Index

abnormality as normality 25, 26, 39, 142, 162, 165
academic stressors 119, 123
ACT-R 152–3
active genotype–environment correlation 10, 32–3, 60, 84, 132, 145, 169
ACTN3 70–73
Almeida, David 116
alpha-actinin-3 70–71
America see USA (United States of America)
Anderson, John 152
apprenticeships 174, 175
arithmetic see mathematical ability
arrays/chips of DNA
  Learning Chip technology 12, 20, 143, 152, 162, 180
  medical applications 19–20
Astrand, Per-Olaf 70
Australian twins’ study 27, 28
Bandura, Arthur 98–9
Barkley, Charles 69
basic skills 4–11, 161–5, 174, 176, 180–85
digital competence 4, 8, 176, 182
genetically sensitive school model 161–3, 164, 165, 180–81, 184, 185
school responsibility/failure 4–5, 6, 11, 162
see also mathematical ability; reading ability; writing ability
Beadle, Phil 151
bell curve distribution 24, 25, 30, 36, 46, 146
see also abnormality as normality
blank slate philosophy 5–6, 9, 12, 99, 145, 175
BMI (Body Mass Index) 65
Bouchard, Claude 67–9
Index

**Brainology** software technology 154–5
Butterworth, Brian 49

CardioChips 19–20
careers 86, 92, 174–5
Carnegie Learning math program 152, 153, 154, 155, 156
change/continuity 26, 143–4
chaos 131–3
child prodigies 46–7
choice
  choosing activities 181–2, 185
designer babies 96
equality of opportunity 129–30, 133–4, 139, 172
facilitation by technology 157, 182
key to genetically sensitive education 9, 11, 146, 163–5, 186
physical education 61, 69, 72, 74, 75, 172–3, 181
school size 177, 178
of schools 127, 137
self-efficacy beliefs 99
STEM careers 86
vocational education 175
CKM (creatine kinase gene) 69
class size 180
‘clones’ in the classroom study methodology 115–18
peers hypothesis 120–22
results 118–20
cognitive ability see IQ/cognitive ability
Coleman Report 137–8
Collins, Francis 19
Colorado twins’ study 27, 28, 30
computer-based teaching
  basic digital competence 4, 8, 176, 182
  facilitating choice 157, 182
facilitation by technology 157, 182
discriminant analysis 44
discerning the phenotype 34–5
digital competence 4, 8, 176, 182
Docherty, Sophia 51, 52
dopamine 63
Down syndrome 105–6, 107–8
DRD2 receptors 63
Dweck, Carol 98, 153, 154, 156, 157, 163
Down syndrome 105–6, 107–8
Dweck, Carol 98, 153, 154, 156, 157, 163
MOOCs (Massive Open Online Courses) 157–8
scientific evidence 151, 157
sensory joy 150–51
confidence genes 99
continuity/change 26, 143–4
coronary network 73
Csikszentmihalyi, Mihalyi 117, 118
curriculum see National Curriculum
diagnosis/labelling 25–6, 37–8, 48–9, 113, 165–6
digital competence 4, 8, 176, 182
see also computer-based teaching
disability/difficulty, semantics of 44
discrimination 111
dizygotic twins (DZ twins) 15–16
DNA
  ACTN3 70–73
  CKM (creatine kinase gene) 69
  Human Genome Project 18–19
  KIAA0319/reading problems 35–7
  Learning Chip technology 12, 20, 143, 152, 162, 180
  medical chip/array applications 19–20
  in MZ twins/DZ twins 15
  pooling to explain mathematical ability 51, 52
  SLC6A3/smoking 63
  sporting aptitude 70, 71–3
  Docherty, Sophia 51, 52
dopamine 63
Down syndrome 105–6, 107–8
DRD2 receptors 63
Dweck, Carol 98, 153, 154, 156, 157, 163

