英文和繁體中文版
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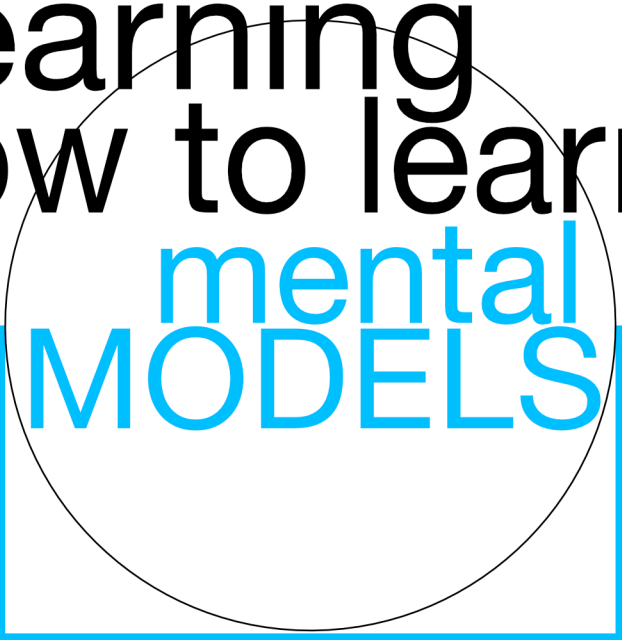
Learning how to learn mental MODELS



A practical philosophy
with basic principles
for learning, creating and dealing with problems

Learn how to:

- Build mental models from dual views
- Act effectively without thinking
- Solve problems intuitively
- Use limits creatively

Neil Keleher

Learning how to learn: mental models

英文和繁體中文版

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Contents

1. Mental models result from learning

Our brain could be thought of as a model builder. It builds models (more specifically: mental models) as a result of anything that we learn. It builds them so we can use them to better experience life.

Mental models result anytime that we learn.

- They have intelligence or processing power or some choice making ability.
- They have inputs and outputs.
- They allow us to act effectively without thinking (via habits).

In terms of construction: * They are (ideally) built using two points of view. * They can be modular in nature. * They can be networked, scaled and modified. * We can choose, to an extent, how they are constructed.

Once built, they process information from our senses (inputs) and they drive actions as a result of what they sense (outputs). How do they drive actions and other outputs? Through habits.

Behind every habit is a mental model.

Habits are the outputs (the actions, thoughts or intuitions) of mental models. Through habits, mental models enable us to act effectively without thinking.

1. 學習產生心智模型

我們的大腦可以被視為一個模型建造者。 它通過我們學到的任何事物建立模型（更具體地說： 智模型）。它建立它們， 以便我們能夠更好地體驗生活。

心智模型是我們學習時的產物。

- 它們具有智能或處理能力或某種選擇製作能力。
- 它們有輸入和輸出。
- 它們允許我們通過習慣（不經思考）有效行動。

在構建方面：

- 它們（理想情況下）是使用兩個視角建造的。
- 它們可以是模組化的。
- 它們可以是網絡化的、可擴展的和可修改的。
- 我們可以在一定程度上選擇它們的構造方式。

一旦建立， 它們就從我們的感官（輸入）處理信息，並且根據它們感知到的內容驅動行動（輸出）。 它們如何驅動行動和其他輸出？ 通過習慣。

每個習慣背後都有一個心智模型。

習慣是心智模型的輸出（行動、思考或直覺）。 通過習慣， 心智模型使我們能夠在不經思考的情況下有效行動。

Acting effectively without thinking

Thinking takes time. Being able to act without thinking allows us to act in a timely manner; it also allows us to focus on other things while our models and their habits take care of the details.

Riding a motorcycle, we learn the various models that allow us to control the bike without having to think. As a result, we can focus on the road ahead and what is on it. Instead of having to think about how to steer, change gears, accelerate or slow down, we can do all of these things without thinking because of the mental models we built while learning how to ride.

Doing high school math, we can do simple math operations without thinking because we've done those simple operations enough times that they've become models and now every time we see 2x8 we know habitually, without thinking, that the answer is 16. As for more complicated math, we can do that too (or elements of that) without thinking because we've learned and repeated the necessary steps enough times that we have a model of it.

Doing yoga, if we've learned a sequence of poses, we don't have to worry about what pose follows the one we are currently doing. We can instead focus on the pose we are currently doing. Then we can focus on moving into the next pose as smoothly as possible. Likewise doing Tai Ji. Knowing the movements, we can focus on doing them while maintaining connective tissue tension between the parts of our body so that the movement of one part is effortlessly transmitted to other parts.

Having learned the parts of a computer system, the mental model of that system allows us to visit the system in our minds eye; we don't have to think about how the parts go together, we know. If there are problems with the actual system, we can use the mental model as a guide to figuring out the source of the problem.

