Learning - theory and practice

Motives

Most people want to learn stuff. Some people want to learn more stuff than others. Some people prioritize learning higher than other people. But what is true for all people, is that they should get the most out of the time they spend on learning. This essay is about just that, systematizing one's learning to get the most out of the time spent.

The concept of info density

The concept is based on an analogy, as are concepts often. Think of a given chemical that is soluble in water. The water can contain more or less of this chemical. So it is with language. Think of info as being communicated via expressions of language. Expressions can contain more or less info. In other words, it is possible to communicate the same info with different numbers of expressions, of different lengths. This info per language is the **info density**. Perhaps as an approximate one can use words as the unit of language (L), and propositions as the unit of info (I). $\rho = \frac{I}{L}$

The concept of relevant info

There is a lot of info communicated by a stream of language. It is not all that info we care about. Generally, when learning, one is interesting in some more restricted class of info, say, info about genetically modified food. Perhaps more specifically info about the health effects on humans of eating genetically modified food.

Also, generally, when one is learning one is interested in info in the right class, but also info that one does not already have. This is the reason that we don't just read the same book over and over again. It is just repetition. Even though we sometimes do read a book more than once. That is perhaps because we did not read it through properly the first time (read it too fast, perhaps), or want to be extra sure about what it says. But generally, we aren't interested in info that we already have.

Generally, one may refer to info that satisfies both these conditions as **relevant info.** That is the kind of info that we want. We can define a function for this, R. R is the fraction of the info that is relevant.

Speed of the language stream

The speed of which we are exposed to the language stream varies. In reading, this various with reading speed, which is adjustable. In listening, it depends if it is live or not. If it isn't live, then one can perhaps speed up the language stream. For instance, if one is watching a lecture in VLC, one can speed up the playback. If the speech stream is live, one can perhaps ask the speaker to speak faster. But in many cases this is not possible, such as lectures, or perhaps the person is already at his maximum speed (maximum speed without starting to be incomprehensible to the listener).

There are physical limitations as to how fast things can go. Even given a very low info density, sooner or later it does not work to increase the speed of the speech stream. There are simply limits on how fast speech go be while one still is able to recognize the words. For reading there is a similar limit. It is possible to adjust one's reading speed, especially with training. But there are limits, sooner or later it is simply not possible to recognize the words any faster.

More formally, the speed of a language stream is language over time. Same unit as language as before, and the unit for time can be seconds as in SI. $v_{stream} = \frac{L}{t}$

Speed of info stream

Combine the concepts above and one gets the speed of the info stream. It is the speed by which info is communicated with the language stream. This is generally faster for written language streams, since reading a word is faster than listening to it.

Generally, the higher the speed of the info stream, the less percentage of the info one will acquire. This is a function of intelligence. Smarter people are faster at acquiring info in part because they can do it faster. The function is perhaps not linear. Perhaps there are thresholds where all info in the stream is acquired until that threshold is met for that person at that time. I write “at that time” because it varies with levels of tiredness, hunger, attention level, and so on.

Formally, the info speed is info per time. $v_{info} = \frac{I}{t}$

Skipping irrelevant info

Sometimes there are long parts of a language stream that contains only, almost only, or just mostly irrelevant info. This is because the info is some that one already has, or because the info is not in the right category. For instance, if one is exclusively interested in whether eating genetically modified

food causes cancer in humans, then info about the effects of eating genetically modified food on the fur of bunnies is not relevant.

If the language stream is non-live speech or written, one can generally skip past the irrelevant parts. It depends on whether the irrelevant parts come together in bunches. If the speaker/writer just spreads irrelevant info throughout the stream, then skipping is no use.

If stream is live-spoken, one can generally not skip. If it is a one to one conversation, then one can perhaps ask the speaker to skip ahead. This may be considered rude. If it is a one to many situation, one can generally not skip past. This is the case with live lectures.

Conceptually, the idea of skipping info is to keep R as close to 1 as possible.

