

The Art of Learning #1

Do you have something you want to _____ or _____? Whether it is a foreign language, a skill set, an _____, a sport, or a musical instrument, _____ a _____ time. _____ to _____ skills without effort, _____ the best way to make an effort is also important. Working hard means not only investing time and energy but also figuring out the _____ way. Of course, just _____ knowledge without effort is _____ question. Besides, there must _____, so _____ for others may not necessarily work for you. You cannot _____ know whether it is the best way for you _____. However, if you choose the fundamentally wrong way, your effort will not _____. _____, the latest findings from _____ and _____ psychology have demonstrated the mechanism of learning; more specifically, how the human brain forms memories and _____. By combining the scientific insights and your personal experiences, you will be able to _____ the best way for you. How can we learn things the most _____?

Do you have something you want to acquire or improve? Whether it is a foreign language, a skill set, an expertise, a sport, or a musical instrument, mastery requires investing a certain amount of time. Though it is impossible to enhance your skills without effort, pursuing the best way to make an effort is also important. Working hard means not only investing time and energy but also figuring out the most effective way. Of course, just collecting knowledge without effort is out of the question. Besides, there must be some individual variations, so what works for others may not necessarily work for you. You cannot ultimately know whether it is the best way for you unless you try it. However, if you choose the fundamentally wrong way, your effort will not bear fruits. Fortunately, the latest findings from neuroscience and cognitive psychology have demonstrated the mechanism of learning; more specifically, how the human brain forms memories and solves problems. By combining the scientific insights and your personal experiences, you will be able to figure out the best way for you. How can we learn things the most efficiently?

acquire	習得する	fundamentally	基本的に
mastery	熟達	bear fruits	実を結ぶ
enhance	向上させる	demonstrate	証明する
pursue	追求する	cognitive	認知の
expertise	専門知識	neuroscience	神経科学

The Art of Learning #2

_____ knowledge can be _____ into two _____; declarative knowledge and procedural knowledge. The former is a knowledge of facts and information that can be _____ or described, _____ the _____ is a knowledge of how to perform tasks and actions, involving skills and _____, _____ usually unconscious of. For example, knowing that you must _____ “s” at the end of the _____ is third-person _____ is a form of declarative knowledge. You are consciously _____, and you can explain it. However, as many people know from experiences, just having the knowledge doesn’t necessarily mean you can use _____ practice. If you can _____ “s” without even thinking, it is a procedural knowledge. Some learning are only valuable _____ become procedural knowledge. Even if you learn a useful _____ for daily conversations in a foreign language, it’s almost meaningless _____ you can _____ and _____ it’s needed. _____ a foreign language, math calculation, or specific movements in sports, _____ declarative knowledge is not enough to perform _____ and effectively. Of course some kinds of knowledge are even valuable as declarative knowledge, such as the _____ World War II _____ 1945 and the _____ of a triangle _____ 180 degrees. Learners have to know whether the knowledge they are _____ should be _____ declarative or procedural knowledge. If it needs to be procedural knowledge, listening to lectures and reading textbooks are _____; learners should practice _____ they can _____ and subconsciously.

What we call knowledge can be divided into two categories; declarative knowledge and procedural knowledge. The former is a knowledge of facts and information that can be explicitly stated or described, while the latter is a knowledge of how to perform tasks and actions, involving skills and procedures, which you are usually unconscious of. For example, knowing that you must add an “s” at the end of the verb when the subject is third-person singular is a form of declarative knowledge. You are consciously aware of the rule, and you can explain it. However, as many people know from experiences, just having the knowledge doesn’t necessarily mean you can use it in practice. If you can automatically put an “s” without even thinking, it is a procedural knowledge. Some learning are only valuable when they have become procedural knowledge. Even if you learn a useful phrase for daily conversations in a foreign language, it’s almost meaningless unless you can recall it immediately and automatically when it’s needed. Be it a foreign language, math calculation, or specific movements in sports, knowing it as declarative knowledge is not enough to perform smoothly and effectively. Of course some kinds of knowledge are even valuable as declarative knowledge, such as the fact that World War II ended in 1945 and the interior angles of a triangle add up to 180 degrees. Learners have to know whether the knowledge they are about to acquire should be held as declarative or procedural knowledge. If it needs to be procedural knowledge, listening to lectures and reading textbooks are not enough; learners should practice repeatedly so that they can perform it automatically and subconsciously.

declarative	宣言的な	recall	思い出す
procedural	手続き的な	interior angle	図形の内角
consciously	意識的に	subconsciously	無意識に
automatically	自動的に		

