

The Commons

WHY WE LEARN

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Educating Social Animals?



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Institutionalized education is unique to the human species, and so it must be examined within the paradigms of human history, culture, and values. However, there is an underlying assumption that the purpose of education is to facilitate learning, and it is the nature of that learning that has occupied the forefront of the debate on education.

What if we ask a different question, perhaps a simpler one? What is the purpose of learning? Learning is found throughout the kingdom of animals and, depending on how you define it, even in plants and possibly other organisms. [1, 2] In this context, the ‘purpose’ of learning can be defined as it would for any behavior: to increase the fitness of the learner. So, does our current system of education lead to an increase in the fitness of our students and, if it does, is that increase in fitness related to learning?

All organisms, including humans, are amazingly good at the calculus of fitness. The scientific literature is full of examples of animals that are capable of determining how much time and effort to put into activities that increase their fitness, when they reach the point of diminishing returns, and when it’s time to

cut and run. Simple examples are found throughout the study of foraging behavior; animals are very good at estimating the amount of time they should spend searching for a certain type of food before switching to another type of food or to another place to look for food. Animals that are better at estimating this breakeven point will waste less energy hunting for food and therefore have more energy to devote to their offspring.

In social animals, this calculus can become even more complex. Social animals must balance the energy and resources devoted to self care versus the energy and resources that are given to the family or clan. Raccoons and many birds, for example, will remain with their parents for a time after they have become reproductively mature, forgoing their own reproduction in order to help their parents rear siblings. The fitness cost of giving up a full breeding season is not trivial, but it is more than repaid by gaining valuable experience helping the parents, the help they will eventually receive from their own offspring, and the increase in fitness due to the shared genes of their close family members.

Social animals such as domestic dogs, certain birds, and the anthropoid primates, including humans, all seem to share an important set of fitness determinants: they are all strongly selected to seek status within their social groups and that status is strongly correlated with the survival and reproductive success of their offspring. The best evidence for the instinctual drive for status resides in the murky realm of human emotion.

Consider a simple instinctual behavior such as egg retrieval in geese. If a nesting goose sees a round object outside of her nest, she will be compelled to roll the object into her nest. The fitness benefit to this behavior is obvious: the 'round object' is most likely an egg and if the egg is neglected, her fitness will suffer. But is she behaving rationally? The answer is 'no'. If you surround her nest with billiard balls, even rounder than an egg and, therefore, even more compelling to the goose, she will pull them all into her nest. If the nest becomes full, she will kick out her own, less round eggs to make room for the billiard balls. Her reaction to the billiard balls, her desire to 'mother' them,

is the result of natural selection on a response to the visual cue of seeing a round object near her nest, not from any rational decision making on the part of the goose.

Can we equate the mother goose's instinctual response with emotion? Does she feel love for the round objects outside her nest? Most ethologists, and even some psychologists, would say 'yes'. In *An Outline of Psychology* (1923), William McDougall [3] defines instinct as: "...an innate disposition which determines the organism to perceive (to pay attention to) any object of a certain class, and to experience in its presence a certain emotional excitement and an impulse to action which finds expression in a specific mode of behavior in relation to that object." He goes on to explain that the distinction between human emotion and an animal instinct is not in the experience of the emotional excitement or impulse itself. Indeed that is the one constant in the emotional/instinctual continuum. Rather, it is the ability of humans and, to a lesser extent, other animals to use our cognitive abilities to interpret the stimuli that trigger the emotional response and to make choices about how to respond to the emotional impulse. The goose may not have the cognitive capacity to differentiate between a billiard ball and an egg, but her feelings of motherly love for it are no doubt comparable to our own experiences of parental love, both being experienced as the 'emotional excitement' that drives the instinctual impulse to nurture our children.

Human emotions are how we experience instinctual drives that improve our fitness. We feel love for our families, and respond to those feelings by being more inclined to sacrifice our own fitness for their welfare, ultimately improving our own fitness in the process. If someone sees his/her potential mate courting another desirable individual, that person will feel jealousy, hurt, or anger, in response to the threat to his/her own fitness.

