Conceptualising the Learning Process: Tackling New Skills Efficiently

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A study exploring how to optimize the learning process; identifying the different types of skill and reasoning about how to learn them to maximum proficiency.

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First it is important to identify who this report is for. This is for people who are planning on achieving goals which require attaining specialised knowledge in a field that they don't already know everything about. For example: this report can be used by an aspiring tennis player who wishes to become the best tennis player in the world- the goal, in this case, "being the best tennis player in the world", the field being tennis.

Second it is important to clarify the different types of skill there are and to explain how best to attain proficiency in them. There are three type of skills.

PHYSICALLY PRACTICAL SKILLS

These are skills that you apply with your body. Examples are: tennis, boxing. Most sports go in this category.

GAME-BASED SKILLS

We define a game to be an endeavour for which there are a fixed, finite set of uniquely identifiable rules that one must operate within, to achieve a defined notion of success, or end-goal within the game. This end goal must be expressible in some consistent language. Examples of game-based skills are: chess, checkers, poker. The end goal of these games is expressible in consistent language; in chess, notions of the "King" and the "Board" are consistent when describing the rules of the game and in describing the winning state.

ARTISTIC SKILLS

We define artistic skills as game-based skills which do *not* have a finite fixed set of uniquely

Authors' Note: I have opted to omit inline citations within the text as I feel they interrupt the flow of reading. All references are included at the end.

identifiable rules, and "success" is subjectively recognised- it is recognised by another individual's (or individuals') *personal* ruleset; an individual may decide that "good singers must be able to sing falsetto", which would rule singers that cannot sing falsetto as "unsuccessful singers". Examples of artistic skills are: playing the guitar, debating, painting.

SKILL PROFICIENCY

For physically practical skills and game-based skills, an agent that is *infinitely proficient* is an agent that can respond favourably to every situation. If we take the example of tennis, a perfect tennis player (i.e. an *infinitely proficient* tennis playing agent) would be able to respond to every permutation of the ball position (visual information); the court material and wind patterns (somatosensory information); and any other sensory information input and respond favourably - successfully return the ball.

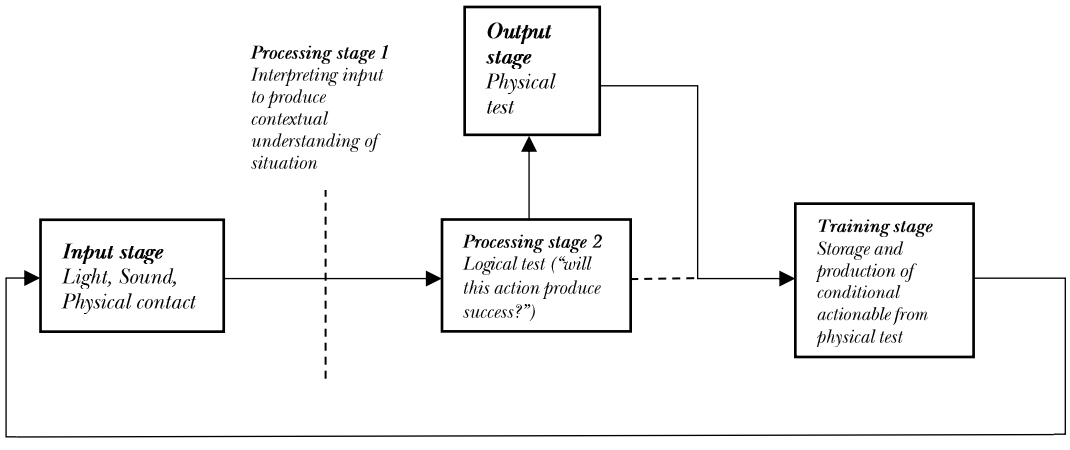
For artistic skills, proficiency is the ability to translate input information into a wide variety of outputs. An infinitely proficient painter can re-create any painting that has ever been painted and every painting that ever *will be* created[1]. Sensory input information in artistic endeavours is more commonly referred to as "inspiration".

