Sharing of tacit knowledge is most important aspect of mentorship, study finds

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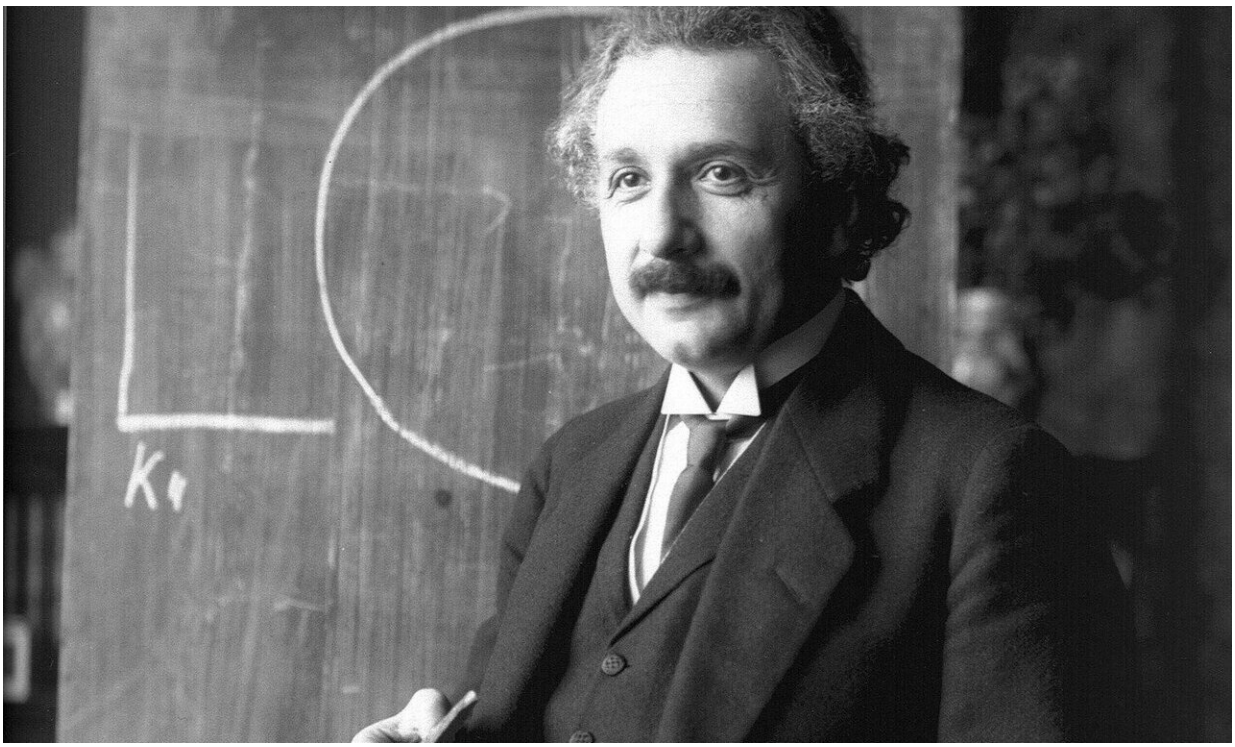

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When it comes to education and mentorship, Northwestern University researchers believe that Albert Einstein had the right idea. The most important aspect of teaching, Einstein thought, isn't relaying facts but imparting tacit knowledge that students will build on for the rest of their lives.

In one of the largest ever multidisciplinary investigations into mentorship and mentee performance, the Kellogg School of Management researchers found that the most impactful mentors are those who teach students to think independently and communicate their unique viewpoints effectively.

"Communicating codified knowledge is relatively straightforward," said corresponding author Brian Uzzi. "It's written down in books and presentations. But it's the unwritten knowledge we intuitively convey through our interactions and demonstrations with students that makes a real difference for mentees."

The researchers note that remote learning, which is becoming more common during the COVID-19 pandemic, may not be as effective a means of transferring such tacit knowledge, which could have long-term effects.

"Face-to-face interaction is essential. When we teach by doing, we are conveying tacit knowledge we don't even realize we have," said Uzzi, the Richard L. Thomas Professor of Leadership at Northwestern's Kellogg School of Management and co-director of the Northwestern Institute on Complex Systems. "If we limit the face-to-face channel by which tacit knowledge is communicated, we potentially slow down the pace of learning and scientific breakthroughs, and that will affect us all."

When mentors excel in transferring tacit knowledge, their protégés achieve two to four times greater success than similarly talented students of mentors who convey regimented knowledge but not tacit know-how, the researchers found. Protégé success was determined by whether they won a scientific prize of their own during their career, were elected to the National Academy of Sciences or were in the top 25% of citations for their field.

The most successful protégés also were more likely to pioneer their own research topics, rather than follow in their mentors' research path. This finding contradicts the popular belief that the most successful protégés will be those who carry on their mentors' already successful work.

The study, "Mentorship and protégé success in science," publishes the week of June 8 in *PNAS*. The study is among the first to look at objective protégé performance over the course of a career, drawing from genealogical datasets that track the relationships between mentors and students.

Previous research into the topic of mentorship has been done largely through self-reporting, often many years after the students graduate. That makes it subject to memory errors and personal biases, researchers say.

The researchers studied genealogical data on 40,000 scientists who published 1.2 million papers in biomedicine, chemistry, math or physics between 1960 and 2017. They also used the ProQuest Dissertations and Theses databank, an official record of advisor/student relationships taken from Ph.D. theses, and supplemented it with additional crowdsourced data from AcademicTree.org and the Mathematics Genealogy Project to ensure they correctly matched mentor/mentee relationships.

To account for the fact that more successful mentors naturally attract more talented students, the researchers grouped mentors with similar records and reputation based on factors including institutional resources, productivity, number of students, citations and other measures of a mentor's skills, and they compared the performance of students within the same mentor peer group. However, one mentor in each peer group had a hidden talent for identifying key problems and producing compelling solutions that the other mentors did not have. These mentors

were future scientific prizewinners.

To assess protégé success, the researchers considered only those students who studied under a mentor before that mentor won their scientific prize to control for selection bias and the halo effect a prizewinning mentor casts over their students.

After controlling for differences in mentorship skills and mentee talent, the researchers found that the most successful protégés studied under mentors who demonstrated a unique skill in ideating and publishing celebrated research and who displayed independent thought by breaking away from their mentors' lines of research.

More information: Yifang Ma el al., "Mentorship and protégé success in science," *PNAS* (2020). www.pnas.org/cgi/doi/10.1073/pnas.1915516117

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