept of being able to remember something like the area of a circle is $Pi*r^2$, understanding relates all aspects, so the circumference is the measure of the line around the circle of $2*Pi*r$, the area, noted above is, and the volume is $4/3 \, Pi*r^3$ is a measure of understanding the relationship between the radius of the circular object and that which you are trying to calculate. This understanding stays with you and even if you forget the formula, you can work it out based on your understanding of the underlying principles. These formulas are things that I definitely don't use every day, and it's likely been decades since I used anything other than the circumference. This is what I mean by learning, because these are mine now.

The ability to remember an abstract fact can be useful, but the ability to understand and internalize the concepts are where true learning comes in.

One more example to give you something more tangible than the shapes above, something we are exposed to every day. Lets talk about photography.

Photography is a realm where there are a lot of 'rules' about what makes a good image. (I can show you a great image that happens to break any one of them, but that's an aside.) These rules will help anyone to create a more generally pleasing image to the viewer. Think about this list:

The rule of thirds - your image should be broken into thirds. If taking a picture of a mountain, you should give 1/3 of the frame to the foreground, 1/3 to the mountain, and 1/3 to the sky.

Use diagonals - you should use a diagonal in your image to lead the viewers eye through it.

Don't center your subject in the middle of the image - your subject should be off center in order to put a little more tension into the image and make it stronger.

When shooting multiple subjects, make it an odd number - if shooting cows in a field, or flowers in a garden, the image is stronger if there are an odd rather than an even number, because it creates more imbalance.

These are just a few of the many 'rules' about photography out there that I can remember right now. You may find these and many more in introductory photography books. If you just remember these rules when you hold your phone up to take a picture, or look through the lens of a camera, "you can take a good photo".

However, if you are working from your memory of the rules, you will apply them in succession, and in frustration as you move, adjust and think about each in turn, taking minutes or more in order to get the composition of an image that satisfies all the rules you know. If, instead, you have learned the why, and really understood the rationale of each of the rules, your brain has moved past the specifics and into a sense of aesthetics where you (or at least me, when I shoot) see the image before you even get the camera out, where you move by feel to adjust the composition rather than by conscious analysis.

It is this almost intuitive understanding that demonstrates real learning to me.

Learning is also an iterative process. There is almost no end to your ability to learn on any subject or skill should you care to pursue it. Each layer of a subject that you learn simply allows you to look past that layer to the next, and to appreciate the nuances now available to you. In the context of creating a nice photograph, since you're already thinking about that, after you understand composition and framing your image, you can

begin to think about colors and tonality, or the way you can creatively use time and focus in crafting your image to show something that is a bit beyond what you see as you stand there.

Another great example of this is that in learning physics of motion, force and leverage, the problems come with assumptions about a "mass-less, friction-less, pulley" which simplifies the problem space and math for the beginner. In more advanced work, one must start to account for the friction interactions in the system, as well as the mass of the pulley and the rope, and if one wants the deep details, the air resistance at the speeds and elevations being used, the electromagnetic interactions, and the specific gravity at the location where the work is taking place (yes, it does vary based on the local density of the structure of the earth and the elevation from the center of the earth).

Even in physical skills you learn, it is possible to go deeper. NFL players talk about how they are coached in route running to think about how their stride, balance and even arm position can aid their ability to change direction.

So, when we have an understanding of a topic, beyond the mere ability to recite from memory information about it, or to perform the action simply by rote, is when we have learned the topic. However, this understanding is truly only freeing us from the need to consciously remember the details, techniques or rules, letting us apply the understanding as well as the ability to look deeper into the topic and see the next level that we don't yet know.

* Inspirational quotes

Perhaps one of the keys for me in why I thought writing to learn would be such a powerful concept and tool is motivated in a few quotes that I've been long familiar with.

"If you can not explain it simply, you don't understand it." From Albert Einstein. Albert was one of the examples of great and clear writing highlighted from his _Relativity: The Special and the General Theory_. The explanation of relative motion, which seeded the concept of general relativity was truly breathtaking in it's clarity, and this was a concept I was already well familiar with having gone through not just the university level physics but calculus classes to understand it.