190
Index

dyscalculia 48–9

dyslexia 34–7

see also dyscalculia

DZ twins see dizygotic twins

education see formal/compulsory education

educational psychologists in schools 111

see also key-worker role

Einstein, Albert 42, 43

elite athletic performance 69–74

endurance sports 72, 74

English classes 119–20

see also reading ability; writing ability

environmental determinism 5–6

epigenetics 144

equal opportunities 128–30, 133–4, 139, 146, 170–72, 187

evocative genotype–environment correlation 10, 32, 54, 84

exercise see physical activity

extracurricular activities 69, 129–30, 172, 182–3, 186

failing schools 126–7, 136–9

fee-paying schools 53, 54–5, 90–91

feedback see praise

Finnish education system 4

fitness 67–9

fixed mindset 154, 156

flow 117–18, 119, 120

formal/compulsory education aims/assumptions 4–10

assessing ‘added value’ 94–5

fee-paying schools 53, 54–5, 90–91

G×E interaction 34

link between school quality and SES 126–7, 136–9

mathematical ability 45, 53, 54–5

national health role of physical education 57–8, 60, 61, 64, 66, 67, 69, 74–5

national systems 27–30

primary school science 79, 80–81, 84–5

responsibility for special educational needs 107

role of IQ scores 90–91, 100, 101, 102, 103

science 79, 80, 81–4, 85

to boost national average reading ability 29–30

UNESCO commitment to universal enrolment 7

see also ‘clones’ in the classroom study; genetically sensitive school model; preschool

Franklyn-Miller, Andrew 57–8, 60

Friemann, Theodore 70

g see IQ/cognitive ability

G×E (gene/environment interaction) 33–4

gender 78, 85–7

gene chips

Learning Chip technology 12, 20, 143, 152, 162, 180

medical applications 19–20

generalist genes hypothesis 50, 89, 106, 144, 154

genetic determinism 95–7, 145

genetically sensitive school model choice as the key 9, 11, 146, 163–5, 186

computers to personalize learning 176

core basic skills 46, 161–3

extracurricular activities 172

Individual Education Plan (IEP) 166–8, 176, 179–80

labels/diagnosis 165–6

preschool 170–71
genetically sensitive school model (continued)
primary school 164, 172–3, 179–83
school size 177, 178
secondary school 179, 183–6
teacher training 175–6
thinking skills 168–70
vocational education 174–5
genotype–environment correlation and choice 163, 177
facilitated by choice 69, 163–5, 172, 177
fostered by praise 156–7
 genetic determinism 95–7, 145
proximal processes between children and parents/teachers 138
science room expectations 82
SES/social mobility 129
thinking skills 168–70
types/importance to personalized learning 10–11
see also active
genotype–environment; evocative
genotype–environment; passive
genotype–environment
gifted children 46–7, 90–91, 92, 101, 102, 111–12, 143, 166
see also elite athletic performance
Gladwell, Malcolm 45–6
Graham, Robert Klark 96
Greven, Corina 99
growth mindset 153–4, 155, 162, 164–5
Hanscombe, Ken 131
Harris, Judith Rich 17
Haworth, Claire 79–80, 82, 83, 85, 87
Head Start Program (USA) 31, 93–4, 135
Heckman, James J. 134, 135, 136
heritability
confidence 99–100
fitness 67–9
IQ 91–2, 93, 95, 100
mathematical ability 44–6, 47, 48
physical activity levels in teenagers over time 59
reading ability 24–30
scientific ability 79–80, 81, 82, 83
SES 127–8, 133–6
trait analysis 16
writing ability 38–9
HERITAGE family study 67–9
hierarchical learning 135, 162, 165
Hodapp, Robert 107, 109
Holland, adolescent activity study 59–60
home environment 10, 31–2, 54, 91–2, 130–33, 135–6, 166
homework 83, 117, 132
hothousing 46–7
Human Genome Project 18–19
Hunter College Elementary School 90–91
IEP see Individual Education Plan
ImmunoChips 20
impaired learning see special educational needs
Individual Education Plan (IEP) 166–8, 176, 179–80
Institute for Effective Education (University of York, UK) 159
internet, as resource 182
IQ/cognitive ability
ACT-R model 152
and confidence 99
heritability 6, 91–2, 93, 95–7, 100, 144
home environment 47, 129, 130–33, 135
relationship with achievement 92–5, 97, 101–3, 135, 136
special educational needs 106, 108, 111–12
teaching thinking skills 168–70
tests 89–91, 92, 97, 102, 169
key-worker role 167, 168, 170, 176, 179, 183, 186
KIAA0319, as possible cause of reading problems 35–7
kindergarten/preschool 27–8, 31, 91, 93–4, 130, 135–6, 170–71
Kovas, Yulia 43, 44, 47–8, 50
labelling/diagnosis 25–6, 37–8, 48–9, 113, 165–6
Lawrence, Ruth 46–7
Learning Chip technology 12, 20, 143, 152, 162, 180
learning disabilities 34–7, 48–9, 105–10
Majors, Krista 152
Massive Open Online Courses (MOOCs) 157–8
mathematical ability
as a basic skill 4
‘clones’ in the classroom study 120
DNA pooling 51, 51–2, 52
environment 46–7, 48, 53–5
general opinions 42–3
generalist genes hypothesis 50
heritability measures 44–6, 47, 48
personalized learning 46, 49
see also Carnegie Learning math program
specific topics 44, 50
struggling learners 43, 47–9, 52, 152
Mathesis, Adrian 43
maximal aerobic capacity (VO$_{2\text{max}}$) 67–8
media 66, 126–7
medical conditions
abnormality as normality 25, 26, 39, 142, 162, 165
learning disabilities 34–7, 105–10
predicted by DNA chips/arrays 19–20
MENSA members 92, 96, 97
mindset for learning 99, 153–8, 162, 164–5
monozygotic twins (MZ twins) 15–16, 68
MOOCs see Massive Open Online Courses
motivation
learning mindset 99, 153–8, 162, 164–5
praise 98–100
science 81, 82, 85–7
MZ twins see monozygotic twins
National Curriculum
in genetically sensitive school
model 161–2, 164, 176, 180–81, 186
mathematics 42, 44, 50
national systems 27
physical education 58, 61, 173, 181, 184
thinking skills 103, 122, 168
neuromuscular disease 70
Nobel Prize-winners 78–9, 96–7
nonshared environment (NSE)
children’s physical activity 58, 59, 75
and choice 177
defined 16–17
individualization 145–6
reading ability 28, 31
school 31, 95
scientific ability/choice 79, 82–3
self-confidence/cognitive ability 101, 103
to tackle obesity 65
Index