不經思考即有效行動

思考需要時間。 能夠在不經思考的情況下行動， 使我們能夠及時行動； 它還允許我們在我們的模型及其習慣處理細節時關注其他事物。

騎乘摩托車時， 我們學會了各種模型， 使我們能夠在不需要思考的情況下控制摩托車。 因此， 我們可以專注於前方的道路及其上的事物。 而不是必須思考如何轉向、換檔、加速或減速， 我們可以因為學習騎乘時建立的心智模型而不經思考地做所有這些事情。

做高中數學時， 我們可以不經思考地進行簡單的數學運算， 因為我們已經足夠多次地進行了那些簡單的運算， 它們已經成為了模型， 現在每當我們看到 2x8 時， 我們都會習慣性地知道答案是 16， 而不經思 考。 至於更複雜的數學， 我們也可以做到（或其元 素之一）， 因為我們已經學習並重複了足夠多次的必 要步驟， 以至於我們有了它的模型。

做瑜伽時， 如果我們學會了一系列的姿勢， 我們不必思考哪一個姿勢在我們目前做的之後。 我們可以專注於做它， 或盡可能平滑地進入它。 同樣做太極。 知道動作時， 我們可以專注於做它們， 同時保持我們身體各部分之間的連接組織連接， 以便一部分的運動無努力地傳遞到其他部分。

學習了計算機系統的部分後， 該系統的心智模型使我們能夠在心目中訪問該系統； 我們不必思考零件是如何組合在一起的， 我們知道。 如果實際系統 有問題， 我們可以使用心智模型作為指南來找出問題 的源頭。

Doing the thinking ahead of time

While models allow us to act effectively without thinking, this isn't to say that models completely remove the need to think. Instead, with mental models, we do most of the thinking ahead of time (or *outside of the flow of time*), as part of the process of building them or reviewing them.

> Here it can help to define thinking as a tool that allows us to break things down into clearly defined elements and put those elements into clearly defined groups. It's also what enables us to choose the scale of breakdown and to define the groups that we put the elements into.

It's because the different processes of thinking take time that it helps to do the thinking ahead of time.

提前進行思考

雖然模型允許我們在不經思考的情況下有效行動， 但這並不意味著模型完全消除了思考的需要。 相反，有了心智模型， 我們大部分的思考都是提前進行的（或在時間流之外）， 作為建造它們或審視它們的過程的一部分。

> 在這裡， 將思考定義為一種工具是有幫助的， 它允許我們將事物分解成清晰定義的元素並將這些元素分組。 它也使我們能夠選擇分解的規模並定義我們將元素分入的組。

這是因為思考的不同過程需要時間， 所以提前思考有助於我們。

Defining the act of thinking

Thinking basically involves mentally cutting things up so that we can better understand them. We don't get full understanding from this cutting up, but it is part of the process of developing understanding, of building a mental model.

As mentioned, thinking takes time. It takes time to figure out how to cut things up, then once we've done that, more time is taken to study, practice or learn what we've cut up. (Cutting things up allows us to learn the parts of a system; from there we learn how those parts work with each other, transmitting signals or more generally *change* between each other.)

The idea of learning, of building mental models is to do this ahead of time, as part of learning, as part of practice so that when the need arises we can act effectively without thinking, without the time lag that thinking tends to incur.

定義思考行為

思考基本上涉及到心智上的切割， 以便我們能更好地理解它們。 我們通過這種切割並不能完全理解， 但這是發展理解、建立心智模型過程的一部分。

如所述， 思考需要時間。 它需要時間來弄清楚如何切割事物， 一旦我們做到了， 還需要更多時間來學習、練習或了解我們切割的內容。 （切割事物使我們能夠學習系統的各個部分； 從那裡我們學習這些部分如何相互作用， 傳遞信號或更一般地改變彼此。）

學習的想法， 建立心智模型是提前進行的， 作為學習的一部分， 作為練習的一部分， 以便當需要時我們可以在不思考的情況下有效行動， 不會因思考而延遲時間。

Learning to act effectively without thinking

While mental models allow us to act without thinking our models aren't always correct and so a big part of learning is testing our models, and improving them. The better we are at testing and improving our models, the more effectively we can act without thinking.

If we understand learning as a process of building and improving mental models, the better we understand the process, no matter what it is that we are learning, the better we can learn and the more effectively we can use that learning. In addition, the simpler and easier learning becomes.