"You never know what you know until you try to teach it". For me at least, this quote has always been a reflection that the act of teaching something forces one to deepen their

understanding of it. It is easy to impart to another a fact such as, pure water freezes at 32F/0C under standard pressures. A fact imparted in such fashion requires and generates no understanding, but it is difficult for me to consider that teaching. Rather, to me at least, teaching is the act of imparting understanding, through which the student is able to manipulate and generate implications from that understanding. One can impart to a child that sharp objects can cut things, and with that understanding a child can generate the idea that scissors, knives and axes are

So, taking these two fundamental concepts, writing to learn then becomes an exercise in using writing as a tool to teach, even if just teaching oneself. It is the process of writing simply and explaining that leads to the connection and innovation in ones own thinking. Surely though there are some fundamentals involved in how we try to go about this that can be extracted and used to bring a level of rigor to what we are attempting to learn.

* Why write?

Why write at all in the learning process? This is an interesting question to which my own writing is providing some extra insight. Let us start with the basics thought.

Writing, especially by hand, is a tool in learning as it provides a mechanical reference to the information within your mind and memory. Human recall being what it is, the more context queues we can use to reference a piece of information, the more we are able to get to it. The act of writing is also an effort in rephrasing the information, since rarely do we write in exactly the words in which we encountered the information - we do not transcribe a book, or a professor exactly, but we rephrase and restate and transform those words into something a little easier for us.

Various psychology around learning suggests that while we learn a little from reading, and we learn more by someone showing us how to, we learn the most by doing it ourselves. Writing in many senses, is doing it ourselves - even without necessarily doing it in the case of skills and such.

Now, getting a little deeper, the act of writing after exposure to the knowledge, while working to integrate it, is not an insignificant effort. It is an investment of time. What is the payoff? For me there have been at least two very noticeable benefits.

First, there is a tremendous focus on the material and subject. The depth in the process is itself a meditative state. I find that while I appreciate sound while I write, I can't split my

attention to something else, without breaking the thought process. The slow focused thinking warps time in the way that meditation does. This is a pleasure in itself.

Second, expressing ideas, explaining them, gives them to me on such a deeper level. Writing, the mechanical typing for me, forces a slowness and depth of thought, is taking me through several rephrasing, and is enabling not just a deeper level of recall to the information from the mechanical act, but is also allowing me to let go of each level of thought as it is written down. This allows me to move more freely to the next piece in the extended body of thought/learning.

There is a psychological limit of working memory, where we are able to hold, manipulate and recall only 7-9 'things'. When trying to learn a large body of information, or to think through a larger problem or domain, we are incapable of working with all of it at any point in time. Writing is an enabler to be able to put down some of these things along the way. When you have it written down, you get to lose the fear of forgetting it. (This is also a good reason to outline as you approach, so that you can work through parts and remember to come back to them later.)

If, instead of writing, you simply tried to think our way through the topic, and you're a limited human like me, you will end up going back over the same parts over and over again, and by the time you've collected them, you're incapable of working to where you want to take them. I've been working on learning various aspects of psychology, influence, leadership and persuasion for several years, and while I can see and almost intuitively grasp that there are deep connections between these topics, I've not been able to articulate them at all due to this effect. In the odd moments now while not undertaking the effort of writing this extended thought on writing, I am working on writing to learn that grouping as well as a few other topics, and am finding the process immensely useful in being able to get further into them.

* Where does this apply

It is interesting to think about this process and where and how it does apply to learning. Certainly the framework of the book _Writing to Learn_ set this into almost completely academic areas, and even the layer of music presented in the book is not set in the framework of playing an instrument as much as understanding and listening to it. However, one of my university psychology classes related the story of a psychology professor teaching his friend to ski in the comfort of his office. This was done over a period of weeks, where the professor described in detail the experience, and coached the friend in position and expectations of sensation and feeling. Iteratively this rehearsal,

though not written, of talking through the details, facilitated enough learning that when the friend was eventually taken out to ski his performance, while by no means expert, was far better than the absolute novice on the day.

Personally in writing this, it's interesting that I used skiing as an example earlier, which shows that we really don't know what we know until we try to teach it.

Beyond that aside, it shows that this process of using writing to explore and Iteratively evolve our knowledge applies to far beyond the realm of academic subjects, but to physical skills, and their outcomes as well. Using writing gives us a framework and rigor the apply to our thinking and critique.