The Art of Learning #3

One of the most important strategies in effective learning is called active recall. As the name _____, it is a practice to actively try to remember the content of learning. This technique, also _____ retrieval practice, has been proven to increase _____ - _____ memory, _____, and _____ identify knowledge gaps. Listening to lectures and reading textbooks _____ are _____; true learning is completed _____ some form of effort to recall. Specifically, you can take tests _____ on, explain or teach your knowledge to _____, or _____ on a _____ paper. Even just recalling the information in your mind can be effective to some extent. For example, you can _____ your memory just by trying to _____ you learned today on your way back home _____ school. The point is to bring the knowledge _____ possible. In _____ this, the value of testing is not just to check if you remember things. Having a test itself becomes a _____ retrieval practice to enhance your _____ - _____ memory. Also, you can _____ your knowledge gaps, which can be the next target for input learning. Taking an exam _____ before and after the test, _____ we do _____. In _____ its efficiency, the importance of active recall is _____. A _____ shows that the effectiveness of active recall is not _____ understood by many. Moreover, retrieval practice is tough. Recalling information _____ our memory is _____, and we could be _____ ourselves by recognizing the fact that we don't remember or understand. However, the hardship of active recall may be a _____ a necessary _____ for our growth.

One of the most important strategies in effective learning is called active recall. As the name suggests, it is a practice to actively try to remember the content of learning. This technique, also termed as retrieval practice, has been proven to increase long-term memory, aid later retention, and help identify knowledge gaps. Listening to lectures and reading textbooks alone are insufficient; true learning is completed when it involves some form of effort to recall. Specifically, you can take tests early on, explain or teach your knowledge to someone else, or write it out on a blank sheet of paper. Even just recalling the information in your mind can be effective to some extent. For example, you can enhance your memory just by trying to bring to your mind what you learned today on your way back home from school. The point is to bring the knowledge out of your memory storage with the least amount of clues as possible. In light of this, the value of testing is not just to check if you remember things. Having a test itself becomes a form of retrieval practice to enhance your long-term memory. Also, you can recognize your knowledge gaps, which can be the next target for input learning. Taking an exam improves learning before and after the test, even if we do poorly on it. In spite of its efficiency, the importance of active recall is often overlooked. A survey shows that the effectiveness of active recall is not properly understood by many. Moreover, retrieval practice is tough. Recalling information from our memory is cognitively demanding, and we could be disappointed with ourselves by recognizing the fact that we don't remember or understand. However, the hardship of active recall may be a kind of a necessary investment for our growth.

retrieval	検索	overlook	見落とす
retention	保持	cognitively demanding	認知的に負担の大きい
insufficient	不十分な	recognize	認識する
clue	手がかり	investment	投資

The Art of Learning #4

A Chinese politician and poet in the 11th Century, Ouyang Xiu listed three _____ situations to come up with good _____; on a horse, a pillow, and toilet seat. An interesting fact about human intelligence is that the brain is _____ the _____ when we are not actively and consciously thinking about it. This function is called the _____ network. It is a subconscious process, so we are not _____. _____ the time _____, our _____ network has been working in the background, looking for a solution, combining different _____ information, and _____. _____, when we are asleep, the brain organizes the information we learned _____ the day and _____ into long-term memory. The brain continues the work even when we are taking a rest or doing something else, _____ possibly _____ the following two insights _____ learning. Firstly, _____ that we should _____ our study time _____ one session. For example, if you can spend 7 hours _____, it's better to _____ into 1-hour sessions in 7 days, _____ studying for 7 hours straight in a day. By _____ study sessions, we can make the best use of both the default mode network and memory consolidation by sleep. What matters is having the _____ studying, resting, and studying again. Another implication is that we should start working on large projects or _____ tasks _____ possible and _____. Whether it is solving a difficult math problem or writing a long essay, you _____ early on. When you _____ a _____, don't _____, and take a step back. This is not giving up, _____. The next time you return to work, you can _____ the background processing your brain has been doing. Ouyang Xiu _____ consciously _____ essays on horseback, _____ good _____ just by sleeping. Probably he had once already _____ on his desk, and _____ him, his brain continued the work on a horse and a pillow.