In younger children, the most powerful emotional drives typically center on parents, and this makes sense given that the survival of a young child depends almost entirely on the willingness of the parents to provide protection and resources. To some extent,

this emotional drive may be transferrable to parental surrogates, such as teachers. Jealousy is largely directed at siblings or other rivals for the attention and esteem of the parents. Social status within your family determines fitness. When children enter adolescence, however, fitness becomes increasingly a function of attracting quality mates and their emotional priorities reflect this. Low social status in the eyes of a peer group will severely limit fitness, as low social standing will limit access to potential mates. In women, low social status may mean only having access to men of low status. In men, low status may mean having no access to mates at all. Not surprisingly, adolescents and adults are acutely sensitive to the signals that reflect social status.

The use of social status as a motivation for learning has been well demonstrated by Irene Pepperberg in her work with Alex, an African grey parrot. [4].

Traditionally, animal training relies on simple conditioning: present an animal with a food reward for performing a certain behavior in association with a verbal command or hand signal. The problem with this approach is that the animal learns without context or meaning, and Dr. Pepperberg's goal was to study animal cognition, that is, the ability to associate the words with their meaning. For example, you can easily teach a bird to say 'nut' by giving it a nut every time it says the word, but does the bird actually know what a nut is?

Dr. Pepperberg started with the assumption that parrots are social animals. In the wild, they form colonies and their fitness depends on having status within the colony. She reasoned that the motivation to mimic sounds in the wild is social interaction. Her training method, called the model/rival procedure, requires two trainers to speak to each other, in Alex's presence. The trainers ask each other simple questions such as "What is this toy?" The other trainer answers "It's a truck" and then he/she gets the truck and praise from the first trainer. The trainers switch roles and repeat the procedure. Then one of the trainers asks Alex the question. If Alex answers correctly, his reward is his inclusion in the conversation and access to the toy. If the bird is inattentive

or uncooperative, the trainers can hide the toy or even leave the room. Alex and other birds trained this way not only have remarkable vocabularies, but they have demonstrated that they understand the meaning of these words, and even have been known to invent words for novel objects and food items based on their similarity to familiar objects. If the social component is removed, for example by using video tapes of conversations between trainers, the birds do not learn new words.

Dr. Pepperberg's technique is effective because it promotes the status of the learner within the social groups most relevant to the learner, and is therefore valued by the learner. While rational arguments about long-term benefits of education may be accurate, they will not override a student's instinctual desire to have status within the group, and any educational system that does not take this into account will be perceived to be of limited value to some fraction of its students.

Students have an innate drive to learn, but sadly that drive does not always persist over the course of education. Students' earliest motivations to learn may include an inborn curiosity about the world, but that curiosity is fed and fueled by social interactions – often in the form of asking parents questions and the obvious pride an interest the parent shows in that interaction and the child's interest. In environments where curiosity is not rewarded with social interaction and parental esteem, the innate drive to learn will diminish, though to what extent seems to vary widely across individuals.

In our educational system, the motivations are similar but the rewards are less available. The teacher in many ways functions as a surrogate parent; students are rewarded by the praise and esteem of their teacher. That esteem is expressed not only in the form of grades, but also in encouragement, praise, and willingness to call on the student again in the future. However, there is only one teacher, and many students may have precious few opportunities to be the student who is called on and have the opportunity to earn the esteem of having made a worthwhile contribution to the class discussion. The ability to contribute something of value is a very powerful motivation, even in young children.

Although the role of social interactions between children is being increasingly recognized in education systems, the lecture format, which lends itself far less readily to student interactions than other teaching environments, is still widely used. Student interactions tend to be limited to non-academic activities, such as sports, extracurricular activities, and break times, where there is limited participation with the teachers. Except for academic clubs, students are rarely encouraged to teach each other and interact socially around academic work.

A recent series of experiments by Sugata Mitra showed that groups of children will quite willingly and quite effectively teach each other, when given the right tools. In his “Hole In The Wall” experiments [5], Mitra provided groups of school age students in India with access to the internet in the form of computers that were embedded in the walls of buildings where children had free access. His results were remarkable. In the absence of teachers and with only the most minimal outside instruction, they not only became fluent in using the computer and accessing internet resources, but also showed marked improvement in their language skills, including spoken English, and even an impressive understanding of complex topics in genetics and molecular biology, all in only a few months.