nonshared environment (continued)
  writing ability 39
  see also ‘clones’ in the classroom study
North American twins’ study 27, 28, 30
North, Kathryn 70–71
Norwegian twins study 27, 28, 30
NSE see nonshared environment

obesity 64–7, 173
  food choice 67
Ofsted 127
Oliver, Bonamy 38
Oliver, Jamie 66
online learning 157–8

Paracchini, Silvia 36
parents
  blank slate philosophy 5, 99
  changing role children’s physical activity 58–9
  designer babies 96–7
DNA testing for sporting aptitude 70, 71–3
home environment 10, 31–2, 54, 91–2, 130–33, 135–6, 166
IQ test coaching 101
nurture assumption 17
praise 98, 99, 155–6
passive genotype–environment correlation 10, 32, 84, 132
peers/friends 17, 62, 95, 117, 118–19, 119–22, 123
Perry Preschool Program 135–6
personalized learning
  achievement–IQ relationship 92, 101–2
  active genotype–environment correlation 11
computer-based teaching see computer-based teaching
DNA chips 12, 143

physical education 60, 61, 69, 72, 74, 75, 172–3, 181
pooling practice 158–9
portage service 113–14
resource allocation 102–3
role of IQ testing 90, 97, 101–2
for struggling learners 37–8, 49, 107–11, 112
see also genetically sensitive school model
physical activity
  correlation with smoking 62–4, 75
  decline by adolescence 58–9
  elite athletic performance 69–74
  genetically sensitive school model 172–3, 179, 181, 184
  heritability of fitness 67–9
  school role 57–8, 60, 61, 64, 66, 67, 69, 74–5
  weight control 64, 66, 67
Plato 42
policy ideas see genetically sensitive school model
portage services 113–14, 130, 171
positivity 122
Prader–Willi syndrome 106, 107
praise 98–100, 153, 155–6
pre-reading skills 26
predictors of achievement
  19th century 29
  IQ 89–92, 93, 97, 99, 100, 103
  Learning Chips 20, 143
  self-confidence 98, 99, 100, 103
  SES 127, 128
preschool 27–8, 31, 91, 93–4, 130, 135–6, 170–71
primary schools
  genetically sensitive model 164, 172–3, 179–83
  Individual Education Plans 167, 179–80
  literacy 27–30, 31, 166
  mathematics 45
Index

physical education 59, 61, 69, 75, 172, 173, 181
science 79, 80–81, 84–5
UNESCO commitment to universal enrolment 7

QTL (Quantitative Trait Loci) hypothesis 25–6, 36–7, 52, 73, 79, 142

reading ability
basic tool to function in society 4
Down syndrome 108
environmental influences 31–3
G×E (gene/environment interaction) 33–4
genetic influences 24–30
learned skill 23
preschool focus 27–8, 170
struggling readers 24, 25, 30, 34–8
support at home 32, 132, 166

