AJNR

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AJNR Am J Neuroradiol 2013, 34 (7) 1293-1294
doi: https://doi.org/10.3174/ajnr.A3286
http://www.ajnr.org/content/34/7/1293

Do Not Brainstorm!

The good ideas are all hammered out in agony by individuals, not spewed out by groups.

Charles Browder

This "Perspectives" is the first "panel of a triptych," in which I attempt to examine and cast a shadow on 3 activities commonly occurring in neuroradiology, radiology, and medicine in general. This one deals with group thinking, the second will examine the way we teach and learn radiology, and the last, how we do research.

Some years ago, I used to ask my division members to sit down and have a brainstorming session regarding possible research projects for the academic year. Although I am sad to report that it never worked as I thought it would, I am now beginning to understand why this happened. While one of the major principles of brainstorming is "freewheeling" (that is, the wilder the idea, the better), this process is not completely free of structure and constraints as originally thought.[1] The basic brainstorming rules are the following: no criticism, think "up" (bigger ideas are better than small ones), combine and improve ideas ($1 + 1 = 3$ rule), and quantity is desirable. Paradoxically, these weak and loose guidelines prevent brainstorming from achieving it goals. First, the lack of criticism forces a suspension of judgment, which we now know is contrary to the development of good ideas. "Freewheeling" implies lack of prior preparation, and without it, the result is generally no new ideas. Improvement cannot be accomplished without some criticism. As I explained in my "Overwhelmed by Choices" editorial last month, mental priming prevents true free association from happening; thus, freewheeling is usually not achieved, and, after all, what good is quantity without quality?

This brainstorming thing started in the advertising world. Batten, Barton, Durstine, and Osborn (BBDO) is a company specializing in advertising and marketing.[2] In 1939, Mr. Alex Faickney Osborn became its president. He spent most of his life as a salesman, business manager, and statistician and later taught psychology at the Ford Motor Company and advertising at the YMCA. At the start of his tenure at BBDO, he introduced the concept of "brainstorming." In 1942, he published his book *How to Think Up* (McGraw-Hill), and in 1953, another called *Applied Imagination: Principles and Procedures of Creative Problem-Solving* (Scribner). Both turned into bestsellers, and soon after, he became known as a "creativity theorist."[3]

Mr. Osborn eventually resigned from BBDO and dedicated himself full-time to writing. So popular were his books that in 1954, he funded the Creative Education Foundation (motto: "Where brainstorming began"; zero users on-line the multiple times I visited it) supported solely by royalties from his publications.[4] The Foundation spurned the Creative Problem-Solving Institute (in charge of the longest running creativity conference in the world) and the *Journal of Creative Behavior* (published by Wiley, no impact factor found).[5] On the basis of Osborn's ideas, Buffalo State College started the International Center for Studies in Creativity, which grants a master of science degree in creativity. Part of this success was the fact that BBDO grew rapidly (current number of employees: 15,000) and attracted prestigious clients such as Pepsi, FedEx, GE, Bank of America, and Johnson & Johnson, among many other Fortune 500 companies. The success of BBDO is, at least, partly due to brainstorming.

So, what are the mechanics of brainstorming? Well, you get about 12 participants (both experts and neophytes) and put them in a room and ask them to address one specific question (asking multiple questions is thought to be counterproductive). Asking the correct question is essential to brainstorming and other related activities. Osborn milked about one idea per minute out of such groups, tapping into the "gold mine between your ears" (another of his books). Brainstorming spawned the Osborn-Parnes Creative Problem-Solving Process, which is still commonly used and is based on 3 principles: explore the challenge, generate ideas, and prepare for action.[6] This method uses both divergent and convergent thinking, and when you add to it "lateral thinking," you have the "productive thinking model," which addresses these questions: What is going on? What is success? What is the question? It also generates answers, forges a solution, and aligns resources.[7] The last derivative from the original brainstorming concept is the "plan-do-check-act" method used for quality control and continuous improvement of processes and products (Toyota famously used it to improve throughput and quality on assembly lines with excellent results). All of these principles sound logical and very exciting until you realize that their basic foundation, brainstorming, does not work. The appeal of brainstorming lies in our own insecurities. If you participate in a session where all you get back is good vibrations and positive feedback, I assure you that you will love it!