Attention span, mental energy, and available time

Between humans there is variance in how long they can continue to acquire info from a given stream in a row, and for how long in a given day. Some people have a hard time focusing, and others don't. Some people have inexhaustible amounts of mental energy. They can spend their entire day in intellectual endeavors without getting mentally tired. Other people need a lot of time to relax. I imagine that these two correlate positively, but probably not perfectly. Thus, there are going to be people who are good at concentrating, but only for a rather limited mount of time a day, say 4 hours.

Music seems to have some effects on mental energy levels. Music perhaps works only for when one is reading, although it seems possible that some people could get something out of listening to music while listening as well. I find that I can go on for hours if I listen to the right music. Generally one wants to avoid music that distracts one. Often this happens when one begins listening to the lyrics instead of reading or listening to the speech. For this reason, I generally prefer music with either no lyrics, or inaudible lyrics. In that way I don't get distracted.

The relationships between time spent, language speed, info density, and mental energy are perhaps not so simple. Perhaps when one is working near maximum capacity of acquiring info, that is, $v_{maxproc} \approx v_{info}$, then one consumes mental energy faster than if one was working at say, 0.8 capacity. Depending on one's levels of mental energy, it might be an idea to not work as full capacity, but instead work as a little lower capacity so as to not run out of mental energy.

Another thing is relevant to the above, and that is how much time one has to study. If one has close to every hour one is awake, then one should probably spread out one's mental energy over the entire day for optimal maximum info acquired per time. This might or might not involve lowering one's reading speed so as to go on non-maximum capacity.

However, if one only has a few hours a day to study, and the rest of one's day requires little mental energy, then it might be worth it to operate at maximum capacity even if this is somewhat wasteful. Formally, we can define efficiency as info per mental energy, that is, how much info one acquires given one unit of mental energy. $\eta = \frac{I}{E}$

Focus

My thoughts tend to wander. This happens especially when my brain is not working at maximum or close to maximum capacity. When I do, I stop paying attention to the stream of language before me and think of other stuff. In that way, I'm not learning from the stream.

For my focus to work efficiently, I need to avoid streams with low info density. Also, if the info density is too high, it does not work efficiently either, as I will be missing a lot of information. In other words, the optimal is $v_{maxproc} \approx v_{info}$ that is, when the maximum processing speed of info is approximately equal to the actual info speed.

Self-control

People differ in their levels of self-control. In regards to learning, a relevant aspect is the ability to avoid getting distracted by other things. Most relevant today is perhaps the ability to avoid spending many hours talking about irrelevant matters on instant messengers, and not spending a lot of time on social media sites (Facebook, Google+, Twitter) or other similar sites (reddit, 4chan, 9gag).

People who have poor self-control may need to take measures to avoid falling prey to such temptations. Perhaps a good idea is to not read on a computer where there is a browser ready nearby that can take one to one of the sites mentioned before.

Another relevant aspect, is actually taking the time off from other activities to study. Studying necessarily takes time.

Learning a lot

Keeping the above in mind, and adjusting one's behavior so as to maximize R, keep oneself focused, avoid getting distracted, spending time studying, then it is possible to learn much, much faster than people normally learn, even at university levels. Think about it, people normally attend quite a few lectures. From an optimization perspective, this is not optimal. One can learn faster by staying at home if one can find material with relevant info. Luckily, this has become very easy with

the help from the internet.

If one still wants to watch lectures, even socially, then it might still be an idea to stay at home. This is because the teachers vary in their teaching abilities as well. So, perhaps one can find better lectures on the same subject on the internet and watch those instead. If one can, then one can perhaps arrange a study group at home where one watches the lectures. This way one can also skip stuff that isn't relevant, if that is true for everybody in the group.

People vary in their intelligence (relevant to their maximum capacity of acquiring info), their motivation, their self-control skills, and their goals. For this reason, it might be a good idea to study alone, or study with other people similar to oneself in the above traits.