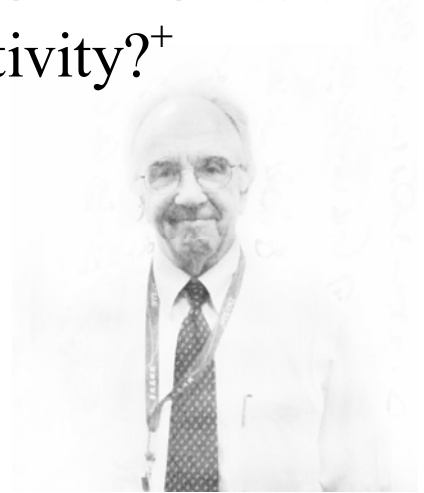


Inventory and Invention: How Can a Classical Education Foster Creativity?⁺

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In February, 2012, I directed a week-long series of conversations and presentations on our campus on the overall subject of innovation and creativity. As part of that forum, I invited J. Rogers Hollingsworth, a historian at the University of Wisconsin, to present a lecture on how universities around the world have encouraged—and discouraged—breakthrough innovation in the sciences. He has spent decades studying that issue, and has interviewed 500 of the leading scientists in the world. Many of his insights are reflected in the remarks below on stimulating creativity in the sciences.

The subject is of great interest to me, because I am in the process of writing a history of the rise and fall of human civilizations around the world. It turns out that one of the hallmarks of successful civilizations is the ability to foster innovation. By

the same token, one of the hallmarks of a civilization in decline is a failure to foster innovation.

So in this paper I would like to reflect on this question as it relates both to classical education in Chinese history and then to world history. I will first mention a few reasons why a classical education discourages innovation, followed by some reflections on how a classical education is absolutely necessary for innovation. That paradox—that the study of classics both discourages and encourages innovation—is captured in the title. In English the two terms "inventory" and "invention" share the same root, though they seem very different. Inventory implies the past; invention implies the future.

How does a classical education discourage creativity?

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- (1) Past knowledge not always relevant to future problems. The past is a very useful repository of human experience, and is a guide to the future—but not always. The fact is that history never repeats itself in exactly the same way. Similar, yes; the same, no.
- (2) A classical education typically focuses on successes. We tend to study what worked, what led to beneficial outcomes, and what the previous generations have told us was worth remembering. Let me give an example. I've always thought that Xunzi 荀子 had a much more interesting and profound understanding of human nature than Mengzi 孟子. But the classical tradition, because of the neo-Confucian heritage, focuses almost exclusively on Mengzi. So Xunzi's insights are not given much weight.
- (3) All civilizations require bureaucracy in order to accomplish complex goals. But bureaucracy actively discourages innovation because innovation requires risk, and risk invites a certain degree of failure, which bureaucracy has no tolerance for. When, as in traditional China, access to the bureaucracy is by exam, then innovative thinking is going to be discouraged even more. I remember reading Northern Song scholars who constantly criticized students for studying only for the exams and not for the sake of real learning.
- (4) A classical education reinforces conventional standards of thought and behavior. More on that later.
- (5) Creativity occurs on the margins, but classical education is the center. New thinking, because it is likely to be wrong (because it is risky) is not going to have prestige and reputation, by definition. But

that is where the innovation is. Confucius was creative, but he was not at the center.

If that is the case, then how does a classical education promote creativity? The answer lies in another question: How do you know something is new if you don't know what is old? Invention thus requires a knowledge of inventory, of what came before. Creativity, on the other hand, means something new, something previously unknown, something resulting from breaking previously established rules. But how is it possible to know that you have broken a rule if you don't know what the rules are in the first place? How do you know something is new if you don't know what is old?

Examples:

- (1) Renaissance = re-birth. The European Renaissance was founded as a rebirth of classical studies. Scholars looked to classical antiquity for inspiration. This is one reason why, incidentally, I believe that China and Taiwan are soon about to begin a renaissance of their own, and that this renaissance will be based on a synthesis of Chinese classical education and modern science.
- (2) A very high proportion of scientists in the United States received a liberal arts education at small liberal arts colleges without expensive equipment. There are many potential reasons for that, but one of them is surely that their education was broad and general, and in the process introduced them to the most exciting questions of life and to the joy of learning.

