

Do our genes determine learning ability?

Taking an evidence-based approach to teaching and learning, as encouraged by the field of educational neuroscience, is challenging and at times controversial. Perhaps the most contentious aspect of this endeavour is the application of genetics to education, which has generated considerable debate. Nevertheless, the fact that it is controversial doesn't mean that we should shy away from it. So what exactly can the study of genetics tell us about learning, and what can educators do with this information?



**Annie
Brookman-
Byrne**

A large body of evidence indicates that cognitive abilities are influenced by genetics, and that each psychological trait is influenced by many genes. This means that educational outcomes are heritable to some extent: to take an example, a study of 13,306 twins found that a composite GCSE English, maths and science score was 62% heritable. Interpretation of this finding requires an understanding that heritability describes differences between individuals.

High heritability can mean that schools are doing a good job of educating pupils, so that remaining differences between pupils (whatever their size) are down to genetics. It is crucial to understand that high heritability does not mean that the school or other environmental factors are unimportant.

Rather than delving further into the details, let's consider how these summary findings might relate to learning and education. First, these discoveries support the argument that learners have different strengths and weaknesses, and should not all be expected to conform to the same profile of competences. Second, genetically influenced individual differences in ability may take away some of the pressure on educators. Teachers and schools are judged on the performance of their pupils, and as such aim for the highest grades for all students across subjects, yet a genetically informed approach might lead to greater acceptance of differences between pupils.

So far, these messages don't seem too outrageous. So why is genetics such a controversial topic in education? Some fear that these findings – that school-related abilities are in part due to genetics – will lead to a deterministic stance: if we accept that not all students can achieve the same grades, is there a danger that some children will get left behind without the help they need?

However, an appreciation of differing skill-sets need not lead to such a fatalistic position. There are two responses to this concern. The first is that a genetic predisposition for finding certain subjects or activities challenging does not mean that this can't be combatted. Rather than being left behind, learners could be given further assistance in recognition of the difficulties they face. As described above, heritability of traits does not mean that the environment has no effect. Teachers should continue to provide the best

Do our genes determine learning ability?



possible educational practices, such as a reading intervention for a struggling reader. The second response is that we should reconsider what constitutes success and which skills are valued.

As we discover more about the science of learning, including the role of genes, it is expected that there will be a move towards precision education. Tailoring education to the needs of individuals is anticipated through the accumulation of information on genetic, neural, and environmental risk factors. The more that we know about what causes individual differences, the more we will be able to adapt teaching and learning activities to each pupil.

You don't need to be a scientist in order to understand that our genes are a part of who we are, in the same way that our brains are a part of who we are. Finding out as much as possible about the mechanisms and processes underlying and affecting learning (through genetics, neuroscience, psychology, and other disciplines) is the best way to find out how to support everyone in their learning. Scientists should engage with those who are affected by their work: active engagement and discussion between educators and geneticists will enable

teachers to shape the future of research. The best way to proceed is to open the conversation and consider the most desirable way of incorporating research findings into practice.

This article was originally published by npj Science of Learning Community in December 2017.

Annie Brookman-Byrne is a science writer and Deputy Editor of The Psychologist magazine from the British Psychological Society. Her background is in educational neuroscience research, using behavioural, neuroimaging and classroom methods to examine science and maths reasoning. Annie also writes regularly for the Jacobs Foundation's blog on learning and development (BOLD).

Tailoring education to the needs of individuals is anticipated through the accumulation of information on genetic, neural, and environmental risk factors