

About Learning

You cannot teach a man anything, you can only help him to find it within himself. Attributed to Galileo, *How to Win Friends and Influence People* (1935) by Dale Carnegie

Introduction

I have spent my childhood and adolescence implicitly believing in ideas about learning that in later life I have come to disbelieve. It appears to me that those ideas are quite common in our society, including among schoolchildren. These false ideas cause significant harm to many of those who believe in them and, being widespread, to society. I therefore think it is important to disabuse students, and particularly children, of these ideas.

The false ideas about learning maintain their hold in the mind of the public mainly because they are rarely examined. One of the false ideas is that the nature of learning is self-evident and needs no examination. This, of course, makes those ideas self-reinforcing.

This essay is a brief description of those erroneous ideas about learning and of an alternative view - in my opinion, the correct view. To make things concrete, I start by listing a set of practical implications of the rejection of the false notions and adoption of the alternative view. These are things that can and should be done by the various people involved in education - students, teachers, and managers of education systems.

Practical implications

What students should know:

1. First and simplest: Students should understand that if they are unhappy with their achievements at school this can be fixed. There is no inherent flaw in the student. It is simply a matter of intellectual investment. If the student is motivated and willing to put in the effort they can become as good a student as they wish to be. Those other students that are doing better are essentially putting in more effort.
2. More generally, students should learn about learning - how learning works, what are its uses and misuses, what is the relationship between the student and the educational establishment, etc.
3. Students should see learning (or not learning) as being their choice and their responsibility. Teachers provide tools for them to learn, but they cannot make them learn, no matter how good the teachers are or how well-paid. Teachers can force the students to sit in class (whether or not this is the right thing to do), but no amount of sitting in class can force students to learn.

What teachers should do:

4. Teachers should see their role as being enablers of learning, not enforcers. Their job is to help the students learn, not to force them to do so. The latter job is simply impossible. While the teachers can try to encourage students to learn in various ways, their primary role is to help students who want to learn to do so.
5. Teachers should focus their efforts on individual student feedback rather than material presentation. Material presentation can be done by books or other non-interactive modes - there is no need for a teacher to be involved. The teacher's foremost function is to be responsive - understand the student's way of thought and respond to it appropriately.
6. Teachers should pay attention to meta-learning - improving their students' learning methodologies. They should understand what are the methods the individual students are using in order to learn and verify that they are effective and successful for each student.

Specific tools and techniques:

7. Homework, assignment and test grading should be viewed by students and teachers as a service that the teachers provide to the students. The grades are tools that allow the students to understand how well they are doing, to identify areas of strength and weakness, and to understand the effectiveness of learning methods. A student who employs good learning methods should have an accurate assessment of their capabilities. Such a student should be able to predict their grade in advance of the test. If a student or a teacher is surprised by test results then they are not learning or teaching effectively. Students should be encouraged to correct homework, assignments and tests based on the teacher's feedback until they meet high standards.
8. Since learning is mostly a matter of processing information rather than acquiring new information, reconsidering familiar material is the main tool of learning. Rather than moving quickly to new material and problems it is better to understand in depth familiar material and problems. Having reached a solution once doesn't mean the material is "known", or that the problem is "solved". Solving literally the same problem over and over is a very important learning technique.
9. To the extent that technology is applied to learning as a way to make the presentation of material better ("clearer", more engaging), it doesn't address the most important part of learning - contemplation. To assist in contemplation the technology would have to be interactive in ways that are flexible enough to match the various ways the students think. Computer programming is a good example of such a technology.

Design of the educational system:

10. The educational system should be built around an "education on demand" principle, i.e., with the aim of providing appropriate learning opportunities to people who want to learn.
11. Evaluation of students' achievement by various means - written and oral tests and homework grading - should be a tool to improve the students' achievements rather than a

tool to compare students to each other.

12. Since interaction with an attentive teacher is an important factor for effective learning, the system should be geared toward maximizing the amount of attention a student can receive by recruiting a large number of motivated teachers. Ideally, a one-to-one teacher-to-student ratio should be achieved.

