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NEUROSCIENCE PROVIDES FRESH INSIGHT INTO

the 'aha' moment

By David Rock

The human brain is an extraordinary information-processing system, dispensing trillions of calculations every second. The brain is brilliant at executing physical tasks that can be codified, such as playing an instrument or driving a car; however, our brains have some surprising limitations when it comes to certain types of mental tasks. Think of these in two categories. >

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First, there is linear problem solving, which involves logically working out a solution to a question—for example, doing math or calculating a time zone difference. Doing this kind of task uses what is called "working memory": we hold information in our memory and manipulate it or work on it. It's a conscious task that happens in the foreground of our attention, and we need to focus to do it. We need working memory when we don't have an obvious answer to a problem. It's used for things such as making decisions, remembering, and other cognitive tasks.

Our working memory is far more limited than people generally acknowledge. What do you get when you add 10 plus 10? That's easy—20. Yet you don't really need working memory for that. The answer is stored in long-term memory. What about adding 128 with 287? You can do it, but it takes quite a bit of working memory. Adding up just six digits requires a lot of effort. What about if you try to multiply 23 and 56, without paper or a calculator? For most people, it's too much. Your working memory maxes out.

By and large, multiplying four numbers is not a lot of information to process at all. Just to remain standing up, your basal ganglia has to do a multitude of much harder calculations each second to work out just the right amount of force to apply to various muscle groups. These are considered "nonconscious" tasks in that there is no working memory or attention involved.

There are tremendous resources available to process information nonconsciously. Yet our conscious resources are tiny by comparison. Relatively speaking, if you think of your conscious processing capacity as the coins in your pocket, then your nonconscious processing capacity is the entire U.S. economy by comparison.

No one solves complex problems at will. The answers always suddenly arrive, either as you fall asleep; in the middle of the night; as you wake up; as you exercise, shower, or drive; or while you do something pleasant and repetitive such as knitting, gardening, or cooking.

And right here is the problem. Most real world problems we face, especially at work, tend to be far more complex than multiplying four digits. These are "nonlinear" problems that have no pre-existing, logical, or easy answer, such as how to increase sales when the market for your product is down and everything you have tried in the past hasn't worked. Our conscious problem-solving resources are no good in this situation.

Throughout the years at various workshops, I have asked a few thousand people how they solve these complex problems. The answers are highly consistent. No one solves complex problems at will. The answers always suddenly arrive, either as you fall asleep; in the middle of the night; as you wake up; as you exercise, shower, or drive; or while you do something pleasant and repetitive such as knitting, gardening, or cooking.

New research into these "aha" moments tells us a lot about how to increase the likelihood of having these moments of brilliance. And while it seems unlikely that we can control when we have an insight, it's now very clear that we can dramatically increase the likelihood that an insight will emerge.

My own research on this area indicates that as much as a 500 percent improvement in having insights can be reached by following a few simple rules. The next sections present some of the big discoveries about insight and the brain to help you have more of them, and they can help you explain what you are doing as a trainer or

facilitator when teaching creativity. They may also help you improve how you approach creativity overall.

Quiet

Mark Beeman is one of the eminent neuroscientists studying the "aha" moment. As he said in an article in the first *NeuroLeadership Journal*, "… variables that improve the ability to detect weak associations may improve insight solving." In short, insights tend to involve connections between small numbers of neurons.

An insight is often a long-forgotten memory or combination of memories. These memories don't have a lot of neurons involved in holding them together. The trouble is we only notice signals above whatever our baseline of noise is. Whereas everyday thoughts, such as wondering what to have for lunch, might involve millions of neurons speaking to each other, an insight might involve only a few tens of thousands of neurons speaking to each other.

Just as it is hard to hear a quiet cell phone at a loud party, it is difficult to notice signals that have less energy than the general energy level already present in the brain. Hence, we tend to notice insights when our overall activity level in the brain is low. This happens when we're not putting in a lot of mental effort, when we're focusing on something repetitive, or when we are just generally more relaxed such as we are when we wake up. Insights require a quiet mind because they themselves are quiet.

Inward looking

A second quality of insights relates to the first, though it is slightly different. Our attention at any moment can be externally focused (for example, reading the words in this magazine), or internally focused—for example, on an image you might see in your mind's eye that is activated by a word. We tend to flip between these two states all the time.

When people have insights, Jonathon Schooler finds that they are "mind wandering," which is a form of daydreaming. They are not focused externally on the problem. Mark Beeman finds an alpha effect in the visual and auditory cortex just before someone has an insight, meaning that people shut out external data to save their resources for noticing the insight. Therefore, insights are more likely when you can look inside yourself and not focus on the outside world and when you feel safe enough to reflect on deeper thoughts and not worry about what is going on around you for a moment.

Slightly happy

There is a lot of research showing that being slightly happy, versus slightly anxious, helps people solve more problems and be more creative. Mark Beeman has determined the details of how this happens, showing that when people are happy they are more likely to notice a wider range of information than when they are anxious and will be more "tunnel visioned." So the third quality of the brain state required for insight is feeling open, curious, and generally interested in something.