While it may seem as though one can only write about what one knows about, that really isn't the case. Writing the ignorance you have about a topic lets you start to frame it, and give you a place to put the things you learn. Let's try to talk it through right now.

I know nothing at all about the way in which gravity really works. So, I can start by writing the things I do know. Gravity attracts all mass to all other mass in the universe, at a rate that scales with the size of the mass, but that falls off with the distance between to masses. So, an airplane in the air feels less pull toward the earth than when it's on the ground (though not by much), and in turn it pulls on the earth with less force. The question though is how is this attraction transmitted. I've heard of the idea of a graviton, a particle which carries the force of gravity, so that suggests that each atom in the universe is emitting these gravitons constantly and forever. Emitting a force requires energy though, and the only source of that energy is the mass itself, so this implies that over time, mass will disappear. Now, that could be an interesting thing to fold into the theory of dark matter, where observations of the motion of many galaxies in universe don't match the apparent total mass within them - if due to distance and the time the light takes to travel, when the motion was taking place, there was more mass than we calculate there to be based on our local observations, that could be part of the discrepancy.

I'm quite sure that my ignorance in writing the above could be easily corrected by a physicist, but for me it's a starting point for me to go learn more about the subject, for I've never seen a theory about disappearing mass in the universe, so I've definitely got something wrong.

So you can see that writing from ignorance can give some interesting thoughts and contradictions as you begin to explore a topic. Even if you can't find contradictions, the bare thoughts you can begin to express may pose questions that you have about the topic, that can serve as a bit of a reward for you when you learn enough to answer them.

* The importance of sources

If we think of writing to learn as an exercise that exists in a single point of time, then the mechanical act of writing, or typing, of organizing our thoughts is something that is the end result. The reality however is more complicated, for as I'm writing this, now weeks beyond when I first started, it's apparent that any meaningful writing to learn effort is an iterative process. We will write, and come back and add to our writing as we continue to think and learn on the subject.

It can in fact be interesting as an exercise to return to our writing effort on a regular basis, adding to it as our experience grows. We may also encounter new information in what may seem to be an unrelated that we'd like to incorporate into the way we understand our topic. We may also learn that we got something wrong, whether in the way we have self-organized our thinking, or where something (a fact, or result) we have incorporated is incorrect. So, we are, even when writing for ourselves and our own effort to learn in the moment, we should always understand that we will have an audience in our work of our future self. We may in fact also choose to share our writing effort.

Realizing that our work will have an audience, it becomes critical that we cite sources. The rigor with which you do so is an exercise for you to work out, but the sources of where you obtain the information that you are writing to organize are the footprints that will let you know how you got there. If anything is wrong in your thinking pattern, and you need to figure out what it is, going back to your sources will help.

Tangibly, I think of knowledge a little bit like a building, let's imagine a house for this discussion. A house has a structure, like organized thoughts, there are regular sized objects within our house, like doors, windows, and electrical plugs. There's a lot of variety though in where these things go, how they are arranged, and exactly which we are choosing to implement. The way we lay out the house, or our knowledge and thinking, is entirely individual. So we have built a house, and started to live in it. Imagine taking a vacation, and on returning we notice that one of the doors no longer closes. A cursory examination shows that it is the same door that was there when you left. Without understanding your sources and being able to examine them, you can't go back beyond that cursory examination. Have you ever closed that door before? (I have doors in my house that I don't think I've closed in years.) What is the obstruction? Oh, the door is not swinging level... are the hinges ok? Did the weight of the door over time pull the hinges? Nope, that's ok... so why the shift... dig down and our foundations have shifted a bit.

Maybe a bit silly and exaggerated, but when our source material is incorrect, we can build everything correctly and to spec, and still have problems.

Our sources and references in our thinking, and our logic, are the foundations of the house. If they are wrong, they will result in a learning that does not stand the test of time (and sometimes just won't pass a cursory examination). When we're lucky, simply writing things out and building the structure of our knowledge will expose the errors very early in the process... trying to level the first strut and finding that as you watch one side sinks into the mud for example. It is really only by attempting to construct a model of thought that will let us find the inconsistencies that reveal incorrect knowledge. This is the heart of the scientific method, to build a model and then test our understanding. Unfortunately sometimes the fault in knowledge ultimately revealed could have been around for years, decades or centuries, and only show up when you try to (drawing on the house analogy) add a new bathroom only to find out that your connection to the sewage was never up to spec.

