While we don’t promise equal outcomes, we have strived to deliver equal opportunity – the idea that success depends on effort and merit,” President Obama said in a speech last December. Yet as Obama went on to acknowledge, success in the US is now more dependent than ever on being born into wealth and privilege.

Over in the UK, the mayor of London, Boris Johnson – seen by some as a future prime minister – also recently addressed the issue of growing inequality, but his vision was rather different. Success is all about IQ, Johnson suggested, so all we can do is give the brightest kids the best chance to succeed.

These speeches raise all kinds of issues, but at their heart are two opposing ideas about what it takes to succeed. To some, it’s all about nature, that success is determined by genes. To others, it’s all about nurture – just about anyone can succeed given a chance. So which of these ideas is closer to reality?

The truth, needless to say, is more complex. The genes people inherit matter, but so does their environment. Even IQ, which has been claimed to measure innate intelligence, can be changed by a person’s upbringing. This means that there are plenty of things that can be done to make people more successful – but are governments, schools and parents doing the right things?

The debate about success has been fuelled by a recent twin study led by Robert Plomin of King’s College London, which found that differences in children’s academic performances in UK schools owe more to heritable traits than to teaching or other environmental factors. This result should not be too surprising, given that there is little doubt that intelligence depends in a large part on our genes, and that smart kids usually do better in school.

But the results do not mean that teaching does not matter. That’s like arguing that because differences in height are mostly down to genes food does not affect height in well-fed children. In fact, says Plomin, the large role of genes could be seen as a good thing because the more equal the environment, the more genes – as opposed to parental wealth, say – matter. Nor, he says, does it follow from his findings that we should pour resources into a small elite.

For one thing, children with the highest IQs aren’t necessarily the greatest achievers in later life. In the 1920s, Lewis Terman, a psychologist at Stanford University, recruited 1528 children in California who had scored
very highly on the Stanford-Binet IQ test. Like Johnson, Terman was convinced that IQ was the key to success in later life, defined in terms of earnings and achievements (yes, success could also be measured in terms of, say, happiness, but this article will focus on the narrower, materialistic definitions). He was right up to a point: by the middle of their lives, his 'Termites' had published around 2000 research papers and articles, won at least 230 patents and written 33 novels and 375 short stories and plays. Their median income was around three times that of the US as a whole.

But this is not quite as impressive as it sounds. Even though the median IQ of Terman's subjects was 147, around a quarter ended up in less prestigious jobs, becoming clerical workers, police officers, salesmen or craftsmen. None of the group matched the academic output of Nobel laureates or others among the nation's intellectual elite at the time. Indeed, by focusing on IQ scores, Terman excluded children such as Luis Alvarez and William Shockley, both of whom went on to win the Nobel prize in physics.

What's more, none of the Termites went on to found leading businesses, so they were not great "wealth creators" — one of the arguments for favouring an elite is that they will create wealth for a country. Instead, after 25 years Terman had to acknowledge that "intellect and achievement are far from perfectly correlated".

Genes versus environment

While intelligence clearly matters, then, by itself it is no guarantee of success. There is also overwhelming evidence of the importance of environmental factors, particularly those related to socio-economic status. Children who grow up in poor areas with limited access to computers and books, and who may also have little routine and little parental attention, not only have worse health, but are also more likely to do badly at school. This makes it far harder for them to flourish in adulthood. By contrast, many successful entrepreneurs, leaders and artistic high achievers grow up in stimulating homes surrounded by a diversity of books and are party to inspiring meal-time conversations.

Children whose parents split up or who grow up in emotionally unstable homes also start out at a disadvantage, regardless of their social background. They tend to be more badly behaved and underperform at school.

Edward Melhuish of Birkbeck, University of London, who studies child development, warns that children under 5 who don't receive consistent affection and responsive communication from their parents or caregivers have impaired social and emotional development. Crucially, this affects their language skills, which Melhuish says is a major reason why children from disadvantaged families generally do poorly at school.
HOW TO RAISE SUCCESSFUL KIDS

What can parents do to ensure their child gets the best chance to fulfill their potential? This is far from straightforward, since it won’t be immediately apparent where a child’s strengths and talents lie. Instead, the best approach is to encourage whatever inclinations and interests they show.

This means not just allowing them to pursue directions that would not be the parents’ first choice, like becoming a poet rather than a physician, says Dean Keith Simonton of the University of California, Davis, but encouraging them and recognising that some investments may not pay out. “After spending all that money on ice hockey gear, finding your kid drops out in the first year - ouch!”