The first blow to brainstorming came from Yale University, where researchers formed 4 groups of 12 students who were asked to follow all of Osborn's rules to try to solve several puzzles.[8] The control group was 48 students given the same puzzles but asked to solve them individually. The results showed that individuals came up with more and better ideas than did groups. Many other studies have confirmed this finding. Dr. Michael Mumford, a professor at the University of Oklahoma and Director of its Center for Applied Social Research, calls brainstorming and courses teaching it "garbage."[9] Keith Sawyer, an Associate Professor at Washington University in St. Louis, said of brainstorming, "Decades of research have shown that brainstorming groups think far fewer ideas than the same number of people who work alone and later pool their ideas."[8] The key point about his remark is not that

http://dx.doi.org/10.3174/ajnr.A3286

groups are bad for thinking but that they are bad for the initial part of the process. Regardless of evidence, in our quest for innovation and creativity, it seems that group thinking is gaining even more popularity, particularly in science, where thinking is no longer a solitary endeavor.

What can we do to improve creativity? First, do not tell a person to be "creative." All that does is cause people's minds to freeze up. Dr. Mark Runco, the E. Paul Torrance Endowed Professor at the College of Education of the University of Georgia says, "Do something only you would come up with, that none of your friends or family would come up with." Second and third, get moving (exercise) and reduce screen time. Exercise improves all cognitive processes and watching television and playing video games robs you of the time to do it and to think. Installing exercise equipment in desks or taking breaks often to exercise has been done with good results. Last, do not multitask and take breaks. Productivity increases if a person works on more than one thing, but one must alternate between tasks and never do them at the same time. These rules of thumb have been complemented by other ideas: explore other cultures, follow your passion, and ditch the suggestion box.[10] People who have lived abroad or speak more than one language and even first and second generations of children of immigrants are more creative than others. If one cannot travel, reading magazines, seeing science fiction movies, and attending the opera seem to improve creative thinking. The benefits gained from "following your passion" are more difficult to explain (playing guitar may be your passion but it does not mean you will be good at it or write a concerto). Suggestion boxes and questionnaires suffer from overstructuring and do not permit the free flow of ideas, and many are designed to get (manipulate) desired answers.

One of the major faults with the brainstorming principles is that they avoid criticism. Groups asked to debate ideas do much better than traditional brainstorming gatherings and individuals alone. The idea-liberating action of debate is seen in all cultures.[11] The main author of a previously quoted article stated, "Debate is going to be less pleasant, but it is always more productive."[8] So, it seems that it is best to think alone, then pool your ideas with those of others, and last debate the pros and cons.[12] It also seems that groups formed by individuals who share connections work better than groups of unknowns, and this is one of the reasons why many universities and industries have invested in research buildings. Even Broadway musicals written by closely knit groups do better than those in which the participants do not know each other. Steve Jobs designed Pixar's headquarters with this in mind. In that building, to eat, get coffee, or go to the bathroom, employees had to walk to its center and mingle with their coworkers, giving them time to socialize and exchange ideas (the so-called "water cooler" effect). Similar principles operated at the now-defunct Building 20 on the Massachusetts Institute of Technology campus—that is, a group of highly motivated (and highly intelligent) individuals cross-pollinated to create one of the most productive environments in the history of academic research. Other similar buildings where many inventions and ideas happened were those of the Bell Laboratories. All of these successful buildings share one aspect: They are mostly horizontal and not vertical structures. Verticality prevents mingling, but building in congested cities leaves no option. Authors who work physically close together also produce higher quality science.[13] In a study, authors separated by more than 1 km had the lowest number of citations.

Groupthink is common in science, so common that author bylines keep getting longer. The percentage of teams and the number of authors producing science articles have increased dramatically, a fact that is probably influenced by the current low cost of communication.[14] Even disciplines outside laboratory science, such as economics and sociology, have seen expanding teamwork. Articles published by teams receive higher numbers of citations. We have seen a significant increase in the number of authors in the *American Journal of Neuroradiology* articles, but this should not necessarily be interpreted as guest or honorary authorship or as something detrimental (as long as all authors adhere to ethical principles). Changing author guidelines and requirements does not seem to affect the length of author listings.[15] It seems to me that longer author bylines generally imply better science and that we need to stop worrying about these.

Next month, I will be back with a "Perspectives " on verbal overshadowing and the—mostly bad—influence it has on how we teach and learn interpretive skills.

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