As students get older, social interactions and esteem within their peer group become increasingly more important. If parental esteem or the esteem of teachers has been lacking for a student, it may no longer be of high value to them. In the calculus of fitness, the work required to earn the esteem of teachers and parents may simply outweigh the benefit. If this becomes the case, then there is little immediate fitness benefit to academic performance, unless it is valued by the student’s peers.

This may be the crux of the issue: how does being academically successful make a student more valuable to his/her fellow students? In our current system it seems that it often does not. While students recognize that there may be long term benefits to academic success, those distant rewards may do little to improve a student’s current social standing.

Although society considers adolescents to still be children, from a strictly biological standpoint, an individual's reproductive value, that is the number of offspring you have the potential to produce in your lifetime, is at its highest in the 'pre-adult' years. There is little instinctual drive to postpone an immediate increase in social status, and therefore fitness, for an increase in status at some later time when the individual's reproductive value is diminished. The motivation for promoting fitness later in life will almost always be outweighed by the drive for immediate fitness gains in this age group, unless they are already of low status, in other words, 'nerds.'

The things that will immediately increase a students' social standing within their social group are much more likely to come with a powerful instinctual motivation. What do students admire about their fellow students? They value the same things that we do: inclusion in successful groups that have better access to resources. Cool kids often not only have recognizable behavioral traits that identify them as 'winners', such as confidence and extroversion, they also have access to stuff – electronics, clothes, money, and free time to spend with other students, and opportunities or access to interesting activities. This observation has been effectively exploited by advertisers for many years. Interestingly, similar arguments have been used to support school uniform policies: if students cannot assess one another's status based on clothing, and presumably therefore familial affluence, they will have the opportunity to accrue status on the basis of more meaningful criteria, such as achievement or character.

So how do you make education improve fitness? I would propose the following three things are instinctual motivations for students:

1. Activities that have value in society, including financial value.
2. Access to a group of peers and a sense of belonging to that group.
3. For older students, access to members of the opposite sex.

If education can appeal to these drives, then it will be much more likely to be valued by students.

Genuine opportunities for worthwhile contributions by students are few and far between. Most exercises ask children to repeat well-known solutions to ancient and well-solved problems. They are shielded from any activity that might be construed as ‘work’ – an activity with potential economic value. The only areas where we as adults are willing to concede the possibility of truly valuable contributions by students are in the areas of sports and music. Not surprisingly, these are two areas where students remain actively engaged.

What if schools expected students to be economically productive? What if students were asked to do things that actually increased the capital value of the institution? It is a widely accepted notion that you will remember the skills you use.

This can, and often does, take place early on in the home in the form of chores. As children get older, this can be expanded to including children in discussions about family financial planning and budgets. Even in very small children, the importance of learning that there is value in their behavior, in the form of politeness, respect, and simple manners, is well recognized.

In schools, it is even more important to continue this idea of students contributing in a productive way, although sadly, this is almost never done. Oddly, students are rarely asked to participate in chores at school. These could easily be simple age-appropriate responsibilities that can be carried out under the supervision of other older students, teachers, or aids. Higher levels of academic performance can be linked to more interesting or valuable jobs, such as tutoring other students, including teaching lower grade level subjects, coaching, and organizing school activities and trips. Advanced students could be given opportunities to be trained in employable skills like working in maintenance or the cafeteria. Those who excel at any of these activities can be rewarded in any number of ways – special activities, parties, special access to facilities, and possibly even small stipends.

The intended benefit, of course, is to motivate students to academic achievement. If academic achievement can be linked strongly to status, then students' instinctual drive to seek status will drive them to compete for academic success. However, competition itself is a double-edged sword; beneficial to the successful competitors but less kind to the unsuccessful. Is it possible to have all 'winners' that are competitive in a meaningful way?

In 1982, a remarkable experiment was initiated by William Muir in the School of Agriculture at Purdue University. [6]

For literally thousands of years, farmers have been selectively breeding chickens to produce the largest possible numbers of eggs. It is safe to say that for the past hundred years or so, there has been no variation left in the gene pool for genes that lead to greater egg production in domestic chickens – any genes that may have diminished production have long since been purged by these selective breeding programs.