This is one of the things that happened as Newton's theories of motion and gravity from 1687, were revealed to be incomplete as telescopes advanced enough to make detailed observations of Mercury's movement around the sun. These observations, over nearly 300 years, took Einstein's theory of special relativity to resolve. https://www.forbes.com/sites/startswithabang/2016/05/20/when-did-isaac-newton-finally-fail/?sh=3f887f5948e7

Until that time, the source and foundation that is Newton's theories were thought to be complete. Once they were revealed to be incomplete, every bit of information built on top of them was able to be corrected with time by including the updated theories from Einstein.

* Drawing from programming

I learned to write computer programming at a very early age, at a time when it just was not at all a common thing. At the age of 10, in 1980, I was first exposed to a computer in a classroom, and taught how to use it, through programming, to solve math problems. Much of my career has been spent within the job family of software engineering. In the course of using different programming languages through my education, career, and for

personal projects, I have felt the transformation in my thinking as I have been using each one.

Computer programming languages are an exercise in clear thought, but they constrain thinking patterns. Let us take three different languages which I know (there are many many more I don't know), c, php, and lisp. Among the commonalities between them, all three support the idea of functions, that let you break the instructions down into pieces so that you don't need to write everything in order and detail, but can refer to a specific set of instructions easily with a short reference. Most of the world doesn't have experience in computer programming, but we all are familiar with following instructions in other areas, and one of the most relateable (for me anyhow) comes from the kitchen. A recipe is a way to get a human to perform a set of instructions, much like a computer program gets a computer to do so. These shortcuts in referencing a set of instructions are akin in a recipe to being able to say 'bake a chocolate cake'.

Imagine that we want to want to create a seven layer cake, decorated to look like a Rubik's cube. Our three different computer languages will take very different approaches to this problem, using the concept of 'bake a chocolate cake' in each of them.

c and php have a commonality that is not present in lisp, and that is the concept of a loop, and ability to repeat over a group of instructions. With this ability we can say:

repeat 7 times
  'bake a chocolate cake'

With lisp however, we have to take a different approach, because the language doesn't have a construct to let us do that. Instead we have to approach the problem in layers that resemble the towers of Hanoi puzzle. If you're unfamiliar with the game, there are three pegs, and a number of rings of unique size that fit over these pegs. The rules of the puzzle state that you can not put a larger ring on top of a smaller ring, and you can only move one ring at a time. The goal of the puzzle is to move a stack of rings from one peg to another. Simply put, the puzzle can be solved by moving one less than the full stack of rings to the intermediate peg, then moving the largest ring to the target peg, and then moving the smaller stack on top of it. The concept is to reduce the problem until you get to the trivial case. For details on the game and solution, you can take a look at: https://en.wikipedia.org/wiki/Tower_of_Hanoi

So the instruction set when we think about the problem in lisp is forced to be more like:

'bake a chocolate cake with (some) layers'

'bake a layer'
if (some) is more than one:
    'bake a chocolate cake with (some-1) layers'

When we start this process, some is 7, but it will change each time through.

The other very notable difference between these languages is the fluidity of the approach. When working with php and lisp, and using the recipe analogy, you conveniently live right next to the store and can easily go get everything you need as you need it. With c however, you have to ensure that you have everything you will need before you begin, that you know exactly where everything is in your kitchen. Imagine, if you will, that you are writing the recipe for a blind person to use your kitchen and you have to tell them where everything is, including for example, which position in the egg carton has the next egg to use. The detailed level of thinking required in c requires exacting thought, but has no safeties... your blind person in the kitchen who is exactly following your instructions will cut their fingers off if you tell them the wrong angle to hold the knife as they cut the layer to shape. php and lisp have a bit of safety to them, allowing an imprecision and generalization that c does not have.

So, in php, the 'bake a chocolate cake' reference will be be more like:

to bake a chocolate cake
   get a box of chocolate cake mix and follow the instructions

In c however, it will be more like:

to bake a chocolate cake
    ensure you have a house/apartment with a kitchen and an oven
    go to the supermarket 3 miles from your house
    get 3 cups of white flour, 2 cups of granulated sugar, 3 large chicken eggs, 1/2
cup Hershey's cocoa powder, 3 tsp of baking powder, a spoon, spatula, mixing
bowl, baking pan, dish towel, trash bag
    come home with those supplies
    wash the bowl, spoon and baking pan
    dry the bowl, spoon and baking pan, and set them on the kitchen bench
    break each of three eggs into the bowl, put the shells in the trash bag
    etc.