學習在不思考的情況下有效行動

雖然心智模型允許我們在不思考的情況下行動， 但我們的模型並不總是正確的， 所以學習的一大部分是測試我們的模型， 並改進它們。 我們在測試和改進模型方面越是熟練， 我們在不思考的情況下行動就越有效。

如果我們將學習理解為建立和改進心智模型的過程，我們對這個過程的理解越深， 無論我們在學習什麼，我們的學習就越好， 我們使用學習成果的效果就越 大。此外， 學習變得更加簡單和容易。

Enabling spontaneity

Our mental resources are limited. Thinking takes resources as does noticing what is happening around ourself (or within ourself).

With the automated actions (habits and intuitions) that mental models provide, we can devote our limited processing power and attention to noticing what is happening as it happens. Our mental models can take care of responding.

Mental models tie into our senses and our ability to respond. Thus they can drive responses to what we sense without us having to think.

> Mental models and their habits allow us to be spontaneous in handling change and creating it.

Note, where models are used to represent complex systems (whether those systems are outside of ourselves, or systems that we are a part of), they can help us intuit answers to problems with the system. But failing that, they can make thinking through to the answer easier.

促使自發性

我們的心智資源是有限的。 思考需要資源， 注意我們周圍（或我們自己內部）正在發生的事情也是如此。

有了心智模型提供的自動化行為（習慣和直覺）， 我們可以將有限的處理能力和注意力用於注意事情發生的瞬間。 我們的心智模型可以負責回應。

心智模型與我們的感官和我們的反應能力相連。 因此它們可以在我們不需要思考的情況下驅動對我們所感知到的反應。

> 心智模型及其習慣使我們能夠在處理變化和創造變化時自發地行動。

請注意， 在模型被用來代表複雜系統時（無論這些系統是在我們自己之外， 還是我們是系統的一部分），它們可以幫助我們直覺地解答系統問題。 但是如果 沒有，它們可以使思考以找到答案變得更容易。

Improving models and the process of building them

The idea of this book is to provide a framework and the necessary understanding for improving the mental models we build and use, and for improving the process of building them. It's to help reduce learning effort while at the same time improving our ability to use models to successfully handle both the expected and the unexpected.

> One basic assumption is that we can actively (or consciously) be part of the model building process.

As well as helping to reduce learning effort, other benefits include reducing frustration and making learning a more enjoyable experience.

> These benefits can come about from understanding that we can implement model building at any time, (and thus create new habits on the fly), and acting on that understanding.

By learning how to learn (and how to build mental models) we won't have to spend quite as much time in figuring out how to learn something. We can get on with doing it.

改進模型及其建立過程

這本書的想法是提供一個框架和必要的理解， 以改善我們建立和使用的心智模型， 以及改善建立它們的過程。 它旨在幫助減少學習努力， 同時提高我們使用模型成功處理預期和意外的能力。

> 一個基本假設是我們可以主動（或有意識地）參與模型建立過程。

除了幫助減少學習努力外， 其他好處包括減少挫折感並使學習成為更愉快的經歷。

> 這些好處可以通過理解我們可以隨時實施模型建立（從而隨時創建新習慣）， 並根據這一理解採取行動而實現。

通過學習如何學習（以及如何建立心智模型）， 我們就不必花那麼多時間去弄清楚如何學習某事。 我們可以直接進行。

Getting better at handling change

If we get better at building modular models, we may find it easier to deal with unexpected change, even when it is change that we've never experienced.

We can work towards handling unexpected change without having to think.

> And while that can take a while to work towards, in the interim, we can work towards better handling change by thinking clearly and figuring out what we need to do without getting flustered or upset.

更好地處理變化

如果我們在建立模塊化模型方面變得更好， 我們可能會發現更容易應對意外的變化， 即使是我們從未經歷過的變化。

我們可以努力在不需要思考的情況下處理意外變化。

> 而雖然這可能需要一段時間來實現， 但在此期間，我們可以通過清晰思考， 弄清楚我們需要做什麼，而不是感到慌亂或沮喪， 來更好地處理變化。

Enabling the power of choice

A guy named Derek Sivers did a blog post entitled *Tech Independence*. Towards that end the blog post focused on helping readers get an OpenBSD server up and running so that they could be less dependent on tech companies. With the server they could have their own online *cloud repository* as well as a host for their own website, private email and even a contact list.

While the end result isn't complete independence, the result could be thought of as *being as independent as possible*.

> This book has a similar goal, to help make us **as independent as possible when learning**.

Knowing how to learn gives us more choices both in what we learn and how we learn it, with or without the help of experts or coaches. It makes us a little more independent.

To frame it another way, with AI one of the bigger challenges is (or was) AI learning. If learning is so important in developing AI, it's probably quite important for us as humans also.

Learning how to learn gives us the power of choice. If we learn how to learn, we can choose what we learn and how.