Dr. Muir's unique breeding experiment was based not on individual selection, but rather on group selection. That is, he selected cages of chickens that had higher overall egg production, rather than individual chickens with high egg production.

His results were nothing less than shocking. He reported that after only 5 generations of selection, his birds had showed not only a rate of lay improved 16%, but also over a 60% reduction in mortality!

Chickens are also social animals and they assert status through a strict pecking order. In agricultural settings this can lead to high levels of aggression between birds, often resulting in severe stress and even death of the birds. In Dr. Muir's studies, by selecting for productive *groups* of chickens, he was also co-selecting for groups of chicken that were less aggressive and better able to cope with social stress.

Much like the Purdue chickens, education in social animals

seems to be highly effective when it is done in groups. Although there is much speculation about the role of group selection in human social and cultural evolution, it is clear that we have a strong instinctual drive for a sense of collective membership, and that this may be related to the drive for cultural identity.

What if grades were awarded to teams, not to individuals? Could this foster a drive for a culture of academic excellence within groups?

I think of this as the “Hogwart’s” model, where each student can earn ‘points’ for their team based on their strengths, although this approach might be more appropriately credited to military training where the survival of the unit is tied strongly to the cohesion of the individuals with the unit. It is based on the assumption that every student is gifted at something and allows each student to have the opportunity to have status in a particular subject area, thus having value, even if he/she does not excel at every subject. If all the members of the team share, not only the reward of a good grade, but also the reward of a more interesting work duty, then students are strongly motivated to choose team members based on their ability to contribute and to support those who do contribute to the team. Status becomes strongly bound to academic performance. Strong academic performance means you will be sought out by more privileged groups.

Importantly, student teams need to be self-selecting; that is, students can mutually choose their teammates based on some prior knowledge of the other students’ strengths and weaknesses. Students would need some freedom to change groups, based not only on the overall success of the group, but also on their perceived success within the group. Any individual would need to be able to petition other teams for membership, and any team could seek to recruit individuals that they feel would strengthen their team.

It is also important that the team be cohesive across subjects, and even across extracurricular activities such as sporting teams. This places a priority on groups containing members

with a diversity of strengths and gives every team member an opportunity to be the best in his/her group at something. It also makes the group members responsible for helping each other in their more challenging subjects.

There would need to be rules about the size of groups, how often groups can change members, and the rules for changing groups. For example, the process of recruiting a new team member could be done by a public posting so that all students know that a team has requested that a new student join their ranks, and other teams may respond by putting in bids of their own. After a waiting period, the petitioned student may post his/her reply. This public process will help to reinforce the esteem value of being a desirable team member and provide motivation for academic excellence.

In older students, it may also be advantageous to gender bias the groups, for example, start the term with only all male and all female groups. Since there is a naturally strong motivation to work with members of the opposite sex, this provides another level of motivation for the teams. A team of young men may well be willing to work harder to attract female team members to their group than work to attract another male of comparable academic ability.

Because there is some level of asymmetry in the dynamics of male and female competition for mates, it may make sense to have asymmetry in the rules that govern movement from group to group. For example, you may wish to make the rule that only women may change groups, and that the men's group memberships are fixed for the term, after the initial selection process is complete.

In summary, students will learn best if learning improves their social standing within their peer groups and, by extension, their fitness. Educational paradigms that encourage students to teach one another and encourage them to be accountable for the success, not only of themselves, but of their peers, are worthy of further exploration. Perhaps it should be our role as instructors

to seek out groups of students who do this effectively and reward them, not only with good grades, but with ever more meaningful tasks.

I hope that we can take on as a collective challenge the creative task of finding ways to encourage students to form long lasting, supportive, academically centered groups, and to empower these groups with responsibility for their own instruction, supported by our encouragement, direction, and guidance.

Sources

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For a very thought provoking review of evolutionary sociobiology, I recommend: Robert Wright, *The Moral Animal. Why We Are the Way We Are: The New Science of Evolutionary Psychology*, (New York: Vintage Books, 1994), 466 pages.

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The purpose of learning is a question as old as humankind. In “Why We Learn,” Kathleen Engelmann explores the calculus of fitness, examining the current system of education and proposing new methods. Her approach involves using student teams to maximize our natural social tendencies, thus fostering the innate drive for education.

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