Scandinavian twins’ study 27, 28, 30
School Action Plus (stage in UK SEN provision) 111
School Action (stage in UK SEN provision) 110–11
school meals 66–7
school size 177, 178
schools see formal/compulsory education
scientific ability
gender differences 78, 85–7
genetically sensitive school model 185
heritability measurement 79–80, 81, 82, 83
Nobel Prize-winning scientists 78–9
primary school science 79, 80–81, 84–5
secondary school science 80, 81–4

scientific proof for effectiveness of personalized learning 151, 158–9, 185
secondary schools
genetically sensitive model 179, 183–6
Individual Education Plans 167
physical education 61, 64, 75, 173, 184
science 79, 80, 81–4
self-confidence/esteem, and achievement 98–100, 168–70
self-efficacy beliefs 99
SEN see special educational needs
SES see socioeconomic status
shared environment (SE) defined 16–17
influence on body fat 65, 66–7
leading to nonshared experience 122–4, 145
physical activity 58, 59, 69, 75, 172–3
preschool impact 136
reading ability 27, 28, 31
school effectiveness 95
scientific ability/choice 79–80, 82, 83
writing ability 39
SLC6A3 63
smoking 62–4, 75
SNPs (single nucleotide polymorphisms), mathematical ability 51, 52
social mobility 6, 48, 128–9, 133–6, 170

socioeconomic status (SES)
developmental opportunities 129–30, 133–4
extracurricular activities 129–30, 172, 182
heritability 127–8, 133–6
home stimulation 31–2, 130–33, 135, 136
low status–obesity link 64
socioeconomic status (continued)
media portrayal of low SES pupils 126–7
passive genotype–environment correlation 10
predictor of academic achievement 127, 128
reading ability 31–2
school quality 136–9
social mobility 128–9, 133–6, 170–71
special educational needs (SEN)
for all 112–13
dyscalculia 48–9
dyslexia 34–7
‘gifted and talented’ 111–12, 166
learning disabilities 105–10
portage service 113–14
SES over-representation 128
UK system 110–11
see also struggling learners
‘speed gene’ see ACTN3
spelling 27, 38
sports see physical activity
statements (of special educational needs) 110, 112
statistics 141–2
STEM careers (Science, Technology, Engineering and Mathematics) 86
struggling learners
genetically sensitive school model 165–6
Learning Chip technology 20
mathematics 43, 47–9, 52, 152
readers 24, 25–6, 30, 34–8
resource priority 102
see also special educational needs
Sure Start program (UK) 93–4
Swedish twins’ study 27, 28, 30
swimming 73
talented children 102, 111–12
see also elite athletic performance teachers
achievement–teacher quality link 138
appreciation of genetic influence 5, 6, 12, 34, 45, 144, 145, 175–6
‘clones’ in the classroom study 117, 118, 119–20, 123
genetically sensitive school model 167, 169–70, 179, 180, 181, 182–3
giving praise 98, 155, 156
and personalized learning 149–50, 151, 156, 157, 158, 159, 163–4
SEN 109
skills/training 6 9–10, 11, 157, 158, 164–5, 175–6
teaching confidence/cognitive skills 103
training 175–6
technology see computer-based teaching
TEDS (Twins’ Early Development Study)
home chaos/achievement correlation 131–2
IQ/achievement correlation 94–5, 101
mathematical ability 44–5, 47–8, 50, 51–2
methodology 14–18
scientific ability/choice 79–80, 82, 85, 87
self-esteem 98–100
self-perceived ability 99
shared environment on body fat 65
writing heritability 38–9
see also ‘clones’ in the classroom study
Index

tests/exams
- in genetically sensitive school model 162, 163, 164, 185
- IQ testing 89–91, 92, 97, 102, 169
- physical education 57–8
- thinking skills 168–70
- Thrun, Sebastian 157
- toolkit of basic skills see basic skills
- tracking/monitoring (genetically sensitive school model) 113, 167, 174, 176, 180, 186
- trait analysis 16, 20
- twins studies 26, 27–8, 30, 59–60, 68
  - Scandinavian (Norwegian, Swedish) twins' study 27, 28, 30
  - US (Colorado) twins' study 27, 28, 30
  - see also Twins' Early Development Study

UK see United Kingdom

UNESCO, 2015 target on primary school enrolment 7

United Kingdom
- class gap 128
- debate on school meals 66
- ‘gifted and talented’ programs 102, 111–12
- Institute for Effective Education (University of York, UK) 159
- marketization of education 136–7
- Ofsted 127
- SEN (special educational needs) 110–11
- Sure Start program 93–4
- see also TEDS (Twins’ Early Development Study)
- USA (United States of America)
  - Head Start Program 31, 93–4, 135
  - Colorado twins’ study 27, 28, 30
  - ‘What Works Clearinghouse’ 158–9
- variance 29–30, 48, 142, 146
- VO2max (maximal aerobic capacity) 67–8
- vocational/non-academic education 174–5, 186
- ‘What Works Clearinghouse’ 158–9
- Williams syndrome 106, 107, 108
- working classes see socioeconomic status
- writing ability 4, 38–9