The absorption model of learning

Growing up, I believed that learning happens in class as a teacher explains new material (a set of ideas or techniques) to the students. This seems like it is obviously the case. The teacher has some knowledge that the students do not. The teacher imparts that knowledge. The attentive and competent student absorbs the knowledge and has thus learned something new. If learning has not occurred, then either the teacher failed to present the material properly, or the student has failed to listen attentively, or possibly the student is intellectually deficient and needs special attention. If some students are doing reasonably well, then the problem cannot be with the presentation. A student who is not doing well must then decide whether their problem is inattentiveness or intellectual deficiency. A student who is trying to pay attention in class and still not doing well must conclude, by elimination, that they are not as smart as those students who are doing better. The alternative, of deliberately and flagrantly not paying attention, seems rather attractive at this point as a way of salvaging self-esteem and saving face publicly.

If learning is a simple matter of absorption, no attention needs to be paid to the act of learning - neither the teacher nor the student are expected to think about what the student is doing - attending class and “doing the homework” should result in “knowing the material”. “Knowing the material” is considered a well defined state with a limited scope. Additional effort may allow studious students to cover more material, going beyond class material, but would not make them understand the class material significantly better. The only ones who are expected to put in more effort, and have attention paid to their learning habits, are those students who do poorly enough to be considered problematic. With more work, and help from others, those students could hope to compensate for their problems and approach the achievements of non-problem students.

If on one side of the academic scale are the intellectually deficient students who try to learn but fail, the other side of the scale is inhabited by the rare creatures celebrated in history and in fiction - the geniuses. The geniuses are people who are able to learn without effort or even without showing up for class. They are the select few who are able to come up with new ideas, rather than merely absorb material presented to them. They are creators of knowledge while the bulk of the learners are copiers, who, when they do create at all, create trivia. The average student can barely understand the geniuses, let alone imitate their achievements. Regular students can, however, and indeed inevitably do, recognize genius. Like olympic athletes whose achievements cannot be imitated by the spectators yet are immediately observable by all, the effects of genius are inimitable, yet at the same time are self-evident and unmistakable. In fact,

according to the absorption model, the entire activity of learning is quite similar to a spectator sport where the creative action is done remotely, separated by time, space and personal characteristics, and the overwhelming majority of those involved are audience, passively basking in the resulting light.

The alternative: the contemplation model of learning

In fact, the absorption model of learning, inevitable as it may seem at first glance, is false. Knowledge is a complex structure. The student can no more absorb knowledge than the teacher can emit it. The teacher can facilitate learning in various ways but the bulk of learning - the creation of the complex structure in the student's mind - occurs as a process of contemplation by the student.

A teacher's input, or other external stimuli, are observed by the student. The creation of knowledge based on those experiences involves identifying patterns in the observations and making connections between those patterns and existing knowledge. As more patterns are identified and more connections are made, the knowledge of the same material becomes more widely applicable. At the same time, the connections made to other pieces of knowledge influence the nature of the newly acquired knowledge, making its structure unique to each learner rather than a duplicate of the knowledge of the teacher.

Effective learning requires self-awareness and conscious effort

The fact that learning takes place mostly as contemplation and involves creating connections with the vast structure of previously constructed knowledge has important implications. First, material is never known fully, and can be known in various ways. Only the beginnings of knowledge can be acquired immediately following a presentation or following a limited amount of consideration. Knowledge of a set of ideas grows the longer and the more intensely it is contemplated.

A second implication is that learning is quite different from the obvious, atomic, automatic, unconscious act that the absorption model assumes it is. Learning is, in fact, a complex activity requiring mental effort which can benefit from conscious examination and training. Students who are aware of the way they learn - how much time and effort they spend, what exactly it is that they do, and what the results are - can improve their learning methodologies and become more effective. Students who are using ineffective learning methods are not only wasting effort and time, but may become discouraged and stop trying to learn certain subjects, or even come to consider themselves intellectually deficient and form a habitual aversion to learning.

Differences in achievement are primarily a reflection of accumulated effort

The implications of the contemplation model open up possibilities for causes of differences in academic achievement that the absorption model does not allow. According to the contemplation model, academic achievement is the product of effort and of the effectiveness of the learning methods, as well as of what may be described as background, or inherent, academic capacity. The absorption model assumes away the impact of the first two factors - learning is viewed as involving only minimal effort and essentially no method. The explanatory burden for differences in academic achievement is therefore placed by the absorption model entirely on the third factor, often referred to as "intelligence". Once the impact of the three factors - effort, methods and inherent capacity - is examined in the light of experience, it turns out that most of the differences in academic achievements between students are attributable simply to variations in the accumulated effort the students spend learning.