A Chinese politician and poet in the 11th Century, Ouyang Xiu listed three suitable situations to come up with good sentences; on a horse, a pillow, and toilet seat. An interesting fact about human intelligence is that the brain is even working on the problem when we are not actively and consciously thinking about it. This function is called the default mode network. It is a subconscious process, so we are not aware it's happening. During the time off, our default mode network has been working in the background, looking for a solution, combining different pieces of information, and handing it over to us. In addition, when we are asleep, the brain organizes the information we learned during the day and consolidates it into long-term memory. The brain continues the work even when we are taking a rest or doing something else, which possibly leads to the following two insights about effective learning. Firstly, it implies that we should space our study time rather than compress it into one session. For example, if you can spend 7 hours in total, it's better to distribute it into 1-hour sessions in 7 days, instead of studying for 7 hours straight in a day. By interspacing study sessions, we can make the best use of both the default mode network and memory consolidation by sleep. What matters is having the cycle of studying, resting, and studying again. Another implication is that we should start working on large projects or daunting tasks as soon as possible and willingly stop when we get stuck. Whether it is solving a difficult math problem or writing a long essay, you should begin early on. When you hit a roadblock, don't persist, and take a step back. This is not giving up, but a tactical retreat. The next time you return to work, you can benefit from the background processing your brain has been doing. Ouyang Xiu may not have consciously composed essays on horseback, nor did he come up with good sentences just by sleeping. Probably he had once already worked on it on his desk, and unbeknownst to him, his brain continued the work on a horse and a pillow.

suitable	適した	persist	固執する
consolidate	固める	retreat	退く
interspace	間隔を空ける	compose	作成・作文・作曲する
daunting	ひるむような	tactical	戦術的な
willingly	自発的に	unbeknownst	知られずに

The Art of Learning #5

The primary point for effective learning is _____. We can maximize the learning efficiency and retention by repeating the same content on different days _____. However, we _____ in what we learn within the same day. Mixing related but _____ study is called “interleaving” by cognitive scientists, _____ studies demonstrating the importance of this technique, including a 2007 study from University of South Florida. The subjects learned how to calculate the _____ of four _____ of solids, _____ were given 16 problems to solve. The _____ were divided into 2 groups. The first group learned one type of solids, like _____, and solved 4 problems to calculate the volumes of _____, and repeat the same process with other 3 types of solids. This strategy is often called _____ study. The second group of the subjects did interleaved study; they learned 4 solids _____, _____ 16 problems _____ the four types of solids were _____. A week later, they took another test. When they solved the 16 problems, the blocked study group _____ higher _____ the interleaved, but in the test a week later, the interleaved study group _____ the other group. This is not only true for mathematics but also for other subjects, and even for practicing sports. _____, many people believe that blocked study is more effective than interleaved study; the _____ impression is wrong. When we repeat the same content in a day, we can _____, _____ we _____. When learning English, if you have continuously studied the _____, it is obvious that the next problem will also _____, and you can _____ because you _____. What is difficult _____ is that you can judge whether or not to use the _____ and properly _____ your memory _____ since the last time you used it.

The primary point for effective learning is interspaced repetition. We can maximize the learning efficiency and retention by repeating the same content on different days with intervals. However, we should have variations in what we learn within the same day. Mixing related but distinct material during study is called “interleaving” by cognitive scientists, and there are numerous studies demonstrating the importance of this technique, including a 2007 study from University of South Florida. The subjects learned how to calculate the volumes of four different types of solids, and then they were given 16 problems to solve. The participants were divided into 2 groups. The first group learned one type of solids, like cylinders, and solved 4 problems to calculate the volumes of cylinders, and repeat the same process with other 3 types of solids. This strategy is often called blocked study. The second group of the subjects did interleaved study; they learned 4 solids all at once, and then they solved 16 problems where the four types of solids were randomly mixed. A week later, they took another test. When they solved the 16 problems, the blocked study group scored higher on average than the interleaved, but in the test a week later, the interleaved study group outperformed the other group. This is not only true for mathematics but also for other subjects, and even for practicing sports. More importantly, many people believe that blocked study is more effective than interleaved study; the general impression is wrong. When we repeat the same content in a day, we can temporarily perform it with ease, which deceives us that we have acquired it. When learning English, if you have continuously studied the present perfect tense, it is obvious that the next problem will also require it, and you can solve it easily because you have just used it. What is difficult but important is that you can judge whether or not to use the present perfect tense and properly drag it out from your memory even though it has been a while since the last time you used it.

interweave	綴じ込む	impression	印象
subject	被験者	deceive	騙す
volume	体積	present perfect tense	現在完了形
cylinder	円柱	drag out	引き出す
outperform	しのぐ、上回る		