Being able to think in detail like this can very much assist your learning, and teaching, because you don't get to make assumptions (or any that you make will find a way to ensure you don't get the results that you want).

From all of this, we get several different methodologies of thought that we can explore in our writing and our learning. Each can be useful in certain circumstances and types of problems we face in our learning and thinking. How we reconcile a collection of knowledge, information, results, into a deeper understanding that ties it all together can be easier or more difficult based on the approaches we take in thinking. Being very detail oriented can work through inconsistencies that may be conveniently abstracted into buckets like 'experimental error' and reveal gaps in understanding; taking a less detailed approach can more quickly help us to recognize similarities between disparate ideas and concepts; looking at problems with a reductionist view can help us to more readily see how problems really aren't as difficult as they may first appear.

* When writing isn't writing

The idea of writing to learn doesn't just mean words on a page/screen. The process can be done with diagrams, or flow charts, it can be done with models (physical or computer based), and the concept of the story-board. Different problem spaces can benefit from tools beyond just words.

The helical structure of DNA was best found with a model to work through the information and results being found. Being able to touch and manipulate something physical can be critical to some learning efforts and thinking styles, for most of us are not as gifted as Nickoli Tesla who often claimed he could build and operate novel machinery in his mind.

So, don't feel constrained to only use words in your writing to learn. Use other tools to supplement your words.

* The power of analogy

I have been exploring and learning about the power of story as a tool of influence, and it is likely this exploration that placed _Writing to Learn_ into my suggestions on Amazon. Storytelling draws heavily on the power of metaphor and analogy, the ability to relate

something novel to something familiar, and to give connection to sensation through words. In the process of teaching, analogy and metaphor are tools that can deepen understanding through that connective relationship to the familiar. This is perhaps much more useful in trying to teach oneself than in trying to teach to others as we know all the things which we know, while making an analogy to others risks failed connections if trying to draw on something the other doesn't know.

* We see the world not as it is, but as we are

There's a quote by Anias Nin that I like a lot, "We see the world not as it is, but as we are." This has always reminded me to check my assumptions in thought, and my biases in results. I still have them, and can never get away from them, for I am the collection of my past experiences, expressed within a biological container with limited senses.

As I write this, I am actually laughing. I just went and did a google search to see if a concept I've experienced many times has a name. The idea that when you learn something new, you suddenly see examples of it everywhere in your life. If you learn, for example, that someone tipping their head to one side while they are engaged in a conversation is indicative of submission, analogous to the way a dog will offer it's throat to the alpha of a pack to show that it will not challenge for leadership, or is yielding the fight. Once you learn that concept, you look at every couple, and in every group to see just how often you spot this, and assume that you now have insight into the dynamics in that relationship and group. The behavior hasn't changed, but now you see it everywhere, two weeks later though, it's no longer fresh in your mind, so when you see the same behavior you don't make the connection. The world hasn't changed, but you have.

This is, apparently, the Baader-Meinhof Phenomenon, and is also known as the frequency bias or illusion. https://dqydj.com/baader-meinhof-phenomenon-frequency-bias/

This is just one of many biases that we carry with us in all of our thinking and understanding of the world.

Our brains are incapable of understanding everything in the world in exacting detail. Maybe some different evolved or created intelligence somewhere in the universe and the fullness of it's existence will be capable of that, but for me, and likely anyone reading this thought, it just is fundamentally outside of our capability and always will be. So, we simplify and make a model of it that we can understand. Having a model of how the

universe works saves our tiny little biological brain a lot of effort in trying to analyze everything happening all the time, and lets us actually get on with life. We have a good model when we can anticipate what is going to happen in the future, whether in a second, or further out.

You have inside you an unconscious model of the way physics work, to the degree that when you see someone throw an object in your direction you can generally, without thinking about it, know if you need to duck to avoid getting hit in the face. This serves you quite well here and now, however, if you were on Mars it would be pretty broken because of the difference in gravity altering the trajectory from what you expect.