So the real question is how to encourage those aspects of a classical education that foster creativity, and discourage those aspects that don't foster creativity. I will suggest some strategies that have been successful in the past. These strategies are based on research on how to foster break-

through creativity in the sciences:

- (1) Passion. Because creativity takes place on the margins, often at great risk and without the normal rewards of prestige and reputation, there has to be a deep and abiding and passionate interest in pursuing that particular line of inquiry. One has to encourage students and artists to find what it is they are passionate about, and then help them channel that passion into productive directions.
- (2) Curiosity: education should engage students' curiosity by focusing on problems first, then the solutions in the form of knowledge about those problems.
- (3) Cultivate both breadth and depth: our entire higher educational system—all over the world—focuses on depth—we specialize from early on, until at the Ph.D. level we know more about one tiny piece of knowledge than anyone else in the world. But breakthroughs are made by people who also have a much broader breadth of interests that puts them in contact with all kinds of people outside their own specialization. My experience is that out of 100 people who become researchers and professors, only about 1 or 2 have a deep and abiding interest in the really big, visionary issues. Take biology, for example. Most practicing biologists have been trained in very narrow fields of specialization, and they stay in those fields for the duration of their career. Out of that small number, a tiny fraction are fascinated with the really big—and seemingly unsolvable—issues like "what is life?" How can one explain or understand the astonishing transition from a collection of inert chemical elements to something that is alive? It turns out, however, that it is that small minority of scientists who are fascinated with the really

big questions that often end up being the most creative.

- (4) Small size promotes flexibility and adaptability. The experience of most institutions is that the larger and more prestigious the institution, the less likely it is to foster breakthrough thinking. In the United States and Europe, the big, prestigious universities do not usually produce really breakthrough ideas. Smaller places like Cal Tech and Rockefeller University, or places like the Bell Labs and the research PARC, are far more likely to break new ground. Prestige and size are a real impediment to innovation. So is success. No sooner is a company or an organization successful than it often stops being innovative. That's why in the computing industry, companies don't last very long. Success dooms the companies to failure because they become complacent.
- (5) Frequent conversation with people outside one's own area of expertise. The key to innovation is conversation, conversation, and more conversation. There is no better way to get scholars to be innovative than to provide cheap, good food and a wonderful atmosphere conducive to conversation. Combine eating with talking—figure out ways to get people to interact with each other outside their offices. Rockefeller University, I am told, has a great dining facility with tables that seat no more than eight people, so that conversations don't divide up but take place at the table as a whole, bringing together specialists in diverse areas.
- (6) Create an atmosphere that promotes risk. Failure is essential to the creative process. In Silicon Valley in California, failure is not something to be ashamed of—it's almost a badge of honor. The assumption is that one

learns more from failure than from success, so the more you have failed, the more you know! It's no accident that the most successful system for innovative thinking in the Silicon Valley in California is outside the university. Universities are intensely conservative places intellectually—liberal politically, but intellectually extremely conservative. So for Silicon Valley, the universities provide the knowledge base, but not the environment where that knowledge can be put into practice. That requires a completely different atmosphere. Nothing could discourage risk more than the American system of promotion and tenure, which makes it imperative to get grants and publish successful results in a short period of time. It makes people very, very cautious in what they do. It's also another reason why so much innovation in that field is done by very young people. The knowledge base of the modern digital revolution was produced by companies like AT&T's Bell Labs (where Steven Chu 朱棣文 did the work on lasers for which he received the Nobel Prize), IBM's Watson Research Center, and Xerox's PARC (Palo Alto Research Center). Those were called skunk works that were outside the control of mid-level managers (who would never have permitted such freedom), and it was young people like Steve Jobs and Bill Gates who took many of those innovations and made a revolution out of them. And yet Silicon Valley, and Microsoft, rose out of close proximity and collaboration with universities. There is a kind of symbiotic relationship there.

- (7) As someone who has now spent a whole lifetime in the university (my father was a university professor and a dean and academic vice-president, and I have been both a professor and an academic vice-

chancellor), I am always fascinated by the simple paradox that underlies the modern university. The paradox is that we are programmed in our educational system to be competitive. But competitive people are often the least creative, because competition assumes that all the competitors are playing by the same rules. Creative people, on the other hand, don't play by the rules—they invent not just new rules, but entirely new games. But because they are new, they don't have status or prestige, or money for that matter, which is why passion and curiosity are necessary. Without them, people would not persist in spite of being ignored.

- (8) Lastly, intellectual creativity requires diversity. It requires people to do what does not come naturally, which is to associate with people who are different, not with people who are the same. That is how new ideas are formed, not by associating with people who are alike. All that produces is an echo chamber.

So in closing, let me once again return to my central point, which is that a classical education is absolutely necessary for creativity, because it represents the cumulative knowledge and wisdom of the past. But creativity needs more—it flourishes only in an atmosphere of great tolerance for risk and for failure. To balance these conflicting perspectives is our greatest challenge in higher education.