Not effortful

This final piece of the puzzle is a bit confounding. Basically, if you want insights, you need to stop trying to solve a problem. This can be confusing because usually, insights happen because we become stuck at an impasse. The impasse tends to involve a small set of solutions on which we have become fixed. And the more we work on the same wrong solution, the more we prime the brain for that solution and the harder it is to think of new ideas.

It is much like changing traffic on a freeway—we have to stop the traffic going one way before it can go another. In the brain, wrong solutions push out correct ones. Psychologist Stellan Ohlsson developed this idea into "inhibition theory," which states that we need to inhibit the wrong solutions for the right ones to come to our attention.

Also, effort tends to involve a lot of electrical activity, and this activity can reduce the likelihood of noticing

the quiet signals of insight. The point is that you have to let go of the problem for the solution to come to you. This quality often surprises people, but keep in mind: Our nonconscious processing resources are much larger than our conscious ones.

Implications of the research

While you can't force an insight to take place, you can put your brain into a state that significantly increases the chances of an insight occurring. It is what highly creative people do every day. It means not actively working on a problem, but instead, letting yourself happily mind wander, freely associating and relaxing into a quiet mental state. It means being okay with feeling as you do when you first wake up in the morning—relaxed and with diffuse, easy attention.

This of course is easier said than done. When we have a creative project, we tend to become anxious, and the uncertainty of not being able to find a logical solution creates anxiety in itself. The brain is primed to experience at least a mild threat from most forms of uncertainty. Learning to be okay

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with uncertainty is part of the process of having more insights, because the more anxious you are, the less likely you are to notice any subtle insights.

In organizations, when trying to solve complex problems with others, we tend to do almost exactly the opposite of what the brain needs. We tend to put pressure on ourselves, have that extra coffee, or gather a lot of data, all of which tends to make the brain noisier instead of quieter. Or worse, we brainstorm as a group, which creates a lot of mental noise.

A better approach, if you need to solve a complex problem, is to define a question as a group. Then, take time out and do something interesting (but repetitive and simple) for a while, and allow your nonconscious brain to do the solving for you. In my work with organizations, we have generated a 100 percent to 500 percent improvement in managers' ability to solve complex problems with their teams by teaching them about insight and giving them some models to practice with.

The implications for facilitators in the training room are clear. If you want people to have more insights, you need to reduce the overall "noise" in people's heads and create a space for people to reflect. It means reducing social threat, increasing certainty, and finding ways to quieten the brain.

A good solution is to let people take a walk. Exercising tends to quieten the mind and distract us enough to hear the quiet signals. Another activity is any kind of game that is mentally calming and helps people relax. It doesn't matter what the game is, and the more novel and unexpected the better because this will improve dopamine levels and reduce threat too.

Having more insights is fun and engaging. It gives your brain a boost of dopamine from the novel connections. It helps energize you to get things done, and it helps people to unlock some of life's toughest puzzles. The key is that we have to get used to letting our nonconscious brains do the work.

Relax, let go, and you might find a world of new insights emerge.

What Does This Research Mean for Helping Others Have Insights?

Respect the quiet. We can't solve complex problems with more effort; it takes switching off and quieting down the mind. Letting ourselves be comfortable with internal silence is key, as the silence allows the quiet signals to reach the surface.

- Individually, this means allowing some downtime each day to let your mind wander freely, whether it's on the train or taking a walk. Don't fill every waking moment with stimulation from being too connected because you won't get the downtime needed to have those creative breakthroughs. Switch off your devices for several hours each day, and even for a few days a week if you can, and you should have a lot more insights.
- Organizationally, we should be allowing people to have quiet spaces when they need them. The open plan office is good for collaborative work but can be a hindrance for insight. Also, the brain will tend to be quieter in the mornings, before the buzz of the day. Try to allow people to shut themselves away without meetings for a few hours in the morning, rather than scheduling meetings first thing. Many people find that they need to use the quiet of the evening to get creative work done, and this isn't always ideal for good sleep and general balance.
- As a facilitator or trainer, insight seems to be central for learning: We remember problems we solve with insight for longer periods than problems we solve without insight. Insights also create lots of positive energy, which is great for keeping a training experience lively. Try to create the space for people to have quiet moments within a training program, whether it is taking a walk or having some downtime to allow ideas to bubble to the surface. Packing a day with learning can be fun, but it may not allow the deeper connections to form. Also, it is critical to keep a positive atmosphere in a training room. Using humor turns out to be more than just a nice to have. It's an excellent way to increase the likelihood of insights occurring in a group.

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David Rock will present at two sessions at the ASTD 2011 International Conference and Exposition in Orlando, Florida; one on Sunday, May 22 and one on Wednesday, May 25. For more information, visit http://s36.a2zinc.net/clients/ASTD/ICE11/Public/MainHall.aspx?ID=3772.

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