啓用選擇的力量

一位名叫 Derek Sivers 的人做了一篇題為科技獨立性的部落格文章。 為了這個目標， 這篇文章著重於幫助讀者搭建一個 OpenBSD 伺服器，使他們能夠減少對科技公司的依賴。 有了這個伺服器， 他們就可以擁有自己的線上雲端儲存庫，以及自己的網站、私人電子郵件和甚至是聯絡人名單的主機。

雖然結果並非完全獨立， 但可以被視為盡可能地獨立。

> 這本書有著相似的目標， 幫助我們在學習時盡可能地獨立。

了解如何學習讓我們在學習什麼和如何學習方面有更多選擇， 無論有沒有專家或教練的幫助。 這使我們變得更加獨立。

換句話說， 對於 AI 來說， 其中一個較大的挑戰是（或者說曾經是） AI 學習。 如果學習對於發展 AI 如此重要， 那對我們人類來說也可能相當重要。

學會如何學習賦予我們選擇的力量。 如果我們學會了如何學習， 我們可以選擇學習什麼以及如何學習。

2. Habits allow us to act without thinking

Habits are things that we do automatically, generally without thinking about how to do them. They are triggered in response to something we sense, feel or think. The trigger can come from outside of ourselves or it can come from inside of ourselves, whether from a physical sensation or experience, a particular emotion or even a thought.

The trigger feeds into the input of a model and the model then outputs a controlled response. This response is a habit.

Turning habits into options

We may tend to think of habits as things that we can't control. One reason is that these uncontrollable habits are our sole responses to particular inputs. We have only a single model handling the particular inputs that this uncontrollable habit responds to.

A way around this is to develop other models that respond to these same inputs. We then develop options. These additional models enable us to choose how we respond.

2. 習慣讓我們無需思考就能行動

習慣是我們自動執行的事情， 通常不需要思考如何去做。 它們是對我們感知、感覺或思考的某些事物的反應。 這個觸發可以來自我們自己的外部， 也可以來自我們自己的內部， 無論是來自於一種身體感覺或經驗、特定的情緒， 甚至是一個想法。

這個觸發進入模型的輸入端， 然後模型輸出一個控制反應。 這個反應就是一個習慣。

將習慣轉化為選項

我們可能會傾向於將習慣視為我們無法控制的事物。 其中一個原因是這些無法控制的習慣是我們對特定輸入的唯一反應。 我們只有一個模型來處理這個無法控制的習慣所響應的特定輸入。

一種解決方法是開發其他模型來響應這些相同的輸入。 然後我們發展出選項。 這些額外的模型使我們能夠選擇如何響應。

Habits can be modularized

We may tend to think of habits as large scale sets of actions.

Habits can be quite small and simple. And we can deliberately make them that way. We can create habits that are small and simple by breaking down what we learn.

- Smaller habits, or *micro habits* can be easier to learn. They can also be easier and more efficient to change and modify.
- Micro habits can potentially be used like modules meaning that we can sum or combine habits (or if you like, we can sum or combine the outputs of the models behind these habits.)
- Using these smaller habits like modules can, over the course of time, reduce overall learning effort and can give us greater flexibility and creativity in anything that we do.

> Whether large scale or small, habits potentially make our life easier because they allow us to act without thinking. That being said, part of the process of creating habits involves using thought (the *thinking mind-state*) to break down what we are learning into bite-sized, easy-to-digest chunks that fit within the limits of our short-term memory.

By thoughtfully building mental models and the underlying habits, we may be able to work towards more effective learning simply because we can re-use previously learned mental models.

習慣可以模塊化

我們可能會傾向於將習慣視為大規模的行動集合。

習慣可以非常小且簡單。 而且我們可以刻意使它們變成這樣。 我們可以通過分解我們所學到的知識來創造出小而簡單的習慣。

- 較小的習慣，或微習慣可能更容易學習。 它們也可能更容易並且更有效地改變和修改。
- 微習慣可以像模塊一樣被使用，這意味著我們可以將習慣（或者如果你喜歡， 我們可以將這些習慣背後的模型的輸出）相加和組合。
- 使用這些較小的習慣像模塊一樣，隨著時間的推移， 可以減少整體學習的努力， 並且在我們所做的任何事情上賦予我們更大的靈活性和創造力。

> 無論是大規模還是小規模， 習慣潛在地使我們的生活變得更輕鬆， 因為它們讓我們無需思考就能行動。 這就是說， 創建習慣的過程中的一部分涉及使用思考（思考心態） 來將我們正在學習的內容分解成一小塊一小塊易於消化的塊， 這些塊適合我們的短期記憶的限制。

通過深思熟慮地構建心理模型和底層習慣， 我們或許能夠朝著更有效的學習努力， 僅因為我們可以重複使用之前學到的心理模型。

Mental Models: Learning how to learn[1]

[1] https://leanpub.com/mentalmodels-zh-en