

How Intrapersonal Diversity Enhances Creativity: Leonardo da Vinci

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Leonardo da Vinci died 500 years ago in 1519. One of the greatest polymaths in human history, in many ways he embodied a kind of diversity that contributed mightily to his creativity in areas integral to medicine, including anatomy, physiology, and pathology. To begin to understand and cultivate such diversity and creativity, we first need to contrast them with another understanding of diversity.

Organizations such as the Association of American Medical Colleges define diversity in terms of race, ethnicity, gender, sexual orientation, socioeconomic status, and disability, hoping to promote a more diverse physician workforce (1). This type of diversity might be called interpersonal, focusing on the differences between people.

There is, however, another equally important type of diversity – a type over which each person can exercise considerable influence. It is represented by few individuals in history more than Leonardo. In contrast to the interpersonal form, this type of diversity might be called intrapersonal, and it represents one of the unrecognized keys to Leonardo's – and our own – creativity.

Leonardo

Leonardo came from a disadvantaged background (2). His noble father and much younger peasant mother were unmarried, depriving him of a surname. He grew up with his mother's family and received very little formal education. At age 14, he was apprenticed to a Florentine artist for 7 years. Among the wide variety of crafts to which he was exposed were drawing, painting, and sculpting, as well as drafting, metal working, casting, leather working, and carpentry.

This is the author's manuscript of the work published in final form as:

Lion, A., & Gunderman, R. B. (2019). How Intrapersonal Diversity Enhances Creativity: Leonardo da Vinci. *Academic Radiology*, 26(7), 999–1000. <https://doi.org/10.1016/j.acra.2019.02.005>

Today we think of Leonardo primarily as the painter of masterpieces such as the “Mona Lisa” and the “Last Supper,” as well as the creator of the most expensive painting ever sold, “Salvator Mundi,” purchased in 2017 for \$450 million.

Yet fewer than two-dozen of Leonardo's paintings are thought to have survived, and the full range of his interests and pursuits is best captured not by his canvases but his notebooks. Originally produced as unbound sheets, these records of his daily observations and speculations consist of notes and drawings numbering over 13,000 pages.

Notebooks

The range of Leonardo's pursuits is truly extraordinary and perhaps unequalled. In addition to his work as an artist in a variety of media and his studies of human biology, he functioned as an inventor, architect, engineer, geometer and mathematician, geologist, botanist, cartographer, astronomer, historian, and poet.

Among Leonardo's notebook pages are sketches of a fetus in utero, the valves of the heart, and the ventricular system of the brain. His “Vitruvian Man,” one of the most widely reproduced drawings in history, embodies many of his ideas about the proportions of the human body. He delighted in depicting how inner emotional states reveal themselves in facial expressions, gestures, and posture.

His notebooks constitute perhaps the most diverse and profound record of human creativity ever produced by a single hand. His curiosity about the world seems to have been inexhaustible, matched only by his extraordinary imagination. It is possible that no human being in history has seen more and pondered more of the world in which he lived and moved than Leonardo.

Diversity and Creativity

Leonardo's intrapersonal diversity manifested itself in numerous creative forms from which contemporary radiologists can learn a great deal. He was an inveterate analogist, surveying the broad spectrum of nature to appreciate visual similarities, in much the same way that a poet might connect ideas metaphorically through rhyme and meter.

Leonardo was fascinated by similarities in the branching patterns of objects as diverse as trees, arteries, and rivers. He even formulated what has come to be called "Da Vinci's rule," which states that the cross-sectional area of branches equals the cross-sectional area of the trunk from which they diverge.

Leonardo's recent biographer Walter Isaacson has suggested that this predilection for analogy was so strong that he should be regarded as a creator who operated more in analogue than digital mode (3). Instead of collecting and analyzing quantitative data, producing products that could be counted on the digits, he relied instead on his analogical imagination.

He watched how water flowing through a river and its tributaries, blood flowing through the heart and blood vessels, and molten wax flowing into a mold all change shape but not volume, leading him to formulate the principle of the conservation of volume. His observations about the incompressibility of water led to early innovations in the field we now know as hydraulics.

Combining expertise in both drawing and dissection, Leonardo produced some of the most exact and beautiful renderings of human anatomy ever created. He was the first figure in the history of Western medicine to depict the appendix, and his knowledge of fluid dynamics enabled him to describe the mechanism by which the aortic valve leaflets close centuries before other physiologists (4).

Leonardo's diverse interests could not have borne so much fruit had he not been eager to explore cross-disciplinary connections. Like a radiologist, he was a pattern seeker, but he looked for patterns both within and across a remarkable range of fields. Had he not brought so wide a range of interests and experiences to the table, he might never have recognized many of these similarities.

One of the best examples of Leonardo's analogical imagination concerns the cerebral ventricles. Having used molten wax to test molds in his work as a sculptor, he realized that similar techniques could be applied to the brain's ventricular system. Using hard-won skills developed over many years, he created the first wax mold of the ventricles, showing both their shape and their interconnections.

Enhancing Our Own Creativity

Leonardo's work and life offer guidance and inspiration to radiologists who seek to enhance their intrapersonal diversity and creativity. One suggestion is to read widely and well. This does not mean catching up on journal articles or continuing medical education (CME) credits, but reading outside radiology, in fields as diverse as imaginative fiction, biography, history, and science. It is often when the connection to radiology is not immediately apparent that such reading is most likely to enhance creativity.

Leonardo's story also points us to the arts. Art appreciation, art history, and creative arts such as painting, sculpting, and sewing offer opportunities to broaden and deepen our aesthetic sensibilities. Quantification and analysis have their place, but the analogical imagination can only function at full capacity if the eye is well educated and experience is rich with undiscovered similarities.

Equally important are performative arts, such as music, dance, and theatre. Leonardo himself was a master showman, and some of his most famous contrivances were devised for the stage. Moving from spectator to performer requires us to delve more deeply into the work, opening up deeper insights between which we can draw connections.

A fourth way radiologists can enhance interpersonal diversity is to engage in regular reflective and contemplative exercises. These might include journaling, meditation, or prayer, among other possibilities. Some of Leonardo's most creative ideas seem to have come to him while he was allowing

his imagination free reign. If our attention is tied to specific tasks every minute of the day, our creativity is likely to be compromised.

Finally, radiologists need to find regular opportunities to step outside routines into novel experiences. Through activities such as community service and travel, we can meet new ideas, new people, and new ways of living and working that can fire our imaginations. As Leonardo's work and life demonstrate, it is often out of such challenges that new insights arise.

Conclusions

Few if any radiologists could rival Leonardo for diversity of interest, talent, and productivity. His notebooks are nothing short of astonishing. Yet Leonardo developed habits that can be emulated by every radiologist. By avoiding professional silos and keeping our field of view wide and our interests diverse, we can stoke the flames of radiology's creativity far into the future.

References

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