THE LEARNING PROCESS

The learning process can be modelled as a cycle: information is first inputted into the brain through sensory organs; then the information is processed- taken from this raw sensory data into a form we can understand; then this information is *tested*, and we learn more about the information from this test to produce a *conditional actionable*, i.e. we *train* the brain using a combination of the processed sensory information and the test on this information. To give an example of each let us examine tennis once more.

Imagine you are playing tennis. The raw sensory data is the light hitting the eyes, chemical reactions etc, and the processed form of this information is the understanding that "a tennis ball is hurtling towards my left hand"; "the court material is soft" etc. The logical test then, would be "if I hit the ball with the back of the racket (or perform a backhand) in this specific way, will I successfully return the ball?", coupled with the physical test action of performing the backhand. If you were to successfully return the ball in this instance, the brain would be trained with this new conditional actionable: "if the ball is hurtling towards my left hand and the court is softer than usual, performing a backhand in [this specific

Fig 1: The learning cycle



way] will allow me to successfully return the ball". Fig 1. Shows this cycle in more detail.

The same can be applied to artistic skills; a painter will take raw sensory *inspiration* and then attempt to recreate the abstract processed information either successfully or unsuccessfully and learn from that experience.

OPTIMISATION

From this construction we can see that:

1) *Increasing quantity of input information is always favourable.*

The more input information is available, the more varied the tests can be. Increasing input information is tantamount to increasing the breadth of proficiency.

2) *Increasing quantity of physical test information is always favourable.*

Physical test information produces conditional actionables, which increase proficiency. Input information would be useless without physical test information, as would logical test information; you cannot build up a skill set based on the hypotheticals from the logical test stage, they must be physically tested to produce conditional actionables. Increasing physical test information is tantamount to increasing depth of proficiency.

3) *To optimise for time, you must speed up the rate of processing and rate of physical testing.*

We can say that the "rate of input" is fixed as this is bound by the laws of nature, but the speed at which the information is processed is not necessarily bounded in the same way. Therefore, speeding up the learning process can be achieved by speeding up the rate of processing and/or the rate of physical testing.

DRUGS

Certain drugs may influence the rate of processing stage 2 and, in some cases, rate of testing. Depressants may increase the rate of physical testing but slow the rate of processing and logical testing, stimulants and psychedelics may increase the rate of processing and logical testing.

One can stay stuck in the logical processing stage when learning more nuanced/complicated skills, but this can be potentially mitigated by taking depressant drugs such as alprazolam or alcohol. Let us imagine an agent that wishes to learn such a skill.

- The agent receives input information at time $t = 0$
- The agent processes the information at processing stage 1, after which $t = 0 + p$
- The agent spends some time *deciding what to do*, or processing the information at processing stage 2, after which $t = 0 + p + \sum_0^n d$ where $\sum d$ = *total time taken to process each logical test* (i.e. "what happens if I do [potential action 1], what happens if I do [potential action 2]… what happens if I do [potential action n]")
- The agent completes the cycle at $t = 0 + p + \sum_0^n d + x$ or $t = x + p + \sum_0^n d$
- As n becomes large, a lot of time is wasted at processing stage 2 as no conditional actionables are being made

Depressants may lower the number of logical tests made at processing stage 2 (or lower *n)*, thus increasing the rate of testing. Alprazolam specifically appears to drastically lower *n,* perhaps in some cases to just one logical test.

Conversely, psychoactive substances such as THC and lysergic acid diethylamide may increase the *rate* of logical test production, which can be helpful if we assume that the number of logical tests made is independent of the input from the input stage (or random), but this is currently unclear.

It is also unclear what effect different drugs have on the other stages of the learning cycle; perhaps they have an influence over processing stage 1 and the training stage which is potentially negative.

CONCLUSION

To learn a skill efficiently you must immerse yourself in the appropriate learning environment as to maximise the amount of unique input information you are receiving and perform physical tests as quickly as possible. This will make for an increase in both the breadth and depth of skill proficiency.

Also consider the use of depressant drugs, as this can increase the rate at which logical tests are physically tested to produce conditional actionables.

LIMITATIONS AND FUTURE DIRECTIONS

Lack of empirical data due to difficulty in benchmarking rates of learning and processing make it difficult to draw solid conclusions about the effect of drugs on learning. Going forward it is important to get better equipment and think about how to record the effects of substances on all the different learning stages.

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