Developing our brightest minds

January 31 2007

Who will be the next Albert Einstein? The next Stephen Hawking? A new report from Vanderbilt University reveals the complex mix of factors that create these intellectual leaders: cognitive abilities, educational opportunities, investigative interests and old-fashioned hard work.

"The talent and commitment necessary to develop as a scientific leader require both personal attributes and learning environments that are truly beyond the norm," study authors Camilla Benbow, Patricia and Rodes Hart Dean of Education and Human Development, and David Lubinski, professor of psychology, wrote. "Not surprisingly, the personal attributes of future science, mathematics, engineering and technology leaders reveal that it takes much more than exceptional abilities to truly develop exceptional scientific expertise."

The report is based on 35 years of research from the Study of Mathematically Precocious Youth, a 50-year study that tracks individuals identified as exceptionally gifted at a young age across their lifespan. Begun at Johns Hopkins University in 1971, the study is now based at Vanderbilt University's Peabody College of Education and Human Development and is led by Benbow and Lubinski. The current report reflects data collected from over 5,000 study participants. It was published online last month by the journal *Perspectives on Psychological Science*.

The report has implications that reach far beyond the classroom, as the United States and other nations race to cultivate their brightest minds to

compete in an information-based global economy.

"These findings come at a time when our nation is gathering its diverse resources to ensure that we are positioned to compete in a flat, technology-driven world," Benbow says. "Supporting and cultivating our most intellectually gifted students is critical to maintaining our economic competitiveness globally. This research will help educators identify those students who have the most potential to become exceptional professionals and leaders in science, technology, engineering and mathematics."

"We found that mathematical gifts and a variety of aptitudes have a significant impact, but that special educational opportunities and commitment can dramatically increase this impact," Lubinski adds. "These students are intellectually gifted, and those gifts are best fully realized when they have the full support and understanding of their teachers, their parents and their social network."

Benbow and Lubinski found that while this group of students as a whole had exceptional mathematical ability it was far from homogenous, with a great diversity of talent and interests. These differences have a direct impact on participants' future career choices and success, some of which were outside of traditional scientific and mathematic fields.

"Exceptional verbal ability is characteristic of participants whose favorite courses, college majors and occupations were in the social sciences and humanities, whereas higher levels of mathematical and spatial abilities characterize participants whose favorite courses, college majors and occupations were in engineering and math or computer science," the authors wrote. "Given the ever-increasing importance of quantitative and scientific reasoning skills in modern cultures, when mathematically gifted individuals choose to pursue careers outside engineering and the physical sciences, it should be seen as a contribution

to society, not a loss of talent."

The researchers also found that differences in ability exist even among this elite group. The findings contradict a widely held belief in educational literature that there is an "ability ceiling;" in other words, that differences are moot among the very top students.

Lubinski and Benbow found this not to be the case. The study compared groups scoring progressively higher on the SAT — from the low to mid-500's to above 700 — at age 12 or 13. By age 33, 50 percent of the top scorers had earned a doctorate, compared to 30 percent of the group scoring closer to 500. (Only 1 percent of the general American population earns a doctorate).

"Individual differences in the top 1 percent do make a difference," the authors said. "More ability is always better, other things being equal."

The study identified another, perhaps obvious, factor of these students' success — a willingness to work extremely hard. A majority of the highest performers at age 33 indicated a willingness to work more than 65 hours a week.

Laced throughout the report are differences revealed by the study between men and women. Though they found no differences in overall ability between the sexes, they did find marked differences in types of ability and interests. The report found female participants more likely to prefer organic subjects and careers, such as the social sciences, biology and medicine, and men more likely to prefer inorganic subjects and career paths, such as engineering and the physical sciences.

Benbow was appointed in May 2006 by President George W. Bush as vice chair of the National Mathematics Advisory Panel and was appointed by the president to the National Science Board in September

2006. She is an investigator in the Vanderbilt Kennedy Center for Research on Human Development.

Lubinski is professor of psychology and also a Vanderbilt Kennedy Center investigator. He was awarded the 2006 Distinguished Scholar Award by the National Association for Gifted Children in November 2006.

Source: By Melanie Moran, Vanderbilt University