Even if children don’t end up pursuing a particular subject, sport or instrument, attaining proficiency in one domain helps them understand how to build long-lasting skills in others. Perhaps the best advice of all is for parents to teach their children what Carol Dweck of Stanford University calls a “growth mindset” - the belief that abilities can be developed through dedication and practice and aren’t fixed by biology (see main story). She counsels parents to praise effort and progress, not intelligence and talent.

The former will encourage them to keep trying; the latter will make them want to give up at the first scent of failure.

“Improved language development helps boost cognitive development, literacy and educational attainment as well as social skills,” he says.

The effects of the environment, in other words, are profound. An impoverished upbringing can dent a child’s cognitive ability by as much as nine IQ points (Child Development, vol 65, p 296). By contrast, a privileged background can boost IQ. Adopted children born into poverty but brought up in well-off households have shown big gains in IQ compared with their non-adopted siblings.

These findings have clear implications. To help all children reach their potential, it’s not enough to wait until they start school - by then it may already be too late. What’s needed, says Melhuish, are high-quality “early education centres” that combine child care, parenting support, healthcare and learning in one place, an intervention that has already proved beneficial to children from all backgrounds, and to disadvantaged children most of all.

The importance of early intervention is now widely recognised, and has led to child development initiatives such as Sure Start in the UK and Head Start in the US. President Obama is now seeking cross-party support for his plans to expand access to pre-kindergarten education. “Research shows that one of the best investments we can make in a child’s life is high-quality early education,” Obama said in January. In the UK, however, funding for the Sure Start Initiative has been cut by a third in the past two years.

There is more to success, though, than innate potential and growing up in an environment that helps you realise that potential. “Cognitive ability and intelligence do not seem to predict individual differences in performance among skilled expert performers,” says psychologist K. Anders Ericsson at Florida State University in Tallahassee. He and others argue that the accomplishments of elite performers in many fields, including music and sports but also chess and others involving memory, owe far more to focused practice than to innate talent.

Why do some people practise more than others? Early on, perhaps because of pushy parents. But certain factors appear essential for anyone plotting a path to the top. For instance, you won’t get far without the ability to persevere and stay committed to far-off goals, or “grit”. “Grittier individuals are more successful than others, particularly in very challenging situations,” says Angela Duckworth at the University of Pennsylvania in Philadelphia.

What makes people gritty? Part of the answer is motivation. Duckworth has shown that people score higher on IQ tests when they are given an incentive, such as a small financial reward (PNAS, vol 108, p 7716). This finding has major implications for the study of success. Psychologists, economists and social scientists often point to the association between IQ scores and attainment in life as evidence that success depends largely on intelligence. Yet Duckworth’s work suggests that IQ tests measure more than intelligence –

“Adopted children born into poverty but brought up by well-off families have shown big gains in IQ”
and that motivation is a potent asset.

Grit demands something else as well: the willpower to see something through to the end. It involves hard work, and the resisting of distracting desires and impulses.

Willpower is largely about having self-control, which makes it relevant to the pursuit of achievement in two important ways.

First, self-control—like intelligence—has lifelong benefits. It is a better predictor of exam results among adolescents than IQ scores. Students with more self-control are more likely to turn up to school on time, do their homework and watch less television, Duckworth has found, all of which translated into better grades. A more recent study, which followed 1000 children in New Zealand from birth to 22 years old, found that those who exhibited greater self-control in childhood grew into healthier, more emotionally stable adults. They were also better off financially (PNAS, vol 108, p 2693).

**Self-control**

This mirrors a famous observation by the psychologist Walter Mischel, now at Columbia University in New York City. In the late 1960s, Mischel offered young children a choice between eating one treat immediately, or holding off for 15 minutes and getting two. Years later, Mischel discovered that the children who had managed to wait did better at high school than those who had succumbed to temptation. As adults, those able to delay gratification were also more popular with their peers, less likely to be overweight and earned higher salaries.

The second important thing about self-control is that it can be improved. Roy Baumeister at Florida State University in Tallahassee likens it to a muscle that can be strengthened with exercise. His team has found that exercising self-control in one area of life will improve it in another (New Scientist, 28 January 2012, p 30). His team has also noticed that some people improve more than others, possibly because they have more self-control to start with and so are better at committing to the exercises. "It's a circular process, which is all the more reason why parents should give priority early in their child's life to promoting willpower," says Baumeister. Self-control is also key to focused practice—which is necessary for the development of any skill—since deliberate practice is about pushing yourself to do the most difficult things, rather than just going through the motions, he says.

