

Researchers publish the first comprehensive study of China's STEM research environment in higher education

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China's research environment in STEM higher education faces many challenges.
Credit: University of California - Santa Barbara

China's President Xi Jinping has repeatedly stated his aim of transforming the country into a "science and technology superpower." But when it comes to China's science, technology, engineering and math

(STEM) research environment, newly published research suggests that they may have a long way to go.

UC Santa Barbara distinguished research professor Richard P. Appelbaum, former MacArthur Chair in Sociology and Global & International Studies, and Xueying Han, a former postdoctoral scholar at UCSB who now works for the Science and Technology Policy Institute in Washington, D.C., have co-authored the first comprehensive quantitative analysis of China's STEM research environment.

The study, published in the journal PLOS ONE, explores key challenges that face this burgeoning area of Chinese higher education as the nation pushes to become an academic superpower. While prior research has relied on anecdotal accounts and small focus groups, Appelbaum and Han gathered data from 731 surveys completed by STEM faculty at China's top 25 universities. They sought to understand not only the issues facing the country's top researchers, but how government policies might affect their capacity to innovate.

"Our research shows that the Chinese educational system stifles creativity and the critical thinking necessary to achieve innovative breakthroughs, too often hampers researchers with bureaucratic requirements, and rewards quantity over quality," said Appelbaum. "China's emphasis on rote learning and memorization reinforces this, as does a strong cultural emphasis on respect for authority."

Among other concerns, the study explores two major relational issues in Chinese higher education: perceived bias toward foreign degree holders and the existence of exclusionary research cliques. "Past studies have suggested that foreign degree holders get many advantages—higher salaries, easier access to promotions, bigger lab space—compared to their domestic counterparts," said Han. "But we discovered that Chinese domestic degree holders also thought that a foreign degree would give

you better recognition from colleagues. In China, recognition from colleagues plays a very large role because it influences the other people you interact with, and this recognition could open doors that might not be available to domestic degree holders."

Appelbaum and Han also sensed tension between China's interest in competing with western countries and its nationalist policies. "Our main takeaway is that if China wants to make this transition successfully, it still has a very long way to go," said Han. "That's because the challenges that are facing China's research environment are not things that can be easily fixed by money. They're cultural challenges, and that's going to require a major shift in thinking."

The scholars, who completed the project while working for the former National Science Foundation-funded Center for Nanotechnology in Society based at UCSB, see their research as a baseline, establishing the atmosphere of China's current STEM environment in higher education so that future studies can compare and contrast. "Our study should be replicated within China, by a Chinese university, in an open survey that protects confidentiality and encourages a high response rate," said Appelbaum.

The team also hopes their findings will serve as the impetus for a shift in the focus of Chinese higher education metrics. "The Chinese government would do well to take seriously our conclusions," said Appelbaum. "They should monitor progress in reforming the educational system to encourage more creative and innovative thought, rather than simply counting publications and patents."

"We're very hopeful that someone within Chinese government who is able to make changes sees this study and sees that there is a collective voice among Chinese faculty," commented Han.

More information: Xueying Han et al. China's science, technology, engineering, and mathematics (STEM) research environment: A snapshot, *PLOS ONE* (2018). [DOI: 10.1371/journal.pone.0195347](https://doi.org/10.1371/journal.pone.0195347)

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