When it comes to understanding anything else, whether someone else's behavior, how to bake a cake, or how an atom is put together, these models are our understanding. When we approach the new information, we do so with our current model, which we know is imperfect (if it was perfect, we would never need to try to learn anything, our model would already be able to explain it all, which we know is impossible). This model is our bias.

We face a challenge then when we seek to learn, for we recognize that our model is incorrect or incomplete, but yet we see the world and that which we are trying to learn through that model. This can lead to difficulty in trusting the new information if it contradicts anything in our current model, as the deeper the inconsistency, the more we have to update and rebuild. If we think back to our house, it's relatively easy to refresh the paint, or even to replace the hinges on a door, but when our foundation is cracking, or the very bedrock we thought we built upon is faulty the effort of a knock-down-rebuild might be more than we can handle, and there can be a tendency then to attack or discount the new information rather than undertake that level of personal upheaval.

* Using tools of writing

Lastly perhaps as additions into the toolbox, at least for now in this 'stream of thought' thinking process today, are the tools of writing itself.

I have fond recollections of an English teacher in high school breaking down the introduction, body, conclusion style of writing to the simple mnemonic, "Say what you're going to say, say it, say what you said." This has served me very well over the years, and especially as I've had to write more persuasive emails and documents through my career. Here though, the concept might be a little better thought of as 'introduce the topic you

are trying to learn, explore and play with it, figure out what it all means.' Using the word play is intentional and meaningful here, as play is a very creative and boundless process.

The other key is from one of the best bits of writing advice I can remember encountering, a book called _Hypnotic Writing_ by Joe Vitale, which I actually picked up to deepen my learning about hypnosis itself. Again a fascinating book which did not match my expectations, but ultimately taught me a lot about writing, and even deeper into influence itself. One of the keys from this is to set your own mind and emotional state before you begin writing, and to use that mindset in your writing, as it will naturally show in the words you use. The second key taken from this for me, that applies deeply here, is that the process of writing should be separated from the the process of editing. Write to write, to get the words out, rather than trying to make your first pass perfect and to deeply analyze what you are writing.

As I'm writing this today as well, the process of writing is going easily, because I am following this direction. I'm writing to get the thoughts out, and to explore and play with the ideas. There isn't a lot of censoring taking place, rather the writing is much more fluid and 'stream of thought'. It feels very natural and not at all forced.

* Adding information

All of these thoughts about writing and thinking, understanding and explaining are great, but they are fundamentally incapable of bringing us ranges of new information, or are they?

I remember reading a story once, though I can't at all remember the name of the story or the author. In the story there was a race of alien beings who learned about the nature of the universe, the big bang, the formation of stars and galaxies, while planet bound under a cloak of clouds so thick that they could not see the stars or even the single sun which they orbited, picture something like Venus, but with conditions underneath which are actually acceptable for life. They did this by observing a bowl of water and asking questions, exploring from there the logical implications, resolving the contradictions. It's not clear, in my recollection at least, whether it was proposed that this was done within a short time frame, or whether it was something done by countless generations over a long period of time.

So the exploration of ideas, the process of exploring implications and finding contradictions within, not only is useful in our own writing to think process, but is itself at the heart of what the scientific process is about.

We however, or at least I myself, are not gifted enough thinkers to stare at a bowl of water alone and get to the big bang. Rather we need to do experiments, to see a wide range of things in the world. Our learning and thinking must extend beyond words to actually doing the things we want to learn. While we can write all about downhill skiing for example, at some point in our learning, we need to actually put on a pair of skis and find a snow covered hill. Once we have done that, we can go back to writing as a way to extend our understanding of the experience itself. Iterating through this process with a rigor will have us becoming much better much more quickly than if we just kept throwing ourselves at the hill.

Without the benefit of infinite resources and time, we must also rely upon others to shortcut the process for us. When we want to learn about how to calculate the area of a circle, we don't need to invent for ourselves the tools of geometry, calculus, or the constant of Pi, we just have to learn to apply them and make them our own. The ability to learn from others is one of the things that I feel really makes us uniquely human, as it is one of the very few things we demonstrably and consistently do better than all other living things on this planet. Extending this to the skiing example above, we will find that adding in even watching expert skiers in a venue such as the Olympics, or even the better skiers we may see on our own ventures to the snow covered hills will help accelerate our learning. Taking in the knowledge that a skiing tutor or coach may provide in a lesson, and writing it in our own experience will also further the process.

Writing to learn is an extension of these things, it is a way to take the things we have learned from others, that we have seen, and done, and make it our own. Teaching ourselves and refining our thoughts as we do and try to explain the most salient points and components to ourselves is a process itself of learning.

* What's in our toolbox now

So, what are the fundamentals in our toolbox, how do they together shape the process of writing to think and learn topics that we don't actually know when we begin the process of writing?

Writing to learn and think is a fundamentally personal process. While others may eventually benefit, we gain a power by undertaking it for our own desire to understand. It is this personal curiosity which is perhaps the most basic piece of the overall effort, it will shape our language, and free our thoughts to explore the topic.

We must then begin the process by observation, reading, experimenting, and taking in the information that we would like to learn.

From that base, we then want to engage with the large points within the topic. This top down overview, drawn from programming, breaks up the effort into manageable chunks and lessons. This also dovetails to the 'say what you're going to say' concept. If you can state the large pieces and put them into an interesting order, you have at least a basic understanding of the topic you are trying to learn, even if you have not yet explored and learned the details. This is a process that repeats itself as well as you go deeper into the material. These footprints of points serve an additional purpose as well, for we don't have to hold them in our mind once they've been written down, we know we will come back to them. This ability to let go of that which is not relevant to our immediate words and exploration is a very mindful as well as practical process.

Eventually we will get to a point where we can begin to freely explore the material, the knowledge. Harnessing our curiosity and sense of play we can work through the things we have learned so far about the topic, and as we do that we can see both all that we know as well as the gaps where we don't.

Analogy and metaphor help this exploration by allowing us to relate to what we already know. This is a level of abstraction that allows us to connect seemingly disparate topics together, and that will often allow us to discover new ways to apply and investigate this new knowledge.

This exploration and play with the knowledge should be done in as simple a term as possible. Use the language that makes you most comfortable, and don't be afraid of making it too basic. There will be areas where complex terms are required, but introduce them, and explain them in your writing so that referring to them later becomes just a short way to reference the full explanation.

After a full exposition of all the subtopics within the larger body we are attempting to learn, we get to refine, clarify and iterate. Even here, getting it wrong the first time through does not need to be removed from our writing, rather it presents a great place to explain why that exploration was wrong. It is often said "we learn more from our mistakes than our successes," so we can use our mistakes to continue the process. However, I have found it personally very beneficial to examine success just as rigorously as failure. Thorough examination of a success can reveal flawed approaches covered by mistakes and accidents, and ultimately makes success repeatable. In the process of learning, making success repeatable is what we really want to achieve, as there is always

more to learn whether layers into a subject area, or entering entirely new skills or discipline.

The most basic tool itself, just write (draw, diagram, build models, etc.). Writing itself helps you remember what you write down. Writing it in your own words makes it yours and this transformation of words is the first level of understanding.

Write simply - the simpler you can state things, the clearer the thought actually is. Often, clear simplicity is something we can get to only with revision, as our understanding deepens. When we first start the effort of learning and thinking about something new, we get lost in the complexity of the effort. Getting to the simplicity is a mark and measure of our growing understanding.

Leave yourself footprints - how did you get there, where did the knowledge, or thought come from? These are important to let you understand where any incompletion or mistakes come into your efforts.

Approach it different ways - and with different language. Some topics yield better to different approaches. For some efforts and thoughts, and for some of us, organizing from the top down will work better. For other topics, and for others of us, we must find understanding in the details before we can get to the broad topic level statements to organize them. So too, can different languages and modes of writing (pictures, diagrams, words, videos, etc) help. Do not feel constrained or limited solely to the effort of words, rather work to your own strengths and to the areas where you feel you can make the most progress on a particular topic.

Revise the writing ruthlessly - for clarity and simplicity. Finding a more simple way to state will give you more clarity.

Keep integrating new sources/experiences. Look for sources and experiences that differ from what you have stated/learned so far as well, learn from the contradictions. Push into rather than disregarding any results that don't confirm your thoughts. This will let you find errors within your own thoughts and learning, or uncover the flaws in someone else's writing.

With all of that, we have an approach to the idea of writing to learn, to discover.