Of course, spending effort doesn't necessarily have to be agonizing. Some students enjoy learning certain subjects, or enjoy academic learning in general, and are therefore willingly spending time and energy contemplating certain ideas. Other students find such activity boring or burdensome, or simply feel that they enjoy different activities more, and therefore will not spend time and energy learning, unless as an act of deliberate discipline. And while deliberate discipline can certainly play a role in the amount of effort spent, it is a poor substitute for enthusiasm and enjoyment of learning. It is thus the differences in the propensity to spend the mental effort required for learning (of a particular set of ideas, or more generally as a habit) that are the main reason for differences in levels of knowledge.

Shifting the causal focus for successful learning from intelligence to effort matters a great deal: if intelligence is the prime determinant of successful learning then poor academic achievements are pre-determined and to a large extent unchangeable - neither by teachers nor by the students themselves. The less intelligent students are doomed to their lower achievements, while the more intelligent students are bound to learn more if they only bother to show up (and geniuses will outdo everybody else even without showing up). On the other hand, if successful learning is primarily a matter of effort, then a student who is motivated to do better, and is therefore willing to put in more effort, is almost certain to improve, while the high-achievers are required, in order to maintain this position, to keep putting effort into their studies.

Practical implications for students and teachers

Within the framework of the absorption model, the teacher carries out the following functions: (1) presenting material, (2) enforcing attendance, and (3) measuring and reporting achievement. Since the two latter functions are mechanical, the quality of the teacher is expressed only in terms of the way the presentation is made. Excellent teachers are supposed to be ones whose

presentations are captivating, i.e., causing the students to pay attention, such attention being the only requirement for learning for a competent student.

The contemplation model deemphasizes the importance of the presentation of material. Presentation can be easily replicated through automated means - books and audio-visual media - so it is doubtful whether a live teacher should be engaged in presentation at all. Furthermore, the effect of the presentation on successful learning is minor.

Instead, teachers should emphasize their interaction with the students. By responding to students' queries and providing assistance that is based on understanding the individual student's habits and ways of thinking, a teacher can remove obstacles that could slow a student down considerably, and possibly even result in the student abandoning the effort to learn.

Since interaction is critical, the amount of attention a teacher can pay to each student is a determinant of the quality of teaching. Putting aside all the other effects of large classes (noise, distractions, potential for escalating misbehavior), then, the mere reduction in attention paid to the average student is enough to be significantly detrimental to the students.

Learning techniques should be a matter of high priority to teachers when interacting with students. Teachers should monitor each student's learning activities, methods and results and help the student not only to learn a particular subject, but to become a better learner - more effective and more self-aware - across many areas of study. Homework and tests should be viewed as ways for helping students in guiding their studies and improving their learning techniques rather than tools for the external evaluation of students. The administering of homework and tests and their grading and correcting should be seen as services performed by teachers for the benefit of the students. A student and a teacher employing effective learning techniques should be able to predict the student's test scores pretty well in advance. A student or a teacher who are surprised by the student's grades (and particularly those who are disappointed with the grades) should aim to understand what is the reason for the unmet expectations.

In terms of the curriculum, learning about learning should be considered a crucial subject that is emphasized from a young age. It is crucial that students understand the monotonic relationship between effort and academic success. Students should learn that, almost without doubt and without exception, any student who is motivated to master a certain idea or set of ideas can do so by putting in enough effort. That doesn't mean of course that it is easy to do so (or indeed that putting in the required effort is necessarily the right thing to do). A student may be unmotivated and changing this attitude is difficult. Studying harder may involve breaking with old habits and creating new ones - always a difficult task. But, again, it is essentially purely a matter of motivation.

Conclusion

Abandoning the absorption model of learning in favor of the contemplation model should affect all those involved in learning - the students, the teachers and the designers and administrators of educational systems. If learning is a complex process that could benefit from analysis and examination then the people and systems involved in learning should be self-aware, willing to evaluate the effects of techniques and structures and ready to revise them if necessary. When resources - time, personal effort, and material resources - are spent in one way or another, the students, teachers, designers and administrators should be aware of why they are spent the way they are and consider whether the objectives nominally aimed for are indeed served by the way the resources are spent.

The most precious resource for learning is motivation and it is therefore most important that this resource is spent well. Students who are interested in learning should have the opportunities to do so and have the guidance of teachers in spending their effort effectively and in ways that maintain or amplify their interest. Teachers who are motivated to help students to learn should feel that the system is geared toward achieving that goal.

The contemplative model of learning implies that learning happens best when it involves contemplative students and contemplative teachers within the context of contemplative educational systems.