Knowing that we can improve our willpower and become grittier in the face of obstacles should make us more optimistic about what we are capable of. Unfortunately, we are often held back by our own beliefs about ourselves and our capacity for change. Developmental psychologists have shown that having a fixed mindset—viewing attributes such as intelligence and personality as set in stone—causes people to fear failure, react badly to criticism and avoid new or difficult assignments, hardly a recipe for success. The belief that your traits are malleable, on the other hand, makes you more willing to stretch yourself and learn new skills.

Over the last decade, a team led by Carol Dweck at Stanford University has improved the grades and attendance records of thousands of school and college students.
across the US simply by teaching them that intelligence isn’t fixed, that hard work can make you smarter, and that struggling to adjust to college is a normal learning process and not a sign of poor intellect. A “growth” mindset is advantageous at all stages of life, says Dweck. “It allows you to take on more challenges, and you don’t get discouraged by setbacks or find effort undermining.”

The dangers of a fixed mindset are particularly acute for members of groups about which society holds negative stereotypes, such as African-Americans or women, who may inadvertently conform to the stereotypes. While social attitudes are hard to change, changing mindsets is comparatively easy. Recently, in an unpublished study, Dweck’s team helped to improve African-American high-school leavers’ performance in college simply by encouraging a growth mindset.

The research on willpower and mindset suggests that we have some influence over the cards we are dealt at birth. However, it would be erroneous to cast this as a triumph of nurture over nature. “There is a genetic contribution to individual differences in virtually every psychological trait you can measure, including personality traits and cognitive abilities,” says Scott Barry Kaufman, who studies intelligence and creativity at New York University. Nonetheless, he adds, all traits need to be developed (see below).

“The environment, and life decisions on the part of the individual, are crucial in enabling that development,” he says.

Ericsson argues that in most cases a person can attain expertise in any domain provided they practise long enough in the right way. But quicker learners — those with more talent — will always out-compete slower ones, says Dean Keith Simonton of the University of California, Davis. “Sure, I might be able to become a violin virtuoso if I just practised hard enough for long enough, but if it’s not until I’m 50 years old that I’m ready to audition for a second chair position in a regional orchestra, what’s the point?”

**Dreams matter**

And not only are some people more talented than others, but people also have talents in different areas. Yet if all children are taught the same things in the same way, only some will have a chance to excel. The UK’s one-size-fits-all school system, with a national curriculum intended to minimise inequalities of opportunity, may inadvertently be favouring a subset of children. Almost all the psychologists and development experts contacted by *New Scientist* favour a school system that caters for a broader range of talents and interests, and focuses less on measures and targets.

“Not every student is the same, so multiple options are needed,” says Ericsson. Think of it this way: the more niches there are in a garden — sunny, shady, damp and so on — the wider the range of plants that can thrive there.

Schools should encourage deep, personal learning in more narrow subject areas, and let children develop at their own rate, says Kaufman. Plenty of people bloom late, particularly in the arts and sciences, which demand a range of social and cognitive skills, he says. “It might take someone a long time to overcome some hurdles, and then eventually they break through to greatness.”

What doesn’t help, say the experts, is introducing yet more standardised tests, as the UK is doing. While the US system is less centralised, it, too, is dominated by standardised testing. “Listen to children’s dreams, and encourage them, no matter their test scores or prior background. Reward effort, and the process, not the standardised academic outcome,” Kaufman advises.

Encourage dreaming? That may not seem like a recipe for success to some, but it is perhaps the most important factor of all. US psychologist Ellis Paul Torrance followed the lives of several hundred creative high-achievers from high school into middle age, among them academics, writers, inventors, teachers, consultants, business executives and a song-writer. He noticed that it wasn’t scholastic or technical abilities or achievements at school that set them apart, but characteristics such as having a sense of purpose, the courage to be creative, delighting in deep thinking and feeling comfortable in a minority of one. Most important of all, he thought, was to “fall in love with a dream”, preferably at a young age, and then pursue it with intensity.

Torrance called his group of high-flyers “beyonders”. He reckoned their accomplishments went beyond anything that standard quantitative tests could have predicted — and beyond anyone’s wildest dreams but their own.

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Michael Bond is a consultant for *New Scientist*