



How to Learn in Four Steps

by Anthony Rizzi

Few people have thought much about how we learn. As children, we went to school to learn and we continue to do it in lesser ways in living everyday life, but we seldom think about it. Yet, there is much to learn and when a heavy need arises, whether it be how to make a web page or how to decide what is the right thing to do in a new situation, it can be overwhelming and intimidating to try to figure out even how to begin. Our world is constantly changing, but one of its necessary *constants* is the need to learn.

At the Institute for Advanced Physics (IAP) we make new discoveries everyday. Since the IAP is an educational as well as a research organization, we are constantly meeting and helping people learn these new ideas and ways of thinking and living. During this process, we have seen over and over again how little people know how to learn. Since our work is at the core starting point of all human thinking and, thus, acting, and since people have been given so little on how to learn, I've written this short article to fill the gap to help people learn how to learn.

How then do we learn? The process is fairly simple to understand, but requires real commitment, effort, and time to successfully carry out.



The four steps in learning how to do anything are:

Truth	}	1. Find and understand the principles involved
		2. Habituate that understanding (practice thinking about those principles until they become second nature)
Practice	}	3. Think through how those principles can be applied in (your) life
		a. <i>What</i> can I use them for to advance in truth?
		b. <i>How</i> do I do these things?
		4. Habituate those actions.

You will notice the first two steps have to do with **thinking itself**, while the second two have to do with **how to use** the thinking. In short, there is a distinction between thought and practice. Both are necessary and both need to be in their proper place. We should not have an inordinate emphasis on thought or on practice. This does not mean that we should be careful not to do too much thinking or not to do too much practice. "Ordinate" means "in order." The thought comes in principle first, then the practice. In fact, the ordinate way to learn is to keep the principled order of the four steps as shown. There is of course a balance in executing the various steps that needs to be maintained, which we will discuss along with the steps.

The first step is to get access to the principles that you need by seeking the right expert. Some people can figure things out on their own, but even they benefit by seeking out and putting themselves at the feet of someone who knows. There is not much use, as they say, in reinventing the wheel. Whether it is something life-altering, like learning how to think about the world and God by learning philosophy and science, or something recreational like learning how to play football, *you cannot do what you do not know*. In fact, *you cannot even want what you do not know!* Or, said in terms of the natural powers involved: the intellect comes before the will. Indeed, this is a consequence of the deeper principle that we are made for truth. Thus, learning should be a lifelong process. Try to play football without having a rudimentary knowledge of the rules (principles) of the game. Indeed, try to imagine even wanting to play football without ever having heard of it; you can't, it's impossible!

The first step then is to make sure that you have the principles and that does not mean just as a list on a piece of paper. It means you understand them at some general level. Yet, even after having had some fundamental insights into those principles, you are not done yet with the thought end until you have habituated that understanding.

This habituation is step two, and it means that you need to practice thinking through the principles and wrestle with them. Ask deep questions about them. This does not mean to be skeptical and cynical about the ideas or to your teacher. In some ways, it means the opposite. Remember, as Cardinal Newman said, 10,000 questions does not make a single doubt. It means docility to the ideas; it means humility, which is *openness to truth*. It means trying to knock loose your old false understanding by saying "how can this be true given this;" it means being really ready to hear how it can be true, not waiting with a hatchet ready to cut the idea's head off. This attitude of trust rooted in a dedication to

the truth gives you space to divest yourself of false habits and plant new ones. With this attitude, ask hard questions: How can it be that way? If it is that way, then this would be the case and that seems ridiculous; where have I gone wrong?

As you habituate the principles, you will find old insights about the principles deepened and new ones will arise. If it is a deep subject such as philosophy and science, you will find this work yielding insights across your entire experience.

Practice using the principles in arguments and in areas other than the examples your teacher and your reference material use. Of course, this habituation complements and completes the first step. They go together. In fact, though there is a real distinction between each of the four steps, all are necessary for any one to make sense. They are correlatives in the sense that they are all part of human learning. The man who knows a principle and does not use it, to that degree, sacrifices something of his understanding of it and cuts off access to the depths of the reality that those principles capture. Indeed, for such a man the principles quickly become not realities, but mere mental gymnastics. Of course, on the flip side, the man who tries to act without knowing, to the degree he does so, cannot truly act, for it is obviously said of him that "he does not know what he is doing."

Recalling that these steps belong as part of a whole learning process, you will be able to avoid the danger of getting one step out of balance with the rest. For example, you would stay forever on step one if you wait until you understand every possible implication and side of a certain fundamental principle. In other words, you may try to understand everything before you do anything and this is clearly ridiculous. The idea is to get a generic understanding first. Then habituate that understanding and go back later for more

specification of that understanding. The next two steps, which are basically the living of the truths you learn in the first two steps, will open up those specificities for you.

The third step is natural. You have a bunch of new understandings and you now want to know what you can do with them. You know how the car works and the basic rules of the road; you even can bring them to mind and connect the basic concepts, but when and how fast do you turn to avoid hitting the curb and screeching the wheels? How do you safely pass someone? These things have to be figured out. Again, experts are the place to go. But, commonplace examples can be misleading. In such examples, such as driving or football, most know enough of the practical answers to get by at some level. By contrast, when you are learning something truly new, you will not have this (probably largely unconscious) built up storehouse of understanding. Hence, in that more rudimentary case, you really do have to figure out what to do before you try to do anything.

For example, even supposing that you've learned the idea of football and have all the rules at your finger tips so as to be able to understand them with some real ease, if you have never played or seen anyone that was any good play, you would not know how to implement the game. Though you be a burly 6' 5" man, you would still not be remotely competitive with men who know how to play, especially if you have no acquired athletic skills from other activities. Someone has to teach you how to effectively tackle and block, throw and catch the ball, run the ball, and many other things. This learning can happen in principle by reading and/or watching your teacher, but, for most people, there is no real substitute for a good coach.

An even better example is music. Suppose you have learned how to read music and understand with ease how to change key and what major and

minor keys are and all the rest. Someone still must tell you how to hold your fingers and how to get the proper sound and beat by properly pressing the keys and pedals in time. The more you understand the proper technique, the more you will be primed to play.

This brings us to the last, the fourth step. Knowing all the music theory and even knowing the details of *how to play* is not enough; until you actually play, you will not be able to do it with any competence. Indeed, you will not do it well without lots of practice. This last stage makes us take the top level thinking (step 1) that we have habituated (step 2) and used to feed our knowledge of how to play (step 3) and infuse all this knowledge, as it were, into our emotions and generally into our "muscles and bones," so that all we think finally is in our flesh. When we get to this point, we no longer have to think about playing. We just play; it's natural. This is what virtue is. In this case, we now have the virtue or skill of playing the piano. With any virtue, we feel bad immediately when something is wrong, say as our finger slips toward the wrong key, and feel good when things go as they should. Virtue implies that the principles (step 1) are integrated into our emotions and other spontaneous sense responses and actions.

Our thinking has to be integrated, in C.S. Lewis's phrase, into our "chest," into our physical selves, so that it is a part of us. Only when we have finished this last step and have done all the other steps before it can we say that we truly have a skill in the full human sense of the word. Dogs and other animals can be trained to do things. These are not, properly speaking, skills. Skills are, true enough, *analogically* like instinct and good training, but *not* the same. And, training can often help in developing complex skills, for example, in the first step, by giving direct and, in context, sensory exposure to the principles. This is especially true of young children who cannot be taught verbally or by

writing yet. Still, understanding the principles comes first, followed by the other steps in order, for only those whose *understanding has become second nature* really have a skill. A dog has no understanding in the primary sense of the word, so it cannot meet the essential criteria. A dog that executes a trained behavior, no matter how well it does it, does not understand the nature of the trick and as a result does not spontaneously start doing *fundamentally* new tricks; a dog has no understood principles from which to do this. Of course, ordinary music composers, not to mention men like Bach and Mozart, do move beyond their training because it is more than just training, more than just imitation. It is, if done right, habituated or lived understanding that elevates and perfects their nature. They used to have the potential to be musicians; now, after the four steps, they are, to the degree they've done them well, actually musicians.

Those with skills don't always know how to explain what they understand. In some cases, for example with young children, they may not even know that they understand or at least the depths at which they understand. All that is necessary for a skill is to understand and to make that understanding second nature as broken down in the four steps. Of course, as adults living in 21st century America, we should subject our knowledge to careful scrutiny to learn what we know and don't know so as to avoid error and grow in knowledge and in skill.

Of course, to further grow in a skill, one must repeat the four steps again and again, each time integrating the next level of more specified principles. Each iteration, in turn, also deepens and reinforces all that one has learned in previous execution of the four steps. Notice, also, that one starts in the physical with principles given through the senses in step one and ends with those principles becoming physically part of us when they

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become habits, virtues in us in step 4. Hence, to know for us essentially involves the physical.

The four stages of learning apply to *all* areas of life; sometimes they are explicit, sometimes implicit, but they are always there. Now, the deepest most fundamental realm of our being is clearly the most important. That realm begins with basic questions such as: What is the world? How is it here? Why is it here? What am I? Who am I? Why am I here? The answers to these questions should become part of us, body and soul, by applying these four steps. They then lead us to the particulars like music, driving, and football. Each thing we think and do from the highest to the lowest should be truly learned by us, becoming virtues in us by following the four steps, making us more what and who we are meant to be.

Remember that only when we ground ourselves in the truth does anything we do make any sense, for *he who acts without first knowing does not know what he is doing*.

Anthony Rizzi, Ph.D., Director of the Institute for Advanced Physics, gained worldwide recognition in theoretical physics by solving an 80-year old problem in Einstein's theory; has physics degrees from MIT and Princeton University; has been senior scientist for Cal-Tech's Laser Interferometer Gravitational-wave Observatory (LIGO) and taught graduate courses at LSU; worked on the Manned Mars Craft and the Mars Observer spacecraft; received the NASA Award, as well as, a Martin Marietta New Technology Award.

He is author of The Science Before Science: A Guide to Thinking in the 21st Century and A Kid's Introduction to Physics (and Beyond); he has been interviewed in many media outlets. In addition to his professional articles, Dr. Rizzi recently authored the ground breaking texts Physics for Realists-Mechanics and Physics for Realists-Electricity and Magnetism (both recommended by the journal of the American Association